



DHS SCIENCE AND TECHNOLOGY

Master Question List for COVID-19 (caused by SARS-CoV-2)

Weekly Report

21 December 2020

For comments or questions related to the contents of this document, please contact the DHS S&T Hazard Awareness & Characterization Technology Center at HACTechnologyCenter@hq.dhs.gov.



**Homeland
Security**

Science and Technology

DHS Science and Technology Directorate | MOBILIZING INNOVATION FOR A SECURE WORLD

CLEARED FOR PUBLIC RELEASE

FOREWORD

The Department of Homeland Security (DHS) is paying close attention to the evolving Coronavirus Infectious Disease (COVID-19) situation in order to protect our nation. DHS is working very closely with the Centers for Disease Control and Prevention (CDC), other federal agencies, and public health officials to implement public health control measures related to travelers and materials crossing our borders from the affected regions.

Based on the response to a similar product generated in 2014 in response to the Ebolavirus outbreak in West Africa, the DHS Science and Technology Directorate (DHS S&T) developed the following “master question list” that quickly summarizes what is known, what additional information is needed, and who may be working to address such fundamental questions as, “What is the infectious dose?” and “How long does the virus persist in the environment?” The Master Question List (MQL) is intended to quickly present the current state of available information to government decision makers in the operational response to COVID-19 and allow structured and scientifically guided discussions across the federal government without burdening them with the need to review scientific reports, and to prevent duplication of efforts by highlighting and coordinating research.

The information contained in the following table has been assembled and evaluated by experts from publicly available sources to include reports and articles found in scientific and technical journals, selected sources on the internet, and various media reports. It is intended to serve as a “quick reference” tool and should not be regarded as comprehensive source of information, nor as necessarily representing the official policies, either expressed or implied, of the DHS or the U.S. Government. DHS does not endorse any products or commercial services mentioned in this document. All sources of the information provided are cited so that individual users of this document may independently evaluate the source of that information and its suitability for any particular use. This document is a “living document” that will be updated as needed when new information becomes available.

The Department of Homeland Security Science and Technology Directorate is committed to providing access to our web pages for individuals with disabilities, both members of the public and federal employees. If the format of any elements or content within this document interferes with your ability to access the information, as defined in the Rehabilitation Act, please contact the Hazard Awareness & Characterization Technology Center for assistance by emailing HACTechnologyCenter@hq.dhs.gov. A member of our team will contact you within 5 business days. To enable us to respond in a manner most helpful to you, please indicate the nature of your accessibility problem, the preferred format in which to receive the material, the web address (<https://www.dhs.gov/publication/st-master-question-list-covid-19>) or name of the document of the material (Master Question List for COVID-19) with which you are having difficulty, and your contact information.

Table of Contents

Infectious Dose – How much agent will make a healthy individual ill?	3
The human infectious dose of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is unknown by all exposure routes. Based on experimental studies with humans exposed to other coronaviruses, animals exposed to SARS-CoV-2, and modeling estimates, the median infectious dose is likely between 10 and 1,000 viral particles (plaque-forming units, PFU). We need to know the infectious dose for humans by all possible exposure routes in order to inform models, develop diagnostics and countermeasures, and inform disinfection efforts.	
Transmissibility – How does it spread from one host to another? How easily is it spread?	4
SARS-CoV-2 is passed easily between humans through close contact and aerosol transmission. ^{36, 83, 266, 464} Asymptomatic or pre-symptomatic individuals can transmit SARS-CoV-2 and contribute significantly to new case growth. ³⁹¹ Infection risk is particularly high indoors. ⁵⁹ Household transmission is rapid, ¹⁶ and household contacts spread infection more than casual community contacts. ⁴⁸² Superspreading events (SSEs) appear common in SARS-CoV-2 transmission and may be crucial for controlling spread. Rates of transmission on public transit are unclear but appear low, ²⁵⁰ but the US CDC recommends masks during travel. ⁶¹³ Children of any age can acquire and transmit infection in homes, schools, and community settings, though there is some evidence that younger children (<10-15) are less susceptible and less infectious than older children and adults. Individuals who have clinically recovered but test positive for COVID-19 are unlikely to be infectious. ^{403, 749} We need to know the relative contribution of different routes of transmission (e.g., fomites, aerosols, droplets).	
Host Range – How many species does it infect? Can it transfer from species to species?	5
SARS-CoV-2 is closely related to other coronaviruses circulating in bats in Southeast Asia. Previous coronaviruses have passed through an intermediate mammal host before infecting humans, but the presence or identity of the SARS-CoV-2 intermediate host is unknown. ^{394, 408, 410} Current evidence suggests a direct jump from bats to humans is plausible. ⁷³ SARS-CoV-2 uses the same receptor for cell entry as the SARS-CoV-1 coronavirus that circulated in 2002/2003. Animals can transmit SARS-CoV-2 to humans, but the potential role of long-term reservoir species is unknown. Several animal species are susceptible to SARS-CoV-2 infection. We need to know the best animal model for replicating human infection by various exposure routes.	
Incubation Period – How long after infection do symptoms appear? Are people infectious during this time?	6
On average, symptoms develop 5 days after exposure with a range of 2-14 days. Incubating individuals can transmit disease for several days before symptom onset. Some individuals never develop symptoms but can still transmit disease. It is estimated that most individuals are no longer infectious beyond 10 days after symptom onset. The average time between symptom onset in successive cases (i.e., the serial interval) is approximately 5 days. Individuals can shed virus for several weeks, though it is not necessarily infectious. We need to know the incubation duration and length of infectivity in different patient populations.	
Clinical Presentation – What are the signs and symptoms of an infected person?	7
Most symptomatic cases are mild, but severe disease can be found in any age group. ⁸ Older individuals and those with underlying conditions are at higher risk of serious illness and death, as are men. ⁵⁰³ Fever is most often the first symptom. COVID-19 is more severe than seasonal influenza, evidenced by higher ICU admission ⁷⁴³ and mortality rates. ⁵³⁸ Approximately 15% of hospitalized patients are classified as severe, and approximately 5% of patients are admitted to the ICU. ^{267, 650} Symptoms can persist for months. Between 16% and 76% of cases are asymptomatic throughout the course of their infection, ^{87, 93, 359, 371, 380, 454, 487, 502, 644, 660} though changing symptom definitions make it difficult to compare asymptomatic fractions through time. ⁴⁴⁷ The case fatality rate (CFR) is unknown, but adults >60 ⁵²⁰ and those with comorbidities are at elevated risk of death. ^{650, 773} Minority populations and essential workers are disproportionately affected by COVID-19. ⁴⁶³ Children are susceptible to COVID-19, ¹⁷⁴ though generally show milder ^{125, 423} or no symptoms. We need to know the true case fatality rate, asymptomatic fraction, and the duration of debilitating symptoms.	
Protective Immunity – How long does the immune response provide protection from reinfection?	8
Infected patients show productive immune responses, but the duration of any protection is unknown. ^{29, 718} Reinfection is possible. The longevity of antibody responses and T-cell responses is unknown but appears to be at least several months. Reinfection with SARS-CoV-2 is possible but appears rare, though the true frequency is unknown. The contribution of historical coronavirus exposure to SARS-CoV-2 immunity is unknown. ⁴⁸¹ We need to know the frequency and severity of reinfection, as well as the protective effects of immune components.	
Clinical Diagnosis – Are there tools to diagnose infected individuals? When during infection are they effective?	9
Diagnosis of COVID-19 is based on symptoms consistent with COVID-19, PCR-based testing of active cases, and/or the presence of SARS-CoV-2 antibodies in individuals. Screening solely by temperature or other symptoms is unreliable. Validated serological (antibody) assays are being used to help determine who has been exposed to SARS-CoV-2. We need to identify additional factors that affect the accuracy of serological or PCR-based diagnostic tests.	

Medical Treatments – Are there effective treatments?10
There is no universally effective treatment for COVID-19, but some treatments reduce disease severity and mortality. Remdesivir may reduce symptom duration in hospitalized patients,⁶³ and may reduce mortality when combined with other treatment regimens (e.g., baricitinab).³²⁷
Hydroxychloroquine provides limited to no clinical benefit.^{212, 604}
Corticosteroids may significantly reduce mortality in severely ill⁵¹² and ventilated patients,¹²⁶ especially if given early.⁶⁵⁷
Convalescent plasma treatment is safe and may be effective when administered early,²⁷ though evidence is mixed.⁵²³
Anticoagulants may reduce COVID-19 mortality in hospitalized patients.
The benefits of tocilizumab are unclear, and it can increase hospital stay time and the risk of secondary infection.³⁸⁶
Other pharmaceutical interventions are being investigated but results from large clinical trials are needed.
We need clear, randomized trials for treatment efficacy in patients with both severe and mild/moderate illness.

Vaccines – Are there effective vaccines?11
Several vaccine candidates have shown promising Phase III trial results, and one is currently being administered under FDA Emergency Use Authorization.
We need published results from Phase I-III trials in humans to assess vaccine efficacy and safety, and length of immunity.

Non-pharmaceutical Interventions (NPIs) – Are public health control measures effective at reducing spread?12
Broad-scale control measures such as stay-at-home orders and widespread face mask use effectively reduce transmission and are more impactful when implemented simultaneously. Public health notifications increase adherence to policies.²¹⁹
Individual behaviors (e.g., face masks, social distancing) have been associated with reduced risk of COVID-19 infection.⁵²⁴
Particular focus should be placed on minimizing large gatherings where superspreading events are more likely.⁷²⁹
Research is needed to plan the path to SARS-CoV-2 elimination via pharmaceutical and non-pharmaceutical interventions.
We need to understand measures that will limit spread in the winter, particularly in indoor environments.

Environmental Stability – How long does the agent live in the environment?13
SARS-CoV-2 can survive on surfaces from hours to days and is stable in air for at least several hours, depending on the presence of UV light, temperature, and humidity.⁶¹ Environmental contamination is not thought to be the principal mode of SARS-CoV-2 transmission in humans.
SARS-CoV-2 survival in the air is highly dependent on the presence of UV light and temperature.
There is currently no evidence that SARS-CoV-2 is transmitted to people through food.
We need to quantify the duration of SARS-CoV-2 infectivity on surfaces, not simply the presence of RNA.

Decontamination – What are effective methods to kill the agent in the environment?14
Soap and water, as well as common alcohol and chlorine-based cleaners, hand sanitizers, and disinfectants are effective at inactivating SARS-CoV-2 on hands and surfaces.
Several methods exist for decontaminating N95 respirators⁴⁹³ and other PPE.
We need additional SARS-CoV-2 decontamination studies, particularly with regard to PPE and other items in short supply.

PPE – What PPE is effective, and who should be using it?15
Face masks appear effective at reducing infections from SARS-CoV-2. Healthcare workers are at high risk of acquiring COVID-19, even with recommended PPE.
We need to continue assessing PPE effectiveness with specific regard to SARS-CoV-2 instead of surrogates.

Forensics – Natural vs intentional use? Tests to be used for attribution.16
All current evidence supports the natural emergence of SARS-CoV-2 via a bat and possible intermediate mammal species.
We need to know whether there was an intermediate host species between bats and humans.

Genomics – How does the disease agent compare to previous strains?.....17
Current evidence suggests that SARS-CoV-2 accumulates mutations at a similar rate as other coronaviruses.
Several viral variants, representing unique collections of mutations, are being investigated for their effects on transmission and/or virulence.
Several human genomic regions, including those determining blood type, affect COVID-19 prevalence and/or severity.³⁴
There is some concern regarding SARS-CoV-2 strains involved in continued human and mink transmission.
We need to link genotypes to phenotypes (e.g., disease severity) in infected patients, and identify differences in transmissibility or symptom severity caused by different SARS-CoV-2 mutations.

Forecasting – What forecasting models and methods exist?18
Additional forecasting efforts are designed to assess the effects of interventions such as social distancing and vaccination.
We need to know how different forecasting methods have fared when compared to real data and develop an understanding of which model features contribute most to accurate and inaccurate forecasts.

Infectious Dose – How much agent will make a healthy individual ill?
What do we know?
<p>The human infectious dose of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is unknown by all exposure routes. Based on experimental studies with humans exposed to other coronaviruses, animals exposed to SARS-CoV-2, and modeling estimates, the median infectious dose is likely between 10 and 1,000 viral particles (plaque-forming units, PFU).</p> <p><i>Non-human primates</i></p> <ul style="list-style-type: none"> • A total dose of approximately 700,000 plaque-forming units (PFU) of the novel coronavirus SARS-CoV-2 infected cynomolgus macaques via combination intranasal and intratracheal exposure (10^6 TCID₅₀ total dose).⁵⁸⁰ • Rhesus and cynomolgus macaques showed mild to moderate clinical infections at doses of 4.75×10^6 PFU (delivered through several routes), while marmosets developed mild infections when exposed to 1×10^6 PFU intranasally.⁴²² • Rhesus macaques are effectively infected with SARS-CoV-2 via the ocular conjunctival and intratracheal route at a dose of $\sim 700,000$ PFU (10^6 TCID₅₀).¹⁶⁴ Rhesus macaques infected with 2,600,000 TCID₅₀ of SARS-CoV-2 by the intranasal, intratracheal, oral and ocular routes combined recapitulate moderate human disease.⁴⁶⁹ A small study infected Rhesus macaques via ocular inoculation (1×10^6 TCID₅₀), resulting in mild infection; however, gastric inoculation did not result in infection (same dose), suggesting a limited role of gastric transmission. Interpretation is limited due to the small scale.¹⁶³ • African green monkeys replicate aspects of human disease, including severe pathological symptoms (exposed to 500,000 PFU via intranasal and intratracheal routes),⁷³⁴ mild clinical symptoms (aerosol exposures between 5,000 and 16,000 PFU),²⁸⁰ and acute respiratory distress syndrome (ARDS), with small particle aerosol exposure doses as low as 2,000 PFU.⁷¹ • Aerosol exposure of three primate species (African green monkeys, cynomolgus macaques, and rhesus macaques) via a Collision nebulizer resulted in mild clinical disease in all animals with doses between 28,700 and 48,600 PFU.³²¹ • Rhesus macaques have been suggested as the best non-human primate model of human COVID-19.⁴²¹ Infectious SARS-CoV-2 has been isolated from rhesus macaque feces, suggesting possible fecal-oral transmission.⁷⁷¹ <p><i>Rodents and other animal models</i></p> <ul style="list-style-type: none"> • The SARS-CoV-2 median infectious dose in Golden Syrian hamsters via the intranasal route was experimentally estimated at 5 TCID₅₀ (~ 3.5 PFU).⁵⁸⁴ Low-dose intranasal inoculation of ferrets (2,000 PFU) and Golden Syrian hamsters (1,800 PFU) with SARS-CoV-2 resulted in mild clinical symptoms, the production of infectious virus, and seroconversion.⁴⁵⁹ • Golden Syrian hamsters exposed to 80,000 TCID₅₀ ($\sim 56,000$ PFU) via the intranasal route developed clinical symptoms reminiscent of mild human infections (all hamsters infected).⁶¹⁸ Golden Syrian hamsters infected with 100,000 PFU intranasally exhibited mild clinical symptoms and developed neutralizing antibodies,¹²⁰ and were also capable of infecting individuals in separate cages. • Transgenic (hACE2) mice became infected after timed aerosol exposure (36 TCID₅₀/minute) to between 900 and 1080 TCID₅₀ (~ 630-756 PFU). All mice (4/4) exposed for 25-30 minutes became infected, while no mice (0/8) became infected after exposure for 0-20 minutes (up to 720 TCID₅₀, ~ 504 PFU).⁵⁴ This paper has methodological caveats (e.g., particle size). • Ferrets infected with 316,000 TCID₅₀³³⁹ or 600,000 TCID₅₀⁵⁷² of SARS-CoV-2 by the intranasal route show similar symptoms to human disease.^{339, 572} Uninfected ferrets in direct contact with infected ferrets test positive and show disease as early as 2 days post-contact.³³⁹ In a separate ferret study, 1 in 6 individuals exposed to 10^2 PFU via the intranasal route became infected, while 12 out of 12 individuals exposed to $>10^4$ PFU became infected.⁵⁹² <p><i>Modeling estimates</i></p> <ul style="list-style-type: none"> • The infectious dose of a pathogen can be estimated by the amount of genetic material passed between an infector and infectee (called “bottleneck” size);⁶²⁷ using epidemiological data, sequencing data, and statistics, the average “bottleneck” size for SARS-CoV-2 has been estimated as $\sim 1,200$ viral particles, though exposure routes were not possible to identify.⁵⁴³ • Modeling aerosol exposures from 5 case studies suggests the inhalation ID₅₀ for SARS-CoV-2 is approximately 361-2,000 viral particles, which is approximately 250-1,400 PFU.⁵⁴⁶ <p><i>Related Coronaviruses</i></p> <ul style="list-style-type: none"> • Humans exposed intranasally to ~ 70 PFU of seasonal coronavirus 229E developed infections,⁹⁶ with a plausible intranasal ID₅₀ of 10 TCID₅₀ (~ 7 PFU).^{78, 478} The inhalation infectious dose of seasonal coronavirus 229E is unknown in humans. • The infectious dose for severe acute respiratory syndrome coronavirus 1 (SARS-CoV-1) in mice is estimated to be between 67-540 PFU (average 240 PFU, intranasal route).^{155, 158} • Genetically modified mice exposed intranasally to Middle East respiratory syndrome coronavirus (MERS-CoV) between 100-500,000 PFU show signs of infection. Infection with higher doses result in severe syndromes.^{19, 141, 388, 767}
What do we need to know?
<p>We need to know the infectious dose for humans by all possible exposure routes in order to inform models, develop diagnostics and countermeasures, and inform disinfection efforts.</p> <ul style="list-style-type: none"> • Human infectious dose by aerosol, surface contact (fomite), fecal-oral routes, and other potential routes of exposure • Most appropriate animal model(s) to estimate the human infectious dose for SARS-CoV-2 • Does exposure dose determine disease severity? • What is the ratio of virus particles/virions to PFU for SARS-CoV-2?

Transmissibility – How does it spread from one host to another? How easily is it spread?
What do we know?
<p>SARS-CoV-2 is passed easily between humans through close contact and aerosol transmission.^{36, 83, 266, 464}</p> <ul style="list-style-type: none"> As of 12/21/2020, pandemic COVID-19 has caused at least 77,074,469 infections and 1,697,679 deaths globally.³¹⁸ In the US, there have been 17,862,876 confirmed COVID-19 cases and 317,858 confirmed deaths,³¹⁸ though both cases³³ and fatalities are underestimates.^{498, 733} Estimates of human transmissibility (R_0) range from 2.2 to 3.1.^{433, 514, 576, 740, 766} SARS-CoV-2 can spread via aerosol or “airborne” transmission beyond 6 ft in certain situations⁷²⁴ such as enclosed spaces with inadequate ventilation.¹¹⁰ The risk of infection from fomites is believed to be low.²⁸¹ Exhaled breath may emit 10^5-10^7 genome copies per person per hour;⁴²⁹ the amount of infectious virus remains unknown. Vertical transmission from mother to fetus is possible^{193, 680} but rare.⁶⁵¹ <p>Asymptomatic or pre-symptomatic individuals can transmit SARS-CoV-2 and contribute significantly to new case growth.³⁹¹</p> <ul style="list-style-type: none"> Individuals may be infectious for 1-3 days prior to symptom onset.^{41, 705} Pre-symptomatic^{72, 344, 628, 639, 745, 770} or asymptomatic^{50, 300, 428} patients can transmit SARS-CoV-2.⁴¹⁷ Between 15-56%⁵⁶⁸ of infections may be caused by pre-symptomatic transmission,^{100, 283, 413, 765} and 75.9% of transmission events in China were associated with pre-symptomatic or asymptomatic transmission.⁶¹⁶ Most transmission occurs before symptoms begin and within 5 days of symptom onset.¹²⁷ Asymptomatic individuals can transmit disease as soon as 2 days after infection.⁶³⁸ There is evidence that asymptomatic individuals transmit SARS-CoV-2 less often than symptomatic individuals.^{65, 87, 647} <p>Infection risk is particularly high indoors.⁵⁹</p> <ul style="list-style-type: none"> SARS-CoV-2 may be spread by conversation and exhalation^{11, 385, 599, 631} in indoor areas such as restaurants.³⁹⁶ Positive SARS-CoV-2 patients were twice as likely as negative patients to report that they had recently eaten in restaurants²²⁰ or worked in an office.²¹⁵ Clusters are often associated with large indoor gatherings,^{376, 515} including bars, restaurants,⁷⁵⁸ and gyms.¹²³ Very few outbreaks have occurred in outdoor settings.⁸⁸ <p>Household transmission is rapid,¹⁶ and household contacts spread infection more than casual community contacts.⁴⁸²</p> <ul style="list-style-type: none"> On average, 16.6%⁴³⁰ to 18%³⁴² of household contacts of infected index patients acquire SARS-CoV-2 (i.e., the “attack rate”). Attack rates are higher for symptomatic index cases, spouses of index cases, and adults,⁴³⁰ though transmission to children may be underestimated.²⁶² 75% of household infections occurred within 5 days of illness onset in the index case.²⁶² In a US study, 31 of 58 households (54%) with a primary SARS-CoV-2 case showed evidence of secondary transmission; in 7 of these 31 households (23%), all members of the household became infected.³⁸⁶ Index patients who transmitted SARS-CoV-2 to secondary contacts had higher viral titers than secondary contacts who did not subsequently transmit illness, as quantified by nasal swab RT-qPCR.³²⁹ <p>Superspreading events (SSEs) appear common in SARS-CoV-2 transmission and may be crucial for controlling spread.</p> <ul style="list-style-type: none"> Most new infections come from a few infectious individuals (overdispersion parameter $k = 0.2$-0.5).^{15, 188, 368, 373, 691} <p>Rates of transmission on public transit are unclear but appear low,²⁵⁰ but the US CDC recommends masks during travel.⁶¹³</p> <ul style="list-style-type: none"> Several studies have identified plausible transmission on airplanes.^{49, 133, 288, 336, 471} Fluorescent tracer research on commercial airplanes suggests a low risk of aerosol or surface transmission during flights, though key parameters remain uncertain.⁶¹⁹ On trains in China, transmission rates were high for those in the same row as an infectious individual (1.5-3.5% attack rate), though low for non-neighboring passengers.²⁹⁶ Outbreaks have also occurred on public buses.⁴²⁷ <p>Children of any age can acquire and transmit infection in homes, schools, and community settings, though there is some evidence that younger children (<10-15) are less susceptible and less infectious than older children and adults.</p> <ul style="list-style-type: none"> The role of children in SARS-CoV-2 transmission is unclear. There is evidence of high transmission rates among same-aged children,³⁷³ as well as transmission in the home,^{304, 372, 386, 516} at school,^{263, 313} and in the community.^{287, 539} However, there have also been suggestions that children are both less susceptible to COVID-19 (due to low PCR test positivity rates)⁴³⁰ and less infectious (because they are rarely identified as the index case in households).⁷⁷⁹ Some emerging evidence suggests that young children (<10) are less susceptible and less infectious than adults, while older children and adolescents are more similar to adults.²⁵¹ Contact tracing in China, Iceland, and Israel has found lower rates of transmission to and from younger children (<10-15) compared to adults, but similar rates in older children.^{153, 519, 641} After schools reopened in Italy, researchers found low attack rates in preschool (0%) and elementary school children (0.38%), but higher attack rates in middle and high school students (6.5%).³⁶² Discrepancies regarding the susceptibility and infectivity of children may be partly explained by age. Children are also less likely than adults to test positive for COVID-19 via RT-PCR⁷¹⁴ despite being infected,^{180, 658} underestimating pediatric COVID-19 infections.^{153, 444} Serological studies in Germany,²⁸⁶ Spain,⁶⁵⁶ and Italy⁸⁵ found high rates of SARS-CoV-2 exposure in children, though the finding is not ubiquitous.⁶⁵ Separating the effects of differential susceptibility, infectivity, test positivity, and testing likelihood⁴⁴⁴ by age is crucial to understand the role of children. <p>Individuals who have clinically recovered but test positive for COVID-19 are unlikely to be infectious.^{403, 749}</p>
What do we need to know?
<p>We need to know the relative contribution of different routes of transmission (e.g., fomites, aerosols, droplets).</p> <ul style="list-style-type: none"> How common is transmission from bodily fluids like semen,³⁸⁷ urine,⁶⁴⁰ and feces?⁶⁷² How infectious are young children compared to adults? What is the emission rate of infectious particles while breathing, talking, coughing, singing, or exercising?

Host Range – How many species does it infect? Can it transfer from species to species?
What do we know?
<p>SARS-CoV-2 is closely related to other coronaviruses circulating in bats in Southeast Asia. Previous coronaviruses have passed through an intermediate mammal host before infecting humans, but the presence or identity of the SARS-CoV-2 intermediate host is unknown.^{394, 408, 410} Current evidence suggests a direct jump from bats to humans is plausible.⁷³</p> <ul style="list-style-type: none"> • Early genomic analysis indicates similarity to SARS-CoV-1,⁷⁷⁶ with a suggested bat origin.^{142, 776} • Positive samples from the South China Seafood Market strongly suggests a wildlife source,¹¹³ though it is possible that the virus was circulating in humans before the disease was associated with the seafood market.^{60, 143, 744, 757} • Viruses similar to SARS-CoV-2 were present in pangolin samples collected several years ago,³⁵⁸ and pangolins positive for coronaviruses related to SARS-CoV-2 exhibited clinical symptoms such as cough and shortness of breath.³⁹³ However, a survey of 334 pangolins did not identify coronavirus nucleic acid in ‘upstream’ market chain samples, suggesting that positive samples from pangolins may be the result of exposure to infected humans, wildlife or other animals within the wildlife trade network. These data suggest that pangolins are incidental hosts of coronaviruses.³⁷⁹ <p>SARS-CoV-2 uses the same receptor for cell entry as the SARS-CoV-1 coronavirus that circulated in 2002/2003.</p> <ul style="list-style-type: none"> • Experiments show that SARS-CoV-2 Spike (S) receptor-binding domain binds the human cell receptor (ACE2) stronger than SARS-CoV-1,⁷³⁶ potentially explaining its high transmissibility. • Changes in proteolytic cleavage of the Spike protein can also affect cell entry and animal host range, in addition to receptor binding.⁴⁴⁵ • Modeling suggests a wide range of animal hosts for SARS-CoV-2, though experimental studies are still needed.¹⁵¹ <p>Animals can transmit SARS-CoV-2 to humans, but the potential role of long-term reservoir species is unknown.</p> <ul style="list-style-type: none"> • Infected mink have been linked to human infections in workers at mink farms.⁵⁰⁵ • In the US, researchers experimentally exposed big brown bats (<i>Eptesicus fuscus</i>) to SARS-CoV-2 via the oropharyngeal and nasal route and found no subsequent signs of infection, clinical symptoms, or transmission.²⁷⁴ <p>Several animal species are susceptible to SARS-CoV-2 infection.</p> <ul style="list-style-type: none"> • Animal model studies suggest that Golden Syrian hamsters and ferrets are susceptible to infection.^{120, 339} In the Netherlands, farmed mink developed breathing and gastrointestinal issues, which was diagnosed as SARS-CoV-2 infection.¹ SARS-CoV-2 cases in mink on US farms show high mortality rates, and farms have implemented strict biosecurity measures.³⁶¹ Infected mink in the US have been linked to human infections.³ • Several non-human primates are also susceptible to infection with SARS-CoV-2 including cynomolgus macaques,⁵⁸⁰ African green monkeys,⁷³⁴ and Rhesus macaques.⁴²² • Raccoon dogs (mammals related to foxes) are susceptible to COVID-19 (10⁵ intranasal exposure dose) and were shown to transmit infection to other raccoon dogs in neighboring enclosures.²³³ • Domestic cats are susceptible to infection with SARS-CoV-2 (100,000-520,000 PFU via the intranasal route⁶¹⁵ or a combination of routes²⁷³), and can transmit the virus to other cats via droplet or short-distance aerosol.⁶¹⁵ • Wild cats (tigers and lions)⁷⁰⁴ can be infected with SARS-CoV-2, although their ability to spread to humans is unknown.^{435, 763} Studies have confirmed that human keepers transmitted SARS-CoV-2 to tigers and lions at the Bronx Zoo.⁵⁸ Two cases of SARS-CoV-2 infection have been confirmed in pet domestic cats.¹⁰⁵ • Deer mice can be experimentally infected with SARS-CoV-2 via intranasal exposure (10⁴ or 10⁵ TCID₅₀)¹⁹⁴ and are able to transmit virus to uninfected deer mice through direct contact.²⁵⁸ Their capacity as a reservoir species is unknown. • Ducks, chickens, and pigs remained uninfected after experimental SARS-CoV-2 exposure (30,000 CFU for ducks and chickens,⁶¹⁵ 100,000 PFU for pigs,⁶¹⁵ ~70,000 PFU for pigs and chickens⁶⁰⁰ all via intranasal route).⁶¹⁵ When pigs were inoculated by the oronasal route (10⁶ PFU), minimal to no signs of clinical disease were noted, suggesting limited transmission concerns.⁵³⁶ • Chicken, turkey, duck, quail, and geese were not susceptible to SARS-CoV-2 after experimental exposures.⁶³⁷ • Rabbits do not exhibit clinical symptoms after exposure to SARS-CoV-2, but do seroconvert.⁴⁷³ • Cattle exposed to SARS-CoV-2 showed no clinical disease but exhibited low levels of viral shedding in the nose, which could be residual virus from the exposure dose.⁶⁶⁸ • Dogs exposed to SARS-CoV-2 produced anti-SARS-CoV-2 antibodies⁷⁴ but exhibited no clinical symptoms.^{615, 624} • In Italy, approximately 3-6% of domestic dogs and cats showed detectable neutralizing antibodies to SARS-CoV-2, though no animals showed clinical signs or positive RT-PCR tests in addition to the antibodies, and no evidence exists of transmission from dogs or cats to humans.⁵²²
What do we need to know?
<p>We need to know the best animal model for replicating human infection by various exposure routes.</p> <ul style="list-style-type: none"> • What is the intermediate host(s) (if any)? • Which animal species can transmit SARS-CoV-2 to humans? • Can SARS-CoV-2 circulate in animal reservoir populations, potentially leading to future spillover events?

Incubation Period – How long after infection do symptoms appear? Are people infectious during this time?
What do we know?
<p>On average, symptoms develop 5 days after exposure with a range of 2-14 days. Incubating individuals can transmit disease for several days before symptom onset. Some individuals never develop symptoms but can still transmit disease.</p> <ul style="list-style-type: none"> • By general consensus, the incubation period of COVID-19 is between 5³⁶⁹ and 6⁷⁰⁶ days.⁷⁵⁰ Fewer than 2.5% of infected individuals show symptoms sooner than 2 days after exposure.³⁶⁹ However, more recent estimates using different models calculate a longer incubation period, between 7 and 8 days.⁵⁴⁹ This could mean that 5-10% of individuals undergoing a 14-day quarantine are still infectious at the end.⁵⁴⁹ • There is evidence that younger (<14) and older (>75) individuals have longer COVID-19 incubation periods, creating a U-shaped relationship between incubation period length and patient age³⁴⁵ while adolescent and young adult populations (15-24 years old) have been estimated at ~2 days.³⁹⁸ • Individuals can test positive for COVID-19 even if they lack clinical symptoms.^{50, 119, 267, 650, 770} • Individuals can be infectious while asymptomatic,^{111, 586, 650, 770} and asymptomatic and pre-symptomatic individuals have similar amounts of virus in the nose and throat compared to symptomatic patients.^{41, 337, 781} • Peak infectiousness may be during the incubation period, one day before symptoms develop.²⁸³ Infectious virus has been cultured in patients up to 6 days before the development of symptoms.⁴¹ <p>It is estimated that most individuals are no longer infectious beyond 10 days after symptom onset.</p> <ul style="list-style-type: none"> • A systematic review of published studies on SARS-CoV-1, SARS-CoV-2, and MERS-CoV found none that reported isolation of infectious virus from COVID-19 patients beyond 9 days from symptom onset, despite high viral loads by genetic tests.¹¹⁸ • While the amount of virus needed to infect another individual is unknown, mild-moderate COVID-19 cases appear to be infectious for no longer than 10 days after symptom onset, while severely ill or immunocompromised patients may be infectious for 20-70 days⁴⁶ after symptom onset; individuals can also transmit infection before symptoms appear.⁶⁸⁵ • Asymptomatic individuals are estimated to be infectious for a median of 9.5 days.²⁹⁷ <p>The average time between symptom onset in successive cases (i.e., the serial interval) is approximately 5 days.</p> <ul style="list-style-type: none"> • On average, there are approximately 4¹⁷⁹ to 7.5³⁸⁹ days between symptom onset in successive cases of a single transmission chain (i.e., the serial interval). Based on data from 339 transmission chains in China and additional meta-analysis, the mean serial interval is between 4.4 and 6.0 days.^{178, 551, 750} • The serial interval of COVID-19 has declined substantially over time as a result of increased case isolation,²⁴ meaning individuals tend to transmit virus for less time. • The generation time (time between infection events in a chain of transmission) for SARS-CoV-2 is estimated as 4-5 days.²⁵⁹ <p>Individuals can shed virus for several weeks, though it is not necessarily infectious.</p> <ul style="list-style-type: none"> • Children are estimated to shed virus for 15 days on average, with asymptomatic individuals shedding virus for less time (11 days) than symptomatic individuals (17 days).⁴²⁵ • Asymptomatic and mildly ill patients who test positive for SARS-CoV-2 take less time to test negative than severely ill patients.³⁸⁰ • Patients infected by asymptomatic or young (<20 years old) individuals may take longer to develop symptoms than those infected by other groups of individuals.⁷⁰⁶ • Viral RNA loads in the upper respiratory tract tend to peak within a few days of symptom onset and become undetectable approximately two weeks after symptoms begin.⁶⁸⁴ The duration of the infectious period is unknown,⁶⁸⁴ though patients can test positive for SARS-CoV-2 viral RNA for extended periods of time, particularly in stool samples.⁶⁸⁴ • Patients being released from the hospital may still exhale detectable levels of SARS-CoV-2 RNA (~7,000 genome copies per hour), though the infectivity of these patients is unknown.⁷⁷⁵
What do we need to know?
<p>We need to know the incubation duration and length of infectivity in different patient populations.</p> <ul style="list-style-type: none"> • What is the average infectious period during which individuals can transmit the disease? • How soon can asymptomatic patients transmit infection after exposure? • Does the incubation period correlate with disease severity or exposure dose?

Clinical Presentation – What are the signs and symptoms of an infected person?
What do we know?
<p>Most symptomatic cases are mild, but severe disease can be found in any age group.⁸ Older individuals and those with underlying conditions are at higher risk of serious illness and death, as are men.⁵⁰³ Fever is most often the first symptom.</p> <ul style="list-style-type: none"> • Most symptomatic COVID-19 cases are mild (81%).^{650, 726} Fever,^{39, 267} cough,²⁶⁷ and shortness of breath^{112, 124, 298} are the most common symptoms, followed by malaise, fatigue, and sputum/secretion.¹⁵⁰ In at least one cohort, however (n=1,564), muscle pain (55%) and headache (51%) were more common than cough (49%).¹⁹¹ Chills, muscle pain,⁴⁷⁰ sore throat, loss of taste or smell,^{115, 524, 746} gastrointestinal symptoms,⁵⁸² neurological symptoms,⁴⁰² and dermatological symptoms¹⁵⁰ also occur with COVID-19,¹¹² and atypical symptoms such as unexplained limb pain may also present with COVID-19.¹⁴⁵ Headaches are common, may persist for weeks, and may be associated with shorter disease duration.⁹⁹ • In children, loss of taste or smell, nausea or vomiting, headache, and fever were predictive of COVID-19 infection.³⁴⁰ Children were less likely to exhibit cough and loss of taste or smell than adults, but more likely to show sore throat.³⁷² • COVID-19 generally begins with fever, then cough and malaise.³⁶³ In 49 children with COVID-19 (0-22 years), however, only 51% developed fever.⁷⁵⁵ Only 20% of emergency department patients testing positive for COVID-19 had fevers >100°F.⁶⁷⁸ In older patients, delirium should be considered a symptom of COVID-19 with or without other typical signs.³³³ <p>COVID-19 is more severe than seasonal influenza, evidenced by higher ICU admission⁷⁴³ and mortality rates.⁵³⁸</p> <p>Approximately 15% of hospitalized patients are classified as severe, and approximately 5% of patients are admitted to the ICU.^{267, 650} Symptoms can persist for months.</p> <ul style="list-style-type: none"> • Higher SARS-CoV-2 RNA loads on admission have been associated with greater risk of death.^{431, 712} Individuals of any age can develop severe symptoms and require ICU care.⁵⁰⁶ Males are associated with worse outcomes compared to females.⁵²⁶ • Early presenters, who are admitted to the hospital within 7 days of symptom onset, have worse clinical outcomes than those admitted later in illness,⁷²⁷ potentially due to an observed hyperinflammatory response 5-7 days after symptoms begin.⁴⁶⁷ • SARS-CoV-2 attacks blood vessels in the lung,⁹¹ leading to clotting complications and ARDS.^{14, 676} Clotting affects multiple organs⁵⁵⁷ and is present in 15-27% of cases.⁴²⁴ COVID-19 also causes pneumonia,⁵¹⁰ cardiac injury,⁶¹⁷ secondary infection, kidney damage,^{40, 636} pancreatitis,³⁰ arrhythmia, sepsis, stroke,^{446, 530} respiratory complications,⁶⁶⁹ and shock.^{267, 298, 687, 773} • COVID-19 symptoms like fatigue and shortness of breath commonly persist for weeks⁶⁴⁹ to months⁹⁸ after initial onset. Most (88%) individuals infected with COVID-19 (n=86) showed evidence of lung damage six weeks after clinical recovery.²⁶⁸ Approximately 9% of hospitalized patients experience at least 1 hospital readmission (from any cause) within 2 months of COVID-19 recovery, with individuals over 65 showing slightly higher odds of readmission.³⁷⁰ <p>Between 16% and 76% of cases are asymptomatic throughout the course of their infection,^{87, 93, 359, 371, 380, 454, 487, 502, 644, 660} though changing symptom definitions make it difficult to compare asymptomatic fractions through time.⁴⁴⁷</p> <p>The case fatality rate (CFR) is unknown, but adults >60⁵²⁰ and those with comorbidities are at elevated risk of death.^{650, 773}</p> <ul style="list-style-type: none"> • Cardiovascular disease, obesity,^{17, 532} hypertension,⁷⁶¹ diabetes, cancer,⁶⁹² down syndrome,¹³⁹ and respiratory conditions all increase the CFR.^{650, 773} Prior kidney disease may increase disease severity,⁴⁹⁵ though age may be the dominant factor.⁴⁹¹ • The CFR increases with age (data from China and Italy): 0-19 years < 0.2%; 20-29 years = 0-0.2%, 30-39 years = 0.2-0.3%, 40-49 years = 0.4%, 50-59 years 1.0-1.3%, 60-69 years = 3.5-3.6%, 70-79 years = 8.0-12.8%, >80 years = 14.8-20.2%.⁵⁰⁰ • In Iceland, the overall CFR has been estimated at 0.3-0.6% but increases to ~4% in those over 70 years old.²⁶⁹ An estimated overall infection fatality rate for Indiana was calculated as 0.26%, increasing to 1.71% for those >65 years old.⁷⁰ <p>Minority populations and essential workers are disproportionately affected by COVID-19.⁴⁶³</p> <ul style="list-style-type: none"> • Black, Asian, and Minority Ethnic populations, including children,⁵² acquire SARS-CoV-2 infection at higher rates than other groups^{224, 257, 509, 545} and are hospitalized^{240, 548} and die disproportionately.^{290, 448} Hispanic and Black COVID-19 patients tend to die at younger ages than white patients.⁷³⁵ Hispanic, Black, and American Indian children accounted for 78% of early US pediatric deaths (n=121).⁶⁹ Social vulnerability is associated with greater SARS-CoV-2 transmission risk.¹⁵² • Pregnant women with COVID-19 require ICU care at similar rates as non-pregnant women⁶⁴ and are less likely to present with fever and myalgia,²⁶ but have higher rates of preterm delivery.⁷³² Severity in pregnant women may be associated with underlying conditions such as obesity,²⁶ and symptom severity may be predicted early.⁴⁵⁷ Preterm births are more likely in symptomatic patients.¹⁶⁰ Approximately 25% of pregnant COVID-19 patients had symptoms for at least 8 weeks.¹⁸ • In the UK, healthcare workers are >7 times more likely to develop severe COVID-19 than non-essential employees.⁴⁷² <p>Children are susceptible to COVID-19,¹⁷⁴ though generally show milder^{125, 423} or no symptoms.</p> <ul style="list-style-type: none"> • 21% to 28% of children (<19 years old) may be asymptomatic.^{423, 518, 550} Most symptomatic children show mild or moderate symptoms.^{256, 518} Severe symptoms in children⁴¹² and infants^{86, 423} are more likely in those with complex medical histories.⁶¹¹ • WHO⁷²³ and US CDC³¹⁷ have identified a rare condition in children (Pediatric Multi-System Inflammatory Syndrome, MIS-C)²⁴⁸ linked to COVID-19 infection.^{577, 659} The prevalence of this condition is unknown. Children with both severe and moderate initial symptoms can progress to MIS-C.²⁴⁷ Black children are overrepresented among MIS-C patients.³⁷⁸
What do we need to know?
<p>We need to know the true case fatality rate, asymptomatic fraction, and the duration of debilitating symptoms.</p> <ul style="list-style-type: none"> • We need to understand the mechanism and clinical implication of chronic COVID syndrome.⁵¹ • What are the pathogenic pathways of SARS-CoV-2 infection in children,⁴⁷⁹ and why are their clinical manifestations different (typically milder) from adults?²⁴⁵

Protective Immunity – How long does the immune response provide protection from reinfection?
What do we know?
<p>Infected patients show productive immune responses, but the duration of any protection is unknown.^{29, 718} Reinfection is possible. The longevity of antibody responses and T-cell responses is unknown but appears to be at least several months.</p> <ul style="list-style-type: none"> • In a study of healthcare workers in the UK, those with SARS-CoV-2 antibodies from prior exposure (n=1,167) were protected from reinfection for a median of 127 days (no symptomatic reinfection, 3 subsequent positive PCR tests).⁴²⁶ • Researchers have found SARS-CoV-2 antibodies circulating in patients for 3-6 months after infection.^{211, 269, 579, 581} Mild COVID-19 infections can induce detectable immune responses for at least 3 months.⁵⁸¹ Antibody levels increase with disease severity⁶⁵⁴ and are largely unaffected by patient age.²¹¹ A UK study found evidence of antibody levels waning after 4-6 months, though the study looked at population-level seroprevalence and not individual antibody levels.⁷⁰² • Neutralizing antibody responses are present within 8-19 days after symptom onset^{416, 643} and can persist for months.⁶⁸³ Individuals with more severe infections developed higher neutralizing antibody levels that persisted longer than those with asymptomatic or mild infections.⁶⁰⁶ The antibody IgM appears to contribute substantially to SARS-CoV-2 neutralizing ability, with IgG also contributing to a lesser extent.²⁴² Asymptomatic cases generate weaker antibody responses to SARS-CoV-2.¹³² • Antibody levels declined in 156 healthcare workers who tested positive for SARS-CoV-2, with 28% dropping below detectable levels when tested after 60 days, suggesting caution in single time-point assays to detect prior SARS-CoV-2 infection.⁶⁰⁵ • Strong, early inflammatory immune responses are associated with more severe clinical presentation.¹⁶¹ There appear to be several distinct immunological phenotypes associated with COVID-19, with cytokine storm syndrome present in ~3-4% of patients.⁴⁶⁸ A more common phenotype is characterized by a lack of Type I interferon response and general immunosuppression, which may help to explain variability in corticosteroid treatment effects.⁴⁶⁸ • SARS-CoV-2 specific memory B cells are involved in the human immune response, and provide evidence of B cell-mediated immunity after mild-moderate COVID-19 infection.⁴⁹⁷ T-cell responses may persist for at least 6 months, though they appear stronger in individuals with more severe COVID-19 cases.⁷⁸² While memory B and T cells both persist for at least 6 months, there is some variability in the persistence of specific antibodies (e.g., IgG vs. IgA).^{235, 614} • Immune responses appear to differ between symptomatic and asymptomatic COVID-19 patients; asymptomatic patients appear to mount robust T-cell responses, express higher levels of interferon-gamma and interleukin-2, and have more coordinated production of pro-inflammatory and regulatory cytokines than symptomatic patients.³⁷⁴ • In a 35-year study of 10 men, reinfection with seasonal coronaviruses occurred 1-3 years after initial infection.¹⁸⁴ Previous studies on coronavirus immunity suggest that neutralizing antibodies may wane after several years.^{95, 741} <p>Reinfection with SARS-CoV-2 is possible but appears rare, though the true frequency is unknown.</p> <ul style="list-style-type: none"> • Researchers in Hong Kong³⁴⁹ and the US⁶⁵³ have identified COVID-19 reinfections. Reinfections have been either less³⁴⁹ or more severe⁶⁵³ than the initial infection. The infectiousness of re-infected individuals is unknown. • Two studies suggest limited reinfection potential in macaques, with re-challenge 28 days¹⁶⁵ or 35 days¹²² after initial exposure resulting in no clinical symptoms. Ferrets infected with 10²-10⁴ PFU were protected from acute lung injury following secondary challenge with SARS-CoV-2 28 days after initial exposure, but they did exhibit clinical symptoms.⁵⁹² <p>The contribution of historical coronavirus exposure to SARS-CoV-2 immunity is unknown.⁴⁸¹</p> <ul style="list-style-type: none"> • Cross-reactivity in T-cell responses between other human coronaviruses and SARS-CoV-2 may explain some variation in symptom severity among patients.⁴⁴⁰ Key components of the human immune response (memory B cells) are activated by SARS-CoV-2, and may persist for decades to offset any waning antibody immunity.⁴⁸⁴ Cross-reactivity from seasonal coronaviruses also enhances the immune response toward the S2 unit of the SARS-CoV-2 Spike protein.⁴⁸⁴ • Two studies identified key components of the adaptive immune system (CD4⁺ T cells) in the majority of recovered COVID-19 patients, and these cells reacted to SARS-CoV-2 Spike protein.^{81, 261} These studies also identified Spike protein responses in CD4⁺ T cells of ~30-40% of unexposed patients,²⁶¹ suggesting some cross-reactivity between other circulating human coronaviruses and SARS-CoV-2.^{81, 261} Long-lasting T-cell responses have been seen in SARS-CoV-1 patients, and T-cell cross-reactivity between other coronaviruses and SARS-CoV-2 suggest additional immune protection.³⁷⁵ • Children do not appear to be protected from SARS-CoV-2 infection by historical exposure to seasonal coronaviruses.⁶⁰⁷ Serum from patients exposed to seasonal coronaviruses did not neutralize SARS-CoV-2,⁵⁴⁴ though there has been some cross-reactivity between seasonal coronaviruses and SARS-CoV-2 nucleocapsid (N) protein.⁶⁶²
What do we need to know?
<p>We need to know the frequency and severity of reinfection, as well as the protective effects of immune components.</p> <ul style="list-style-type: none"> • How do different components of the immune response contribute to long-term protection? • How does initial disease severity affect the type, magnitude, and timing of any protective immune response? • Given different immunological responses for men compared to women,⁶⁴⁵ as well as for adults compared to children,⁷⁰⁸ are distinct diagnostic tests or medical treatments required for the different groups? • How long does protective immunity last for children compared to adults?

Clinical Diagnosis – Are there tools to diagnose infected individuals? When during infection are they effective?

What do we know?

Diagnosis of COVID-19 is based on symptoms consistent with COVID-19, PCR-based testing of active cases, and/or the presence of SARS-CoV-2 antibodies in individuals. Screening solely by temperature or other symptoms is unreliable.

- As of 12/16/2020, the FDA has granted EUAs to 303 diagnostic tests, including 231 molecular, 62 antibody, and 10 antigen tests,²²⁶ which include one for detecting neutralizing antibodies from prior SARS-CoV-2 infection¹⁹⁵ and at-home diagnostic assays for SARS-CoV-2 infection.²²⁸⁻²²⁹ The US FDA also issued an EUA for an at-home test kit capable of testing for both COVID-19 and influenza,²⁰⁴ and has granted an EUA for the Ellume COVID-19 at-home antigen test, available without a prescription to symptomatic and asymptomatic individuals at least two years of age.^{186, 227}
- The US CDC recommends that anyone who has been in contact with a positive COVID-19 case should be tested.¹¹⁶
- The timing of diagnostic PCR tests impacts results. The false-negative rate for RT-PCR tests is lowest between 7 and 9 days after exposure, and PCR tests are more likely to give false-negative results before symptoms begin (within 4 days of exposure) and more than 14 days after exposure.³⁵⁴ Low viral loads can lead to false-negative RT-PCR tests, and viral loads are lower in late stage infections as well as at the end of a given day.⁴⁰⁶
- The duration of PCR-detectable viral samples is longer in the lower respiratory tract than the upper respiratory tract; nasopharyngeal sampling is most effective (89%) between 0 and 4 days after symptom onset but falls significantly (to 54%) by 10 to 14 days.⁴³⁶ After 10 days, alternative testing methods (e.g., lower respiratory samples) may be necessary.⁴³⁶
- Symptom-based screening at airports was ineffective at detecting cases (9 identified out of 766,044 passengers screened),¹⁷³ and intensive screening on a US military base during mandatory quarantine did not identify any COVID-19 cases.³⁸³
- Nasal and pharyngeal swabs may be less effective diagnostically than sputum and bronchoalveolar lavage fluid,⁶⁹⁵ although evidence is mixed.⁷²⁸ Combination RT-PCR and serology (antibody) testing may increase the ability to diagnose patients with mild symptoms, or identify patients at higher risk of severe disease.⁷⁶⁸ Assays targeting antibodies against the nucleocapsid protein (N) instead of the Spike protein (S) of SARS-CoV-2 may improve detection.⁹⁰ **Newer tests target up to three viral components, demonstrating high sensitivity and specificity.**⁹²
- Exhaled breath condensate may be an effective supplement to nasopharyngeal swab-based PCR,⁵⁹¹ and other work examining breath-based samplers is ongoing.⁶¹⁰
- Foam swabs lead to more accurate diagnostic tests than polyester swabs for collecting patient samples, though polyester swabs are good enough to be used in case of a shortage in foam swabs.²⁷⁹
- Asymptomatic individuals are more likely to test negative for a specific antibody (IgG) compared to symptomatic patients.⁷¹¹
- The CRISPR-Cas12a system is being used to develop fluorescence-based COVID-19 diagnostic tests.^{171, 302, 693} India has approved a rapid CRISPR-based test paper capable of accurate results within an hour of nasopharyngeal swab.⁵
- Low-sensitivity tests (like lateral flow assays) may be beneficial despite lower accuracy, because they reduce the time necessary to identify and subsequently contain potential outbreaks.⁴⁴⁹
- Immunological indicators^{47, 187, 232, 239, 282, 301, 480, 537, 629, 642, 688, 760} blood glucose levels,⁶⁹⁴ oxygen levels³⁴¹ and bilirubin levels⁴¹⁵ may help identify future severe cases,¹³⁴ and decision-support tools for diagnosing severe infections exist.^{443, 622, 739}
- Pooling samples and conducting RT-PCR tests may expand testing capability.⁴⁵¹
- Detection dogs are being used at airports to recommend individuals for subsequent SARS-CoV-2 PCR testing.⁵⁴⁷
- High-throughput diagnostic are comparable in sensitivity and specificity to PCR, and may increase sampling speed.⁵³¹ A high-throughput diagnostic assay for screening asymptomatic individuals has received US Emergency Use Authorization.^{75, 230}
- Infrared temperature readings may be misleading when used at the entrance of buildings with low outdoor temperatures.¹⁸²
- Some skin manifestations of COVID-19 may be diagnostic, in particular those associated with inflammatory reactions.⁴⁷⁵

Validated serological (antibody) assays are being used to help determine who has been exposed to SARS-CoV-2.

- Repeated serological testing is necessary to identify asymptomatic⁵⁴² and other undetected patients.⁵⁹⁷ Exclusively testing symptomatic healthcare workers is likely to exclude a large fraction of COVID-19 positive personnel.⁶³⁵
- Research has shown high variability in the ability of tests by different manufacturers to accurately detect positive and negative cases.^{365, 713} Meta-analysis suggests that lateral flow assays (LFIA) are less accurate than ELISA or chemiluminescent methods (CLIA), but that the target of serological studies (e.g., IgG or IgM) does not affect accuracy.⁴⁰⁴ The FDA has excluded several dozen serological diagnostic assays based on failure to conform to updated regulatory requirements.²⁰⁰
- In a study with pregnant women, rapid antibody (lateral flow assay) testing resulted in a 50% positive predictive value and 50% false positive rate, which are lower than the values touted for non-pregnant populations.¹⁹²
- SARS-CoV-2 RNA is likely to persist long enough in untreated wastewater to permit reliable detection for COVID-19 surveillance,²¹ and can warn of SARS-CoV-2 cases ahead of positive PCR tests and hospital admissions.⁵²⁵

What do we need to know?

We need to identify additional factors that affect the accuracy of serological or PCR-based diagnostic tests.

- What is the relationship between disease severity and the timing of positive serological assays?
- Are certain subpopulations (e.g., those with blood cancers)⁴⁸⁸ more likely to show false-negative tests?
- How likely are children of different ages to test positive via RT-PCR?
- **Are wearable devices capable of indicating COVID-19 before self-reported symptom onset?**⁶²⁶

Medical Treatments – Are there effective treatments?
What do we know?
<p>There is no universally effective treatment for COVID-19, but some treatments reduce disease severity and mortality. Remdesivir may reduce symptom duration in hospitalized patients,⁶³ and may reduce mortality when combined with other treatment regimens (e.g., baricitinab).³²⁷</p> <ul style="list-style-type: none"> • The US FDA has approved the use of remdesivir in hospitalized patients 12 years and older,²⁰⁶ with an Emergency Use Authorization for other patient groups.^{197, 486} • A large clinical trial (SOLIDARITY, n=2,750 treated patients) found no benefit of remdesivir for patient mortality, regardless of ventilation status or treatment severity.⁵¹¹ An abbreviated clinical trial of remdesivir (n=237) found no significant benefits.⁷⁰¹ <p>Hydroxychloroquine provides limited to no clinical benefit.^{212, 604}</p> <ul style="list-style-type: none"> • Hydroxychloroquine (HCQ) does not prevent infection as either pre-^{13, 244, 552} or post-exposure prophylaxis,^{76, 452} does not benefit mild-moderate COVID-19 cases,^{102, 499} was associated with adverse cardiac events in severely ill patients,³³¹ does not reduce mortality,² and increases mortality when combined with azithromycin.²¹² The FDA revoked its EUA on 6/15/20.¹⁹⁶ <p>Corticosteroids may significantly reduce mortality in severely ill⁵¹² and ventilated patients,¹²⁶ especially if given early.⁶⁵⁷</p> <ul style="list-style-type: none"> • Dexamethasone is associated with substantial reductions in mortality for patients receiving mechanical ventilation, smaller benefits for those receiving supplemental oxygen,²⁹³ and no benefits in patients who did not need oxygen or ventilation.²⁹³ • A large meta-analysis found that 28-day mortality in critically ill patients was reduced in patients (n=678) who received systemic corticosteroids.⁶³³ Four separate, smaller trials of corticosteroids (n<152) were stopped early.^{38, 167, 390, 655} • The benefits of glucocorticoids may depend heavily on patient inflammation.³³⁰ In several studies, high doses of steroids were associated with elevated mortality,^{405, 461} though low-moderate doses can reduce mortality in patients with ARDS.⁷³⁸ <p>Convalescent plasma treatment is safe and may be effective when administered early,²⁷ though evidence is mixed.⁵²³</p> <ul style="list-style-type: none"> • A large trial of plasma therapy (>25,000 patients) shows that treatment is safe, with some evidence that it can reduce 7-day mortality.^{305, 324} Plasma therapy shows larger reductions in mortality when administered within 44 hours of hospital admission,⁵⁹⁶ and donor plasma with higher antibody levels appears more effective.^{325, 438, 558} Even high-titer donor plasma, however, did not substantially improve outcomes in a clinical trial with severe COVID-19 patients (n=228).⁶²¹ • On 8/24/2020, the US FDA approved an Emergency Use Authorization for convalescent plasma therapy.²⁰⁷ <p>Anticoagulants may reduce COVID-19 mortality in hospitalized patients.</p> <ul style="list-style-type: none"> • Both therapeutic and prophylactic use of anticoagulants has been associated with significant (~50%) reduction in mortality in hospitalized COVID-19 patients.⁴⁷⁶ Anticoagulant use was associated with lower mortality in the severely ill,⁵¹³ but the correct dose is critical to avoid complications.³¹¹ High doses of anticoagulants may be effective in critically ill patients.³²³ Patients 65 years and up receiving chronic anticoagulant treatment showed higher survival than propensity-matched controls.¹⁶² <p>The benefits of tocilizumab are unclear, and it can increase hospital stay time and the risk of secondary infection.³⁸⁶</p> <ul style="list-style-type: none"> • While tocilizumab appears to show a 12% reduction in mortality in treated patients,⁴³⁴ a randomized clinical trial found no effects on mortality,²⁸⁴ and other evidence suggests that it may be beneficial only in certain circumstances.^{285, 458, 477, 634} <p>Other pharmaceutical interventions are being investigated but results from large clinical trials are needed.</p> <ul style="list-style-type: none"> • Eli Lilly has received Emergency Use Authorization from the US FDA for its monoclonal antibody product, bamlanivimab, for use in recently diagnosed, mild to moderate COVID-19 patients.⁴⁰⁰ Regeneron's REGN-COV2 monoclonal antibody has been associated with reductions in symptom duration.⁵⁶³ However, data from both Eli Lilly and Regeneron suggest that their monoclonal antibody treatments may not work well for hospitalized patients⁴⁰¹ or those with high oxygen requirements.⁵⁶² • Regeneron received Emergency Use Authorization for an antibody cocktail to treat mild/moderate COVID-19 patients.⁵⁶⁴ • A Phase II trial of inhaled interferon beta-1a showed benefits in terms of reduced disease severity,⁴⁶⁰ though results from the SOLIDARITY trial found no benefit of a separate interferon beta-1a formulation.⁵¹¹ • Anakinra has shown clinical benefits in small observational studies,^{101, 137} and may be effective with methylprednisolone.⁷⁷ Favipiravir may reduce the duration of clinical symptoms¹⁷² and reduce the time for viral clearance.^{234, 666} Bradykinin inhibitors are being investigated as COVID-19 treatments,⁶⁷⁰ due to the potential role of bradykinins in disease.²⁴¹ Statins^{439, 593} and RAAS inhibitors⁶⁹⁹ (for hypertension) do not appear to elevate COVID-19 risk^{32, 567, 630} and may protect against mortality in elderly patients who continue taking them.⁷⁴⁷ Vitamin D (with vitamin B12 and magnesium) may reduce the need for ventilation in COVID-19 patients.⁶⁴⁶ Acalabrutinib may improve patient oxygenation,⁵⁸³ and is being included in large clinical trials (SOLIDARITY).³⁵⁵ Colchicine may reduce rates of intubation and mortality.⁵⁹⁸ Fluvoxamine may reduce clinical symptoms.³⁸² There is no clinical benefit from ritonavir/lopinavir.^{97, 238, 260, 397} Ivermectin reduced viral shedding duration in a small clinical trial (n=72).²⁰ IV immunoglobulin reduced the need for mechanical ventilation in a small trial (n=16).⁵⁹⁵ Androgen has been suggested as a factor in disease severity in men,^{254, 462, 686} and treatment options are in trial.^{255, 442} Insulin use may increase mortality risk compared to other type 2 diabetes treatments⁷⁵⁶ such as metformin.^{80, 319, 357}
What do we need to know?
<p>We need clear, randomized trials for treatment efficacy in patients with both severe and mild/moderate illness.</p> <ul style="list-style-type: none"> • Does time to viral clearance correlate with symptom severity or time to symptom resolution? • What treatment, or combination of treatments, is most effective for different disease severities and patient demographics?

Vaccines – Are there effective vaccines?
What do we know?
<p>Several vaccine candidates have shown promising Phase III trial results, and one is currently being administered under FDA Emergency Use Authorization.</p> <ul style="list-style-type: none"> In the US, vaccination priority is being given to healthcare workers and long-term care residents (1a),¹⁰⁴ all individuals 75 and older and frontline essential workers (1b),¹⁷⁵ and all people 65-75 and those 16-64 with high-risk medical conditions (1c).¹⁷⁵ <p><i>Candidates that have received or applied for approval in the US:</i></p> <ul style="list-style-type: none"> Pfizer/BioNTech – mRNA vaccine named BNT162b2 (international nonproprietary name of Tozinameran)⁷²⁰ <ul style="list-style-type: none"> Vaccine is given as 2 shots, 21 days apart.⁵³³ At the final study endpoint (170 confirmed COVID-19 cases out of 43,000 participants), vaccine showed 95% efficacy at 7 days after the second vaccine dose (28 days after first dose), which was consistent across age, sex, race, and ethnicity.⁵³⁴ Efficacy was 94% for those individuals over 65.⁵³⁴ There were 43,661 study participants, with 162 cases (9 severe) in the placebo group and 8 cases (1 severe) in vaccine group.⁵³⁴ Safety was assessed in children (n=100, 12-15 years old), racially and ethnically diverse patients (30-42% of trial pool), and individuals 56-85 years old (41-45% of participants).⁵³⁵ No serious safety concerns were observed, and adverse events included fatigue (3.8%) and headache (2.0%).⁵³⁵ Other common side effects included pain at the injection site and muscle pain.⁵³⁵ After reports of two allergic reactions in UK healthcare workers,⁵⁸⁵ the US CDC concluded that individuals with known allergies to foods, latex, or pollen (for instance) do not have to take special precautions for the Pfizer/BioNTech vaccine,⁴⁴¹ but should talk to their doctor and be observed for 30 minutes after vaccination.⁵⁸⁵ Storage and shipping requirements are -70°C; once thawed, the vaccine vial can be stored for up to 5 days at refrigerated (2–8°C) conditions.⁵³⁵ Pfizer and BioNTech received Emergency Use Authorization from the US FDA for individuals 16 and older.²⁰² Moderna – mRNA vaccine named mRNA-1273⁴⁵⁶ <ul style="list-style-type: none"> Vaccine is given as 2 shots, 28 days apart.⁴⁵⁶ At the conclusion of Phase III clinical trial, the vaccine showed 94.1% efficacy, 14 days after the second dose.⁴⁵⁶ Efficacy was consistent across age, race, ethnicity, and sex.⁴⁵⁶ Vaccine-induced antibodies persisted for at least 119 days.⁷²⁵ There were 30,000 study participants, with 185 cases (30 severe, 1 death) in the placebo group and 11 cases (0 severe) in the vaccine group.⁴⁵⁶ Side effects included fatigue (10%), muscle aches (9%), joint pain (5%), and headaches (5%).⁴⁵⁶ Pain and redness at the injection site were also noted; adverse events increased in frequency after the second dose.⁴⁵⁶ The vaccine can be shipped and stored at standard freezer temperatures (-20°C) for 6 months, and is expected to be stable under refrigeration (2-8°C) for 30 days and at room temperature for 12 hours.⁴⁵⁵ Moderna was granted an EUA from the US FDA for individuals 18 and older.²⁰¹ <p><i>Phase III Trials (testing for efficacy):</i></p> <ul style="list-style-type: none"> The adenovirus vaccine candidate AZD1222 (from University of Oxford and AstraZeneca) showed 62% efficacy in individuals given two full doses, and 90% efficacy in an accidental subset of individuals given a half dose followed by a full dose.⁴⁴ None of the individuals in the accidental dosing cohort were over 55, potentially explaining discrepancies in efficacy results.⁵⁷⁸ The vaccine appears safe, and instills a robust immune response across age groups.⁵⁵³ The vaccine is given in two doses, 1 month apart.⁴⁴ The Phase III trial included 23,000 participants, all over 18.⁴⁴ The vaccine is stable at 2-8°C for up to 6 months.⁴⁴ Russia's Gamaleya Institute announced that their adenovirus (Sputnik V) vaccine is 91.4% effective 28 days after the first dose, and over 95% effective 42 days after the first dose (21 days after the second dose), based on 39 COVID-19 cases in 19,000 participants.²³⁷ No trial protocols (e.g., age, ethnicity) or data have been published for Sputnik V.⁹⁴ Sinovac has begun Phase III trials of its CoronaVac inactivated vaccine candidate in healthcare professionals.⁶²³ Sinopharm has begun Phase III trials of two of its inactivated SARS-CoV-2 vaccine candidates.⁵⁷ Janssen, with Johnson and Johnson, has begun a Phase III trial with 60,000 participants for their adenovirus candidate.³¹⁵ CanSino's Ad5-nCoV adenovirus vaccine is undergoing Phase III clinical trials.⁷⁷⁷ Novavax has begun a Phase III trial of its subunit vaccine candidate NVX-CoV2373.⁴⁹⁰ Baharat has begun a Phase III trial of its inactivated rabies virus platform (Covaxin) on 28,500 people⁵⁶¹ in India.⁶⁴⁸ Medicago, with GlaxoSmithKline, has announced a Phase II/III trial of their tobacco plant vaccine candidate (CoVLP).²⁶⁴ Anhui Zhifei Longcom (with the China Academy of Medical Sciences) has begun Phase III trials for their RBD-dimer vaccine.⁷⁷² CureVac has begun a Phase III trial of their mRNA vaccine candidate CVnCoV in 36,500 participants.¹⁴⁸ The Institute of Medical Biology has begun a Phase III clinical trial of their inactivated vaccine on 34,020 people.⁶⁰³ Clover Biopharmaceuticals registered a Phase II/III clinical trial for their candidate, targeting 34,000 participants.¹⁴⁰
What do we need to know?
<p>We need published results from Phase I-III trials in humans to assess vaccine efficacy and safety, and length of immunity.</p> <ul style="list-style-type: none"> We need to know how different vaccines will be distributed to different locations, the rate of vaccination in those locations, the age/subpopulation distribution of those given the vaccine, and the adherence fraction for multi-dose vaccines. How much do different vaccines reduce individual transmission risk?

Non-pharmaceutical Interventions (NPIs) – Are public health control measures effective at reducing spread?

What do we know?

Broad-scale control measures such as stay-at-home orders and widespread face mask use effectively reduce transmission and are more impactful when implemented simultaneously. Public health notifications increase adherence to policies.²¹⁹

- Social distancing and other policies quickly reduced spread throughout China,^{350, 353, 356, 419, 432, 690} Europe,^{243, 328} and the US.³⁴⁸ In China, modeling suggests that a one-day delay in implementing control measures increased the time needed to curtail an outbreak by 2.4 days.¹⁷⁷ In the US, each day of delay in emergency declarations and school closures was associated with a 5-6% increase in mortality.⁷⁵³ Reductions in transmission are generally visible 6-9 days after the implementation of NPIs, and increased transmission is generally visible 14-20 days after NPIs are lifted.³⁹⁵
- US counties with mask mandates have lower case growth rates than neighboring counties lacking mask mandates.⁶⁰⁹ Modeling suggests that widespread use of facemasks is effective at reducing transmission⁴⁸³ even when individual mask efficiency is low,¹⁸⁵ though their benefits are maximized when most of the population wears masks.²²¹
- In the US, shelter-in-place orders (SIPOs) and restaurant and bar closures were associated with large reductions in exponential growth rate of cases.¹⁴⁶ School closures and cancellation of large gatherings had smaller effects.¹⁴⁶ Similarly, more public health interventions in a given week was strongly associated with lower COVID-19 growth rates in the next week.³²⁶ Adherence to social distancing policies depends on income.⁷⁰⁷ Telework policies may reduce new cases.²¹⁵
- Mobility^{222, 364} and physical contact rates³¹⁶ decline after public health control measures are implemented. Mobility reductions in the US have been associated with significant reductions in COVID-19 case growth.^{48, 278} Social distancing and reductions in both non-essential visits to stores and overall movement distance led to lower transmission rates.⁴⁶⁶
- A combination of school closures, work restrictions, and other measures are likely required to effectively limit transmission.^{210, 346} School closures alone appear insufficient,^{314, 356} though likely reduced mortality in the UK⁵⁷¹ and the US.⁴⁵
- Reducing capacity at crowded indoor locations such as restaurants, gyms, hotels, cafes, and religious organizations may be an effective way to reduce COVID-19 transmission without more substantial lockdowns.¹²³ Increasing air flow rates in indoor environments, improving mechanical filtration efficiency, and wearing masks may also reduce indoor transmission rates.³³⁴
- Adolescents and young adults (15-24) may require different messaging to improve adherence to NPIs and public health policies,²⁷¹ and self-reported adherence to NPI policies (e.g., mask use) is consistently low in 18- to 29-year-olds.³⁰³ In the US, limiting transmission in younger populations is crucial for reducing hospitalizations and mortality in older cohorts.⁵⁰⁴

Individual behaviors (e.g., face masks, social distancing) have been associated with reduced risk of COVID-19 infection.⁵²⁴

- The US CDC has indicated that face masks inhibit transmission by both reducing the number of exhaled particles from infectious individuals, as well as reducing the number of inhaled particles when worn by uninfected individuals.¹⁰⁹ The US CDC recommends universal masking when indoors to inhibit the spread of COVID-19, alongside physical distancing, avoiding nonessential indoor and crowded outdoor spaces, postponing travel, and increasing ventilation and disinfection.²⁹¹
- Always wearing masks, maintaining physical distance >1m, and frequently washing hands were all associated with reduced risk of COVID-19 infection in individuals who had direct contact with infected individuals.¹⁷⁶
- Particle physics modeling suggests that 2m physical distancing is generally sufficient for reduction of SARS-CoV-2 aerosols expressed during coughs, though smaller particles can travel farther, and wind direction and speed may play a role.²⁹²
- A Danish study found that mask use was not associated with protection from COVID-19 infection, but suffered from limitations in timing (i.e., low COVID-19 prevalence) and self-reporting, and did not assess reductions in emission rates.⁸⁹

Particular focus should be placed on minimizing large gatherings where superspreading events are more likely.⁷²⁹

- Retrospective contact tracing may help identify the source of large clusters of cases, and should be implemented due to the overdispersion or heterogeneity in secondary transmission arising from each primary COVID-19 case.¹¹⁷
- There are multiple types of superspreading events, and different policies are required to mitigate risks from each.²⁸

Research is needed to plan the path to SARS-CoV-2 elimination via pharmaceutical and non-pharmaceutical interventions.

- In South Korea, early implementation of rapid contact tracing, testing, and quarantine was able to reduce the transmission rate of COVID-19.⁶³⁹ Contact tracing and high levels of testing and physical distancing³⁵² may limit COVID-19 resurgence.^{23, 213}
- Premature relaxation of public health control measures may facilitate rapid increases in prevalence at the state level.²³⁶
- Modeling suggests that periods of social distancing or lock-down may be effective in reducing exposure from asymptomatic cases.⁶⁶¹ Testing is critical to balancing public health and economic costs.⁶⁶¹ Rolling interventions may be necessary.⁷⁵¹ Undetected cases can lead to elevated risk of re-emergence after restrictions are lifted.²⁷⁶
- Synchronizing public health interventions across US state lines may reduce the total number of required interventions.⁵⁸⁷
- Modeling shows that travel restrictions are likely to have the greatest impact at reducing SARS-CoV-2 transmission in countries that are highly connected to those with high incidence, and also in countries with low incidence.⁵⁸⁹

What do we need to know?

We need to understand measures that will limit spread in the winter, particularly in indoor environments.

- How effective are school closures when COVID-19 prevalence in the community is high? Low?
- How will holiday travel from colleges and universities impact COVID-19 case growth?
- What is the benefit of “cocooning” high-risk individuals in terms of averted deaths and hospitalizations?⁶⁹⁶

Environmental Stability – How long does the agent live in the environment?
What do we know?
<p>SARS-CoV-2 can survive on surfaces from hours to days and is stable in air for at least several hours, depending on the presence of UV light, temperature, and humidity.⁶¹ Environmental contamination is not thought to be the principal mode of SARS-CoV-2 transmission in humans.</p> <p>Viable SARS-CoV-2 and/or RNA can be recovered from contaminated surfaces; however, survivability varies.</p> <ul style="list-style-type: none"> • Both temperature and humidity contribute to SARS-CoV-2 survival on nonporous surfaces, with cooler, less humid environments facilitating survival (stainless steel, ABS plastic, and nitrile rubber; indoors only; simulated saliva matrix).⁶⁸ Persistence is reduced with warmer temperatures (37°C), and enhanced at colder temperatures (4°C).²⁷⁷ • SARS-CoV-2 was shown to be stable up to 7 days (25-27°C; 35% RH) on smooth surfaces, to include plastic, stainless steel, glass, ceramics, wood, latex gloves, and surgical masks.⁴¹⁴ At 22°C, SARS-CoV-2 was shown to be detectable (via plaque assay) on paper currency for up to 24 hours, on clothing for up to 4 hours, and on skin for up to 96 hours.²⁷⁷ • SARS-CoV-2 was found to be stable across pH 3-10 on several surfaces at 22°C.¹³⁰ After 3 hours (22°C, 65% RH), no infectious virus was detected on printing and tissue papers; on day 2, none was found on treated wood and cloth; on day 4, none was found on glass or banknote; on day 7, none was found on stainless steel or plastic.¹³⁰ • At standard room temperature and humidity, SARS-CoV-2 becomes undetectable on common library items after 2 to 8 days of quarantine depending on the material (e.g., book cover vs leather) and conditions (e.g., stacked vs unstacked).^{7, 308, 608} • SARS-CoV-2 can persist on plastic and metal surfaces for up to 3 days (21-23°C, 40% RH)⁶⁷³ and infectious virus can be recovered from a surgical mask after 7 days (22°C, 65% RH).¹³⁰ • SARS-CoV-2 RNA was detected in symptomatic and asymptomatic cruise ship passenger rooms up to 17 days.⁴⁶⁵ • It is estimated that at least 1,000 viral particles per 25 cm² are needed to detect SARS-CoV-2 RNA on surfaces.⁵¹⁷ <p>In the absence of sunlight, SARS-CoV-2 can persist on surfaces for weeks.</p> <ul style="list-style-type: none"> • In the absence of sunlight, infectious SARS-CoV-2 can remain on non-porous (e.g., glass, vinyl) surfaces for at least 28 days at 20°C and 50% RH; higher temperatures greatly reduce the environmental stability of SARS-CoV-2.⁵⁷⁵ This value is longer than other stability estimates,^{131, 575, 673} potentially due to a fluid matrix with more protein to simulate human respiratory fluid and a higher inoculation dose.⁵⁷⁵ In simulated saliva on stainless steel surfaces, SARS-CoV-2 shows negligible decay over 60 minutes in darkness, but loses 90% of infectivity every 6.8-12.8 minutes, depending on simulated UVB radiation.⁵⁵⁹ • The Department of Homeland Security (DHS) developed a data-based model for SARS-CoV-2 decay on inert surfaces (stainless steel, ABS plastic and nitrile rubber) at varying temperature and relative humidity without sunlight.¹⁶⁹ <p>Particulate matter (PM) does not appear to be a viable transmission model of SARS-CoV-2.</p> <ul style="list-style-type: none"> • It does not appear that pollen or air particulates are carriers of SARS-CoV-2,¹⁸¹ despite some country-level associations.⁵⁵ <p>SARS-CoV-2 survival in the air is highly dependent on the presence of UV light and temperature.</p> <ul style="list-style-type: none"> • DHS has developed a tool for estimating the decay of airborne SARS-CoV-2 in different environmental conditions.¹⁶⁸ Due to the effects of evaporation, modeling suggests that hot, dry conditions increase the aerosol risk of SARS-CoV-2, though cold, humid conditions facilitate transmission by droplet spread.⁷⁶⁹ • Experimental studies using SARS-CoV-2 aerosols (1.78-1.96 µm mass median aerodynamic diameter in artificial saliva matrix) found that simulated sunlight rapidly inactivates the virus, with 90% reductions in infectious concentration after 6 minutes in high-intensity sunlight (similar to mid-June) and 19 minutes in low-intensity sunlight (similar to early March or October).⁶⁰² In dark conditions, the half-life of aerosolized SARS-CoV-2 is approximately 86 minutes in simulated saliva matrix.⁶⁰² Humidity alone had no significant impact on aerosolized virus survival.⁶⁰² • SARS-CoV-2 was shown to have an aerosol half-life of 2.7 hours (without sunlight, particles <5 µm, tested at 21-23°C and 65% RH),⁶⁷³ retaining infectivity for up to 16 hours in appropriate conditions (23°C, 53% RH, no sunlight).²⁰⁸ <p>Stability of SARS-CoV-2 RNA in clinical samples depends on temperature and transport medium.</p> <ul style="list-style-type: none"> • RNA in clinical samples collected in viral transport medium is stable at 18-25°C or 2-8°C for up to 21 days without impacting real-time RT-PCR results.⁶²⁵ RNA in clinical samples is also stable at 4°C for up to 4 weeks with regard to quantitative RT-PCR testing (given that the sample contains 5,000 copies/mL). Separately, storage of RNA in phosphate buffered saline (PBS) at room temperature (18-25°C) resulted in unstable sample concentrations.⁵²⁸ <p>There is currently no evidence that SARS-CoV-2 is transmitted to people through food.</p> <ul style="list-style-type: none"> • There is no documented evidence that food, food packaging, or food handling is a significant source of COVID-19 infections,^{310, 716} though several outbreaks have a hypothesized food origin.²⁷⁵ Infectious SARS-CoV-2 has been found on frozen food packaging, but has not been linked to actual infections.⁵⁶⁹ • SARS-CoV-2 is susceptible to heat treatment (70°C) but can persist for at least two weeks at refrigerated temperatures (4°C).^{131, 556} SARS-CoV-2 maintains infectivity for at least 21 days when inoculated on frozen foods and stored below -20°C.²¹⁸
What do we need to know?
<p>We need to quantify the duration of SARS-CoV-2 infectivity on surfaces, not simply the presence of RNA.</p> <ul style="list-style-type: none"> • It is unclear how viability of SARS-CoV-2 is affected across the food supply chain.⁷⁵⁴ • Does the composition (e.g., organic compounds, metals) of airborne particulate matter affect SARS-CoV-2 stability?⁷⁰³

Decontamination – What are effective methods to kill the agent in the environment?
What do we know?
<p>Soap and water, as well as common alcohol and chlorine-based cleaners, hand sanitizers, and disinfectants are effective at inactivating SARS-CoV-2 on hands and surfaces.</p> <ul style="list-style-type: none"> • A systematic review identified sunlight, UV light, ethanol, hydrogen peroxide, and hypochlorite as methods to reduce surface contamination.⁶¹ However, the levels of decontamination necessary to affect transmission <i>per se</i> are still unknown.⁶¹ • Alcohol-based hand rubs are effective at inactivating SARS-CoV-2.³⁵¹ • Chlorine bleach (1%, 2%), 70% ethanol and 0.05% chlorhexidine are effective against live virus in lab tests.¹²⁹ • EPA has released a list of SARS-CoV-2 disinfectants that have been found effective against SARS-CoV-2 specifically.¹⁸⁹ • Twice-daily cleaning with sodium dichloroisocyanurate decontaminated surfaces in COVID-19 patient hospital rooms.⁵⁰¹ Regular disinfection of hospital rooms (with benzalkonium wipes) can reduce the presence of SARS-CoV-2 on surfaces, though contamination is widespread without regular cleaning.³³⁸ Chlorhexidine digluconate may be ineffective.⁴³ • Oral antiseptic rinses used in pre-procedural rinses for dentistry containing povidone-iodine (PVP-I) are effective decontaminants of SARS-CoV-2, completely inactivating SARS-CoV-2 at concentrations above 0.5% in lab tests (for 15-30 s).⁶⁶ • Efforts are ongoing to create paint-on surfaces⁶² or other surface coatings¹⁹⁰ that can rapidly inactivate SARS-CoV-2. • Iodine-based antiseptics may be able to decontaminate nasal passages, though any influence on transmission is unknown.²³¹ • A mouth-spray previously investigated for the cold-causing coronavirus 229E (ColdZyme[®]) effectively inactivated SARS-CoV-2 <i>in vitro</i>; additional tests are necessary to determine any clinical benefit.²⁷⁰ • Indoor air filters based on non-thermal plasma or reactive oxygen species may be effective at reducing circulating SARS-CoV-2 concentrations, estimated by reductions in surrogate virus, though additional testing on live SARS-CoV-2 virus is needed.⁵⁹⁴ • Indoor air filtration devices based on hydroxyl radical cascades, which do not emit ozone, are being trialed at 4 UK hospitals due to their efficacy in reducing concentrations of a surrogate virus (M2 phage).^{22, 663} • In tests with a surrogate virus (Phi6 phage), a modified version of the Joint Biological Agent Decontamination System (JBADS) was effective at decontaminating military aircraft in approximately three hours using high heat and humidity,⁶³² Phi6, however, may be less stable than SARS-CoV-2 on surfaces, and therefore may not be the best surrogate.⁷¹⁵ • Aquila Bioscience has developed a spray decontamination technique to pair with its existing alcohol- and chemical-free wipe; these products may be used to capture SARS-CoV-2 on skin, surfaces, and washable masks via high-affinity binding.⁷⁹ • Masks with laser-induced graphene have previously shown antibacterial properties,²⁹⁹ and may facilitate mask decontamination, particularly when masks are exposed to sunlight.²⁵ • Peracetic acid dry fogging was shown to be effective at inactivating SARS-CoV-2 on stainless steel coupons, simulating whole-room fumigation.¹⁴⁹ <p>Several methods exist for decontaminating N95 respirators⁴⁹³ and other PPE.</p> <ul style="list-style-type: none"> • Researchers have identified four methods capable of decontaminating N95 respirators while maintaining physical integrity (fit factor): UV radiation, heating to 70°C, and vaporized hydrogen peroxide (VHP).²¹⁷ Ethanol (70%) was associated with loss of physical integrity.²¹⁷ Dry heat and UV decontamination can also be used under certain conditions.²¹⁶ • Additional methods showing efficacy against SARS-CoV-2 on respirators include pulsed xenon ultraviolet light,⁶²⁰ wet heat (using a multicooker),¹⁷⁰ and methylene blue plus light.³⁸¹ • Hydrogen peroxide vapor (VHP) can repeatedly decontaminate N95 respirators.⁵⁷³ Devices capable of decontaminating 80,000 masks per day have been granted Emergency Use Authorization from the FDA.¹⁹⁸ • The FDA has issued an Emergency Use Authorization for a system capable of decontaminating ten N95 masks at a time using devices already present in many US hospitals,⁸² though fit failure after reuse remains a concern.³⁹⁹ • Respirator decontamination methods such as VHP appear to maintain filtration efficiency after repeated decontamination cycles.⁵²⁷ Several decontamination methods, including VHP, moist heat, and UVC, are capable of decontaminating N95 respirators for 10-20 cycles without loss of fit or filtration efficiency.¹⁰ Stacking respirators may increase decontamination rates without compromising efficiency.⁵⁹⁰ Peracetic acid may be effective in combination with VHP.³²⁰ • The US FDA has issued guidance for bioburden reduction systems using dry heat to decontaminate certain respirators.⁶⁶⁴ • A Canadian technology (“D-Pod”) using heat and UVC for PPE is being manufactured for North American distribution.²⁴⁶ • Researchers have developed a thermal inactivation model for SARS-CoV-2, providing estimates of infectivity reduction based on time and temperature in the environment and under decontamination strategies.⁷⁵² • Forced air ozone reactors may be able to decontaminate surgical gowns, though SARS-CoV-2 tests are needed.^{138, 411}
What do we need to know?
<p>We need additional SARS-CoV-2 decontamination studies, particularly with regard to PPE and other items in short supply.</p> <ul style="list-style-type: none"> • Does contamination with human fluids/waste alter disinfectant efficacy profiles? • We need to know how to efficiently and effectively decontaminate whole rooms and large spaces. • What level of decontamination is necessary (e.g., log-reduction) to eliminate transmission risk from contaminated surfaces? • We need to understand how different testing methods and standards affect decontamination efficacy estimates.

PPE – What PPE is effective, and who should be using it?	
What do we know?	
<p>Face masks appear effective at reducing infections from SARS-CoV-2. Healthcare workers are at high risk of acquiring COVID-19, even with recommended PPE.</p> <ul style="list-style-type: none"> Healthcare worker illnesses⁶⁵⁰ demonstrates human-to-human transmission despite isolation, PPE, and infection control.⁶⁰¹ Risk of transmission to healthcare workers is high.⁵⁶⁶ Contacts with healthcare workers tend to transmit COVID-19 more often than other casual contacts.⁶⁹⁸ Hospital-acquired infection rates fell after introduction of comprehensive infection control measures, including expanded testing and use of PPE for all patient contacts.⁵⁷⁴ Universal masking policies also reduced the rate of new healthcare worker infections.^{697, 778} Even among healthcare personnel reporting adequate PPE early in the pandemic (March-April), rates of infection were 3.4 times higher than the general population.⁴⁸⁵ A modeling study suggests that healthcare workers are primarily at risk from droplet and inhalation exposure (compared to contact with fomites), with greater risk while in closer proximity to patients.³²² “Healthcare personnel entering the room [of SARS-CoV-2 patients] should use standard precautions, contact precautions, airborne precautions, and use eye protection (e.g., goggles or a face shield).”¹⁰⁷ The WHO considers face shields as inferior to masks and respirators for control of droplet transmission.⁷²² WHO indicates healthcare workers should wear clean long-sleeve gowns as well as gloves.⁷¹⁹ PPE that covers all skin may reduce exposure to pathogens.^{209, 710} Respirators (NIOSH-certified N95, EUFFP2 or equivalent) are recommended for those working with potential aerosols.⁷²¹ Additional protection (Powered Air Purifying Respirator (PAPR) with hood), should be considered for high-risk procedures.⁸⁴ KN95 respirators are, under certain conditions, approved for use under FDA Emergency Use Authorization.¹⁹⁹ On May 7, the FDA rescinded a number of KN95 models that no longer meet the EUA criteria and are no longer authorized.²⁰⁵ A study suggests that P100 respirators with removable filter cartridges have similar filtration efficiency compared to N95 respirators and could plausibly be used if N95 respirators were in short supply.⁵²¹ Particular care should be taken with “duckbill” N95 respirators, which may fail fit tests after repeated doffing.¹⁵⁹ Dome-shaped N95 respirators also failed fit tests after extended use.¹⁵⁹ The US FDA cautions healthcare facilities using passive protective barrier enclosures without negative pressure, and has withdrawn a prior Emergency Use Authorization for the devices.²⁰³ Experiments with mannequins show that face masks reduce potential spread of SARS-CoV-2 when worn by an infectious individual, but also that face masks by non-infected recipients can reduce the number of inhaled particles; the protective effect was maximized when both infected and uninfected individuals (mannequins) wore masks.⁶⁶⁷ Researchers have developed a lipopeptide fusion inhibitor that prevents SARS-CoV-2 transmission in ferrets given the peptide prophylactically via the intranasal route; human studies have yet to be conducted.¹⁵⁷ <p>Non-medical masks may be effective at slowing transmission, though data specific to SARS-CoV-2 are sparse.^{6, 9}</p> <ul style="list-style-type: none"> On 4/3/2020, the US CDC recommended wearing cloth face masks in public where social distancing measures are difficult to maintain.¹⁰⁸ The CDC recommends masks without exhalation vents or valves,¹⁰³ as masks with valves can allow particles to pass through unfiltered.⁶⁷⁷ The WHO recommends that the general population wear non-medical masks when in public settings and when physical distancing is difficult, and that vulnerable populations (e.g., elderly) wear medical masks when close contact is likely.⁷¹⁷ Infected individuals wearing facemasks in the home before the onset of symptoms was associated with a reduction in household transmission.⁷⁰⁰ A meta-analysis of SARS-CoV-1, MERS, and COVID-19 transmission events found evidence that wearing face masks and eye protection were each associated with lower risk of transmission,¹³⁵ with N95 respirators more effective than surgical masks.¹³⁵ In a separate meta-analysis, N95 respirators were found to be beneficial for reducing the occurrence of respiratory illness in health care professionals including influenza, though surgical masks were similarly effective for influenza.⁴⁹⁶ N95 respirators were associated with up to 80% reductions in SARS-CoV-1 infections.⁴⁹⁶ Surgical face masks, respirators, and homemade face masks may prevent transmission of coronaviruses from infectious individuals to other individuals.^{154, 384, 671} Surgical masks were associated with a significant reduction in the amount of seasonal coronavirus expressed as aerosol particles (<5 μm).³⁸⁴ Homemade masks reduce overall flow from breathing and coughing (63-86% reduction) but also generate leakage jets facing downward and backward from the wearer’s face.⁶⁷⁹ Some non-standard materials (e.g., cotton, cotton hybrids) may be able to filter out >90% of simulant particles >0.3μm,³⁴³ while other materials (e.g., T-shirt, vacuum cleaner bag, towels) appear to have lower filtration efficacy (~35-62%).⁶⁸⁹ Of 42 homemade materials tested, the three with the greatest filtration efficiencies were layered cotton with raised visible fibers.⁷⁵⁹ Neck fleeces commonly worn by runners may increase the frequency of small aerosol particles, compared to wearing no mask at all.²¹⁴ Cotton T-shirt masks appear ineffective at reducing emitted particles when individuals talk, breathe, sneeze, or cough, with those made of single layers increasing emitted particles during these activities.⁴² Smaller aerosol particles (e.g., <0.1μm) are more difficult to filter for most respirators and face masks.¹³⁶ 	
What do we need to know?	
<p>We need to continue assessing PPE effectiveness with specific regard to SARS-CoV-2 instead of surrogates.</p> <ul style="list-style-type: none"> When and how do N95 respirators and other face coverings fail? How effective are homemade masks at reducing SARS-CoV-2 transmission? 	

Forensics – Natural vs intentional use? Tests to be used for attribution.
What do we know?
<p>All current evidence supports the natural emergence of SARS-CoV-2 via a bat and possible intermediate mammal species.</p> <ul style="list-style-type: none"> • New analysis of SARS-CoV-2 and related SARS-like coronaviruses suggests that SARS-CoV-2 jumped directly from bats to humans, without the influence of an intermediate 'mixing' host.⁷³ Pangolin coronaviruses were shown to be more divergent and split off from bat coronaviruses earlier than SARS-CoV-2.⁷³ Current sampling of pangolin viruses does not implicate them as an intermediate to human SARS-CoV-2.⁷³ These data suggest SARS-CoV-2 emerged from circulating bat coronaviruses in SE China/SE Asia and additional zoonotic emergence of novel coronaviruses could occur. • Based on phylogenetic analysis, SARS-CoV-2 most likely emerged from <i>Rhinolophus</i> (horseshoe) bats living in China, Laos, Myanmar, Vietnam, or another Southeast Asian country,³⁶⁶ though historical recombination with pangolin coronaviruses may explain some features of the SARS-CoV-2 genome.²²⁵ • Genomic analysis suggests that SARS-CoV-2 is a natural variant and is unlikely to be human-derived or otherwise created by “recombination” with other circulating strains of coronavirus.^{35, 776} • Phylogenetics suggest that SARS-CoV-2 is of bat origin, but is closely related to coronaviruses found in pangolins.^{408, 410} The SARS-CoV-2 Spike protein, which mediates entry into host cells and is a major determinant of host range, is very similar to the SARS-CoV-1 Spike protein.⁴²⁰ The rest of the genome is more closely related to two separate bat coronaviruses⁴²⁰ and coronaviruses found in pangolins.⁴¹⁰ • Comparing genomes of multiple coronaviruses using machine-learning has identified key genomic signatures shared among high case fatality rate coronaviruses (SARS-CoV-1, SARS-CoV-2, MERS) and animal counterparts.²⁷² These data further suggest that SARS-CoV-2 emergence is the result of natural emergence and that there is a potential for future zoonotic transmission of additional pathogenic strains to humans.²⁷² • Deletion mutants were identified at low levels in human clinical samples, suggesting that the PRRA furin cleavage site alone is not fully responsible for human infection, but does confer a fitness advantage in the human host.⁷³¹ Additional whole-genome sequencing in humans would help to confirm this finding. • Genomic data support at least two plausible origins of SARS-CoV-2: “(i) natural selection in a non-human animal host prior to zoonotic transfer, and (ii) natural selection in humans following zoonotic transfer.”³⁵ Both scenarios are consistent with the observed genetic changes found in all known SARS-CoV-2 isolates. • Some SARS-CoV-2 genomic evidence indicates a close relationship with pangolin coronaviruses,⁷³⁰ and data suggest that pangolins may be a natural host for beta-coronaviruses.^{408, 410} Genomic evidence suggests a plausible recombination event between a circulating coronavirus in pangolins and bats could be the source of SARS-CoV-2.^{392, 742} Emerging studies are showing that bats are not the only reservoir of SARS-like coronaviruses.⁷⁶⁴ Additional research is needed. • There are multiple studies showing that the SARS-CoV-2 S protein receptor binding domain, the portion of the protein responsible for binding the human receptor ACE2, was acquired through recombination between coronaviruses from pangolins and bats.^{35, 392, 409, 764} These studies suggest that pangolins may have played an intermediate role in the adaptation of SARS-CoV-2 to be able to bind to the human ACE2 receptor. Additional research is needed. • A key difference between SARS-CoV-2 and other beta-coronaviruses is the presence of a polybasic furin cleavage site in the Spike protein (insertion of a PRRA amino acid sequence between S1 and S2).¹⁴⁷ • A novel bat coronavirus (RmYN02) has been identified in China with an insertion between the S1/S2 cleavage site of the Spike protein. While distinct from the furin cleavage site insertion in SARS-CoV-2, this evidence shows that such insertions can occur naturally.⁷⁷⁴ • Additionally, “[...] SARS-CoV-2 is not derived from any previously used virus backbone,” reducing the likelihood of laboratory origination,³⁵ and “[...] genomic evidence does not support the idea that SARS-CoV-2 is a laboratory construct, [though] it is currently impossible to prove or disprove the other theories of its origin.”³⁵ • Work with other coronaviruses has indicated that heparan sulfate dependence can be an indicator of prior cell passage, due to a mutation in the previous furin enzyme recognition motif.¹⁵⁶ • A report claiming a laboratory origin of SARS-CoV-2⁷⁴⁸ has been heavily disputed by scientists at Johns Hopkins University.⁴
What do we need to know?
<p>We need to know whether there was an intermediate host species between bats and humans.</p> <ul style="list-style-type: none"> • What tests for attribution exist for coronavirus emergence? • What is the identity of the intermediate species? • Are there closely related circulating coronaviruses in bats or other animals with the novel PRRA cleavage site found in SARS-CoV-2?

Genomics – How does the disease agent compare to previous strains?
What do we know?
<p>Current evidence suggests that SARS-CoV-2 accumulates mutations at a similar rate as other coronaviruses.</p> <ul style="list-style-type: none"> • There have been no documented cases of SARS-CoV-2 prior to December 2019. Preliminary genomic analyses, however, suggest that the first human cases of SARS-CoV-2 emerged between 10/19/2019 – 12/17/2019.^{37, 60, 554} • The estimated mutation rate for SARS-CoV-2 is 6×10^{-4} nucleotides per genome per year.⁶⁷⁴ • SARS-CoV-2 is acquiring nucleotide changes at a rate that suggests the virus is undergoing purifying selection (that the genome is stabilizing toward a common genome).⁷³⁷ Low genetic diversity early in the epidemic suggests that SARS-CoV-2 was capable of jumping to human and other mammalian hosts,⁷³⁷ and that additional jumps into humans may occur. • In an analysis of ~3,500 COVID-19 patients, researchers identified 17 SARS-CoV-2 genome variants that were consistently associated with severe illness, and 67 SARS-CoV-2 genome variants consistently associated with mild disease.⁶⁸² The variants were not rare overall, suggesting use as a screening tool, though a single variant alone is not necessarily responsible for virulence.⁶⁸² Variants leading to the most severe illness were located in the C-terminal end of the Spike protein.⁶⁸² <p>Several viral variants, representing unique collections of mutations, are being investigated for their effects on transmission and/or virulence.</p> <ul style="list-style-type: none"> • Phylogenetic and clinical analysis suggests the D614G mutation in the Spike protein is associated with higher rates of SARS-CoV-2 transmission,⁶⁸¹ but no change in clinical severity in infected patients.³⁴⁷ An ongoing study of SARS-CoV-2 sequences reveals the continued spread and increased presence of sequences with the D614G mutation,^{347, 418, 540, 762} though it is possible that founder effects contributed to its prevalence.⁶⁷⁵ Limited animal model results support the possibility of increased transmissibility,^{295, 541} and the mutation slightly increased viral replication in human cell lines.^{540, 762} Broad phylogenetic analysis, however, suggests that no current, recurring SARS-CoV-2 mutations (including D614G) are associated with higher rates of transmission in human populations.⁶⁷⁵ • The D614G mutation appears to make the virus more susceptible to neutralization by monoclonal antibodies or by convalescent plasma.⁷⁰⁹ Antibodies induced by the D614G mutation or wild-type virus are able to neutralize each other.³⁷⁷ • A separate Spike protein receptor binding motif variant (called N493K) results in similar clinical disease; importantly, it shows evidence of immune escape from polyclonal sera and neutralizing antibodies. This may affect the ability of vaccines and therapeutics that target this region.⁶⁵² As of October 2020, this is the second most common receptor binding domain variant worldwide, and has been found in 12 countries.⁶⁵² • An existing variant (VUI 202012/01) that is increasing in prevalence in some areas of the UK¹⁸³ has been associated with higher transmission rates,²⁹⁴ though confirmation in human or animal studies is needed. There have been no links between this variant and enhanced virulence.⁴³⁷ The variant consists of several mutations linked to the viral Spike protein³³² and receptor-binding domain.⁵⁵⁵ <p>Several human genomic regions, including those determining blood type, affect COVID-19 prevalence and/or severity.³⁴</p> <ul style="list-style-type: none"> • Blood type may affect COVID-19,²⁴⁹ with evidence of slightly increased prevalence^{31, 56, 252} and moderately increased severity in those with type A blood^{289, 407} (though evidence is mixed).³⁶⁷ In US hospital patients, COVID-19 prevalence was slightly higher in individuals with non-O-type blood; blood type affected both risk of mechanical ventilation (lower in type A, higher in B and AB compared to O) and death (higher in AB, lower in A and B compared to O), and Rh negative status was protective for all three measures.⁷⁸⁰ Non-O-type blood has been associated with clotting issues.¹⁶⁶ A large study (n=225,556) found that individuals with type O blood had less severe disease and lower risk of death from COVID-19 than individuals with other blood types, and that Rh-negative status showed lower COVID-19 prevalence.⁵⁶⁰ • Other regions associated with severe disease include locus 3p21.31, where certain alleles are found more often in patients with respiratory distress requiring ventilation,²⁴⁹ as well as those with severe disease.⁵⁰⁷ • Individuals with defective androgen signaling (long polyQ allelic repeats in the androgen receptor gene) were more likely to have severe COVID-19, possibly due to increased inflammatory responses; this may influence treatment decisions.⁵³ • In a study of 2,244 critically ill COVID-19 patients, researchers identified novel associations between several genes involved in innate antiviral defenses (IFNAR2 and OAS) and host-driven inflammatory lung injury (DPP9, TYK2, and CCR2).⁵⁰⁸ Understanding the involvement of these genes could lead to targeted therapeutics; for instance, the development of baricitinab (or other Janus kinase inhibitors) to reduce inflammation caused by TYK2.⁵⁰⁸ <p>There is some concern regarding SARS-CoV-2 strains involved in continued human and mink transmission.</p> <ul style="list-style-type: none"> • Repeated outbreaks of COVID-19 on mink farms, and the detection of mink-adapted SARS-CoV-2 in humans, has led to the mass culling of all mink in Denmark.⁵⁷⁰ The State Serum Institute has noted mutations in the Spike protein that differed from commonly circulating strains and initially showed a decreased susceptibility to neutralizing antibodies.³⁰⁹ • The main SARS-CoV-2 variant associated with mink outbreaks in the Netherlands involves the Y453F mutation, which has also been identified in humans outside of Europe; this suggests the strain originated in humans.¹⁴⁴
What do we need to know?
<p>We need to link genotypes to phenotypes (e.g., disease severity) in infected patients, and identify differences in transmissibility or symptom severity caused by different SARS-CoV-2 mutations.</p> <ul style="list-style-type: none"> • What are the mutations in SARS-CoV-2 that allowed human infection and transmission? • How do viral mutations affect the long-term efficacy of specific vaccines?

Forecasting – What forecasting models and methods exist?
What do we know?
<p>Several platforms provide digital dashboards summarizing the current status of the pandemic in US states and counties.</p> <ul style="list-style-type: none"> • Hospital IQ has a dashboard that forecasts hospital and ICU admissions for each county in the US.³¹² • COVID Act Now: State and county-level dashboard focused on re-opening strategies, showing trends in four metrics related to COVID-19 risk (change in cases, total testing capacity, fraction of positive tests, and availability of ICU beds). Fundamentally uses an SEIR model fit to observed data.⁴⁹² • ESRI estimates the number of active COVID-19 cases in each US county, but validation is needed.⁴⁹⁴ • The National Association of County and City Health Officials (NACCHO) provides a dashboard with estimates of county-specific test positivity rates as well as mortality incidence for different racial groups.⁴⁷⁴ <p>The US CDC provides ensemble forecasts of cases and deaths based on the arithmetic mean of many participating groups.¹⁰⁶</p> <ul style="list-style-type: none"> • Columbia University Model: Spatially-explicit SEIR model incorporating contact rate reductions due to social distancing. Estimates total cases and risk of healthcare overrun.⁵⁸⁸ • Institute of Health Metrics and Evaluation (IHME): Mechanistic SEIR model combined with curve-fitting techniques to forecast cases, hospital resource use, and deaths at the state and country level.³⁰⁶ Also provides global forecasts.³⁰⁷ • Los Alamos National Laboratory: Forecasts of state-level cases and deaths based on statistical growth model fit to reported data. Implicitly accounts for effects of social distancing and other control measures.³⁶⁰ • Google/Harvard University: Time-series machine learning model that makes assumptions about which non-pharmaceutical interventions will be in place in the future.²⁵³ • Northeastern University: Spatially explicit, agent-based epidemic model used to forecast fatalities, hospital resource use, and the cumulative attack rate (proportion of the population infected) for unmitigated and mitigated scenarios.⁴⁸⁹ • Notre Dame University: Agent-based model forecasting cases and deaths for Midwest states. Includes effectiveness of control measures like social distancing.⁵²⁹ • University of California, Los Angeles: Mechanistic SIR model with statistical optimization to find best-fitting parameter values. Estimates confirmed and active cases, fatalities, and transmission rates at the national and state levels.⁶⁶⁵ • University of Geneva: Country-level forecasts of cases, deaths, and transmissibility (R_0). Uses statistical models fit to reported data, not mechanistic models.²²³ • University of Massachusetts, Amherst: Aggregation of state and national forecasts to create ensemble model.⁵⁶⁵ • Youyang Gu: Mechanistic SEIR model coupled with machine learning algorithms to minimize error between predicted and observed values. Forecasts deaths and infections at the state and national level, including 60 non-US countries. Includes effects of public health control efforts.²⁶⁵ <p>Additional forecasting efforts are designed to assess the effects of interventions such as social distancing and vaccination.</p> <ul style="list-style-type: none"> • Massachusetts Institute of Technology: Mechanistic SEIR model that forecasts cases, hospitalizations, and deaths. Also includes estimates of intervention measures, allows users to project based on different intervention scenarios (e.g., social distancing lasting for 3 vs. 4 weeks).⁴⁵⁰ • CovidSim: SEIR model allow users to simulate effects of future intervention policies at state and national levels (US only).¹²⁸ • Covasim: Agent-based model for testing effects of intervention measures, also available as Python library.³³⁵ • Shen et al. estimate US COVID-19 cases under different scenarios of vaccine efficacy, studying the continued need for non-pharmaceutical interventions such as face masks and physical distancing.⁶¹² • The WHO COVID-19 modeling parameter working group has released updated parameter ranges for several key COVID-19 parameters, including the reproduction number (R_0), serial interval, generation time, and fatality rate.⁶⁷ • University of Georgia: Statistical models used to estimate the current number of symptomatic and incubating individuals, beyond what is reported (e.g., “nowcasts”). Available at the state and national level for the US.¹¹⁴ • Researchers use a rolling window analysis incorporating uncertainty in the generation time distribution to estimate time-varying transmission rates in US states (the effective reproduction number, R_{eff} or R_t).¹² • Georgia Tech Applied Bioinformatics Laboratory: Tool providing probability of at least one infected individual attending an event, accounting for event size and county/state COVID-19 prevalence.¹²¹ • MITRE: Dashboards for COVID-19 forecasts and decision support tools, including regional comparisons and intervention planning. Uses combinations of SEIR models and curve-fitting approaches.⁴⁵³
What do we need to know?
<p>We need to know how different forecasting methods have fared when compared to real data and develop an understanding of which model features contribute most to accurate and inaccurate forecasts.</p> <ul style="list-style-type: none"> • Additionally, we need to know how vaccine efficacy, uptake, and deployment will alter COVID-19 progression. • How will spillover and movement between countries affect local COVID-19 resurgence after initial vaccine distribution? • We need real-time, publicly available dashboards to estimate vaccine uptake and adherence rates across the US.

Table 1. Definitions of commonly used acronyms

Acronym/Term	Definition	Description
ACE2	Angiotensin-converting enzyme 2	Acts as a receptor for SARS-CoV and SARS-CoV-2, allowing entry into human cells
Airborne transmission	Aerosolization of infectious particles	Aerosolized particles can spread for long distances (e.g., between hospital rooms via HVAC systems). Particles generally <5 µm.
ARDS	Acute respiratory distress syndrome	Leakage of fluid into the lungs which inhibits respiration and leads to death
Attack rate	Proportion of “at-risk” individuals who develop infection	Defined in terms of “at-risk” population such as schools or households, defines the proportion of individuals in those populations who become infected after contact with an infectious individual
CCV	Canine coronavirus	Canine coronavirus
CFR	Case Fatality Rate	Number of deaths divided by confirmed patients
CoV	Coronavirus	Virus typified by crown-like structures when viewed under electron microscope
COVID-19	Coronavirus disease 19	Official name for the disease caused by the SARS-CoV-2 virus.
Droplet transmission	Sneezing, coughing	Transmission via droplets requires relatively close contact (e.g., within 6 feet)
ELISA	Enzyme-linked immunosorbent assay	Method for serological testing of antibodies
Fomite	Inanimate vector of disease	Surfaces such as hospital beds, doorknobs, healthcare worker gowns, faucets, etc.
HCW	Healthcare worker	Doctors, nurses, technicians dealing with patients or samples
Incubation period	Time between infection and symptom onset	Time between infection and onset of symptoms typically establishes guidelines for isolating patients before transmission is possible
Infectious period	Length of time an individual can transmit infection to others	Reducing the infectious period is a key method of reducing overall transmission; hospitalization, isolation, and quarantine are all effective methods
Intranasal	Agent deposited into external nares of subject	Simulates inhalation exposure by depositing liquid solution of pathogen/virus into the nose of a test animal, where it is then taken up by the respiratory system.
MERS	Middle East Respiratory Syndrome	Coronavirus with over 2,000 cases in regional outbreak since 2012
MHV	Mouse hepatitis virus	Coronavirus surrogate
Nosocomial	Healthcare- or hospital-associated infections	Characteristic of SARS and MERS outbreaks, lead to refinement of infection control procedures
NPI	Non-pharmaceutical intervention	Public health control measures designed to reduce transmission, such as social distancing, movement restrictions, and face mask requirements.
PCR	Polymerase chain reaction	PCR (or real-time [RT] or quantitative [Q] PCR) is a method of increasing the amount of genetic material in a sample, which is then used for diagnostic testing to confirm the presence of SARS-CoV-2.
PFU	Plaque forming unit	Measurement of the number of infectious virus particles as determined by plaque forming assay. A measurement of sample infectivity.

Acronym/Term	Definition	Description
PPE	Personal protective equipment	Gowns, masks, gloves, and any other measures used to prevent spread between individuals
R_0	Basic reproduction number	A measure of transmissibility. Specifically, the average number of new infections caused by a typical infectious individual in a wholly susceptible population.
SARS	Severe Acute Respiratory Syndrome	Coronavirus with over 8,000 cases in global 2002-2003 outbreak
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2	Official name for the virus previously known as 2019-nCoV.
SEIR	Susceptible (S), exposed (E), infected (I), and resistant (R)	A type of modeling that incorporates the flow of people between the following states: susceptible (S), exposed (E), infected (I), and resistant (R), and is being used for SARS-CoV-2 forecasting
Serial interval	Length of time between symptom onset of successive cases in a transmission chain	The serial interval can be used to estimate R_0 , and is useful for estimating the rate of outbreak spread
SIR	Susceptible (S), infected (I), and resistant (R)	A type of modeling that incorporates the flow of people between the following states: susceptible (S), infected (I), and resistant (R), and is being used for SARS-CoV-2 forecasting
TCID ₅₀	50% Tissue Culture Infectious Dose	The number of infectious units which will infect 50% of tissue culture monolayers. A measurement of sample infectivity.
Transgenic	Genetically modified	In this case, animal models modified to be more susceptible to MERS and/or SARS by adding proteins or receptors necessary for infection
Vertical transmission	Transmission from mother to fetus	Generally understood as intrauterine transmission via blood or placenta. Not the same as transmission during or after birth.

Literature Cited:

1. Coronavirus diagnosed at mink farms in North Brabant. NOS 2020. <https://nos.nl/artikel/2331784-coronavirus-vastgesteld-bij-nertsenfokkerijen-in-noord-brabant.html>
2. Effect of Hydroxychloroquine in Hospitalized Patients with Covid-19. *New England Journal of Medicine* 2020. <https://www.nejm.org/doi/full/10.1056/NEJMoa2022926>
3. First case of SARS-CoV-2 in mink confirmed in Oregon. Oregon Department of Agriculture: 2020. <https://odanews.wpengine.com/first-case-of-sars-cov-2-in-mink-confirmed-in-oregon/>
4. *In Response: Yan et al. Preprint Examinations of the Origin of SARS-CoV-2*; Johns Hopkins Bloomberg School of Public Health, Center for Health Security: 2020. https://www.centerforhealthsecurity.org/our-work/pubs_archive/pubs-pdfs/2020/200921-in-response-yan.pdf
5. India's new paper Covid-19 test could be a 'game changer'. *BBC* 2020. <https://www.bbc.com/news/world-asia-india-54338864>
6. Masks for Prevention of Respiratory Virus Infections, Including SARS-CoV-2, in Health Care and Community Settings. *Annals of Internal Medicine* 0 (0), null. <https://www.acpijournals.org/doi/abs/10.7326/M20-3213>
7. Research Shows Virus Undetectable on Five Highly Circulated Library Materials After Three Days. Institute for Library and Museum Services: 2020. <https://www.ims.gov/news/research-shows-virus-undetectable-five-highly-circulated-library-materials-after-three-days>
8. Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19) — United States, February 12–March 16, 2020. *MMWR* 2020. https://www.cdc.gov/mmwr/volumes/69/wr/mm6912e2.htm?s_cid=mm6912e2_w#suggestedcitation
9. Update Alert: Masks for Prevention of Respiratory Virus Infections, Including SARS-CoV-2, in Health Care and Community Settings. *Annals of Internal Medicine* 0 (0), null. <https://www.acpijournals.org/doi/abs/10.7326/L20-0948>
10. 3M, *Decontamination of 3M Filtering Facepiece Respirators, such as N95 Respirators, in the United States - Considerations*; 3M: 2020. <https://multimedia.3m.com/mws/media/18248690/decontamination-methods-for-3m-filtering-facepiece-respirators-technical-bulletin.pdf>
11. AAAS, You may be able to spread coronavirus just by breathing, new report finds. *Science* 2 April, 2020. <https://www.sciencemag.org/news/2020/04/you-may-be-able-to-spread-coronavirus-just-breathing-new-report-finds>
12. Abbott, S.; Hellewell, J.; Thompson, R.; Sherratt, K.; Gibbs, H.; Bosse, N.; Munday, J.; Meakin, S.; Doughty, E.; Chun, J.; Chan, Y.; Finger, F.; Campbell, P.; Endo, A.; Pearson, C.; Gimma, A.; Russell, T.; null, n.; Flasche, S.; Kucharski, A.; Eggo, R.; Funk, S., Estimating the time-varying reproduction number of SARS-CoV-2 using national and subnational case counts [version 1; peer review: awaiting peer review]. *Wellcome Open Research* 2020, 5 (112). <https://wellcomeopenresearch.org/articles/5-112/v1>
13. Abella, B. S.; Jolkovsky, E. L.; Biney, B. T.; Uspal, J. E.; Hyman, M. C.; Frank, I.; Hensley, S. E.; Gill, S.; Vogl, D. T.; Maillard, I.; Babushok, D. V.; Huang, A. C.; Nasta, S. D.; Walsh, J. C.; Wiletyo, E. P.; Gimotty, P. A.; Milone, M. C.; Amaravadi, R. K., Efficacy and Safety of Hydroxychloroquine vs Placebo for Pre-exposure SARS-CoV-2 Prophylaxis Among Health Care Workers: A Randomized Clinical Trial. *JAMA Intern Med* 2020.
14. Ackermann, M.; Verleden, S. E.; Kuehnel, M.; Haverich, A.; Welte, T.; Laenger, F.; Vanstapel, A.; Werlein, C.; Stark, H.; Tzankov, A.; Li, W. W.; Li, V. W.; Mentzer, S. J.; Jonigk, D., Pulmonary Vascular Endothelialitis, Thrombosis, and Angiogenesis in Covid-19. *New England Journal of Medicine* 2020. <https://www.nejm.org/doi/full/10.1056/NEJMoa2015432>
15. Adam, D.; Wu, P.; Wong, J.; Lau, E.; Tsang, T.; Cauchemez, S.; Leung, G.; Cowling, B., Clustering and superspreading potential of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections in Hong Kong. 2020.

16. Adam, D. C.; Wu, P.; Wong, J. Y.; Lau, E. H. Y.; Tsang, T. K.; Cauchemez, S.; Leung, G. M.; Cowling, B. J., Clustering and superspreading potential of SARS-CoV-2 infections in Hong Kong. *Nature Medicine* **2020**. <https://doi.org/10.1038/s41591-020-1092-0>
17. Adams, M.; Katz, D.; Grandpre, J., Updated Estimates of Chronic Conditions Affecting Risk for Complications from Coronavirus Disease, United States. *Emerging Infectious Disease Journal* **2020**, *26* (9). https://wwwnc.cdc.gov/eid/article/26/9/20-2117_article
18. Afshar, Y.; Gaw, S. L.; Flaherman, V. J.; Chambers, B. D.; Krakow, D.; Berghella, V.; Shamshirsaz, A. A.; Boatman, A. A.; Aldrovandi, G.; Greiner, A.; Riley, L.; Boscardin, W. J.; Jamieson, D. J.; Jacoby, V. L., Clinical Presentation of Coronavirus Disease 2019 (COVID-19) in Pregnant and Recently Pregnant People. *Obstetrics & Gynecology* **9900**, Latest Articles, 10.1097/AOG.0000000000004178. https://journals.lww.com/greenjournal/Fulltext/9900/Clinical_Presentation_of_Coronavirus_Disease_2019.2.aspx
19. Agrawal, A. S.; Garron, T.; Tao, X.; Peng, B. H.; Wakamiya, M.; Chan, T. S.; Couch, R. B.; Tseng, C. T., Generation of a transgenic mouse model of Middle East respiratory syndrome coronavirus infection and disease. *J Virol* **2015**, *89* (7), 3659-70. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4403411/pdf/zjv3659.pdf>
20. Ahmed, S.; Karim, M. M.; Ross, A. G.; Hossain, M. S.; Clemens, J. D.; Sumiya, M. K.; Phru, C. S.; Rahman, M.; Zaman, K.; Somani, J.; Yasmin, R.; Hasnat, M. A.; Kabir, A.; Aziz, A. B.; Khan, W. A., A five day course of ivermectin for the treatment of COVID-19 may reduce the duration of illness. *Int J Infect Dis* **2020**.
21. Ahmed, W.; Bertsch, P. M.; Bibby, K.; Haramoto, E.; Hewitt, J.; Huygens, F.; Gyawali, P.; Korajkic, A.; Riddell, S.; Sherchan, S. P.; Simpson, S. L.; Sirikanchana, K.; Symonds, E. M.; Verhagen, R.; Vasan, S. S.; Kitajima, M.; Bivins, A., Decay of SARS-CoV-2 and surrogate murine hepatitis virus RNA in untreated wastewater to inform application in wastewater-based epidemiology. *Environmental Research* **2020**, 110092. <http://www.sciencedirect.com/science/article/pii/S0013935120309890>
22. Airora, The development, testing and verification of Airora's patented biocidal technology. <https://www.airora.com/verification.html> (accessed 19 Oct 2020).
23. Aleta, A.; Martin-Corral, D.; Pastore y Piontti, A.; Ajelli, M.; Litvinova, M.; Chinazzi, M.; Dean, N.; Halloran, M. E.; Longini, I.; Merler, S.; Pentland, A.; Vespignani, A.; Moro, E.; Moreno, Y., Modeling the impact of social distancing, testing, contact tracing and household quarantine on second-wave scenarios of the COVID-19 epidemic. *Preprint* **2020**. https://www.mobs-lab.org/uploads/6/7/8/7/6787877/tracing_main_may4.pdf
24. Ali, S. T.; Wang, L.; Lau, E. H. Y.; Xu, X.-K.; Du, Z.; Wu, Y.; Leung, G. M.; Cowling, B. J., Serial interval of SARS-CoV-2 was shortened over time by nonpharmaceutical interventions. *Science* **2020**, eabc9004. <https://science.sciencemag.org/content/sci/early/2020/07/20/science.abc9004.full.pdf>
25. Allen, D., Graphene Face Masks Set to Boost Coronavirus Protection. <http://emag.medicalexpo.com/graphene-face-masks-set-to-boost-coronavirus-protection/> (accessed 16 Nov 2020).
26. Allotey, J.; Stallings, E.; Bonet, M.; Yap, M.; Chatterjee, S.; Kew, T.; Debenham, L.; Llavall, A. C.; Dixit, A.; Zhou, D.; Balaji, R.; Lee, S. I.; Qiu, X.; Yuan, M.; Coomar, D.; van Wely, M.; van Leeuwen, E.; Kostova, E.; Kunst, H.; Khalil, A.; Tiberi, S.; Brizuela, V.; Broutet, N.; Kara, E.; Kim, C. R.; Thorson, A.; Oladapo, O. T.; Mofenson, L.; Zamora, J.; Thangaratnam, S., Clinical manifestations, risk factors, and maternal and perinatal outcomes of coronavirus disease 2019 in pregnancy: living systematic review and meta-analysis. *BMJ* **2020**, *370*, m3320. <https://www.bmj.com/content/bmj/370/bmj.m3320.full.pdf>
27. Alsharidah, S.; Ayed, M.; Ameen, R. M.; Alhuraish, F.; Rouheldeen, N. A.; Alshammari, F. R.; Embaireeg, A.; Almehali, M.; Adel, M.; Dawoud, M. E.; Aljasmii, M. A.; Alshammari, N.; Alsaeedi, A.; Al-Adsani, W.; Arian, H.; Awad, H.; Alenezi, H. A.; Alzafiri, A.; Gouda, E. F.; Almehanna, M.; Alqahtani, S.;

- Alshammari, A.; Askar, M. Z., COVID-19 Convalescent Plasma Treatment of Moderate and Severe Cases of SARS-CoV-2 Infection: A Multicenter Interventional Study. *Int J Infect Dis* **2020**.
28. Althouse, B. M.; Wenger, E. A.; Miller, J. C.; Scarpino, S. V.; Allard, A.; Hébert-Dufresne, L.; Hu, H., Superspreading events in the transmission dynamics of SARS-CoV-2: Opportunities for interventions and control. *PLoS Biology* **2020**, *18* (11), e3000897. <https://doi.org/10.1371/journal.pbio.3000897>
29. Altmann, D. M.; Douek, D. C.; Boyton, R. J., What policy makers need to know about COVID-19 protective immunity. *The Lancet* **2020**. [https://doi.org/10.1016/S0140-6736\(20\)30985-5](https://doi.org/10.1016/S0140-6736(20)30985-5)
30. Alves, A. M.; Yvamoto, E. Y.; Marzinotto, M. A. N.; Teixeira, A. C. d. S.; Carrilho, F. J., SARS-CoV-2 leading to acute pancreatitis: an unusual presentation. *The Brazilian Journal of Infectious Diseases* **2020**. <http://www.sciencedirect.com/science/article/pii/S1413867020301392>
31. Amoroso, A.; Magistrini, P.; Vespasiano, F.; Bella, A.; Bellino, S.; Puoti, F.; Alizzi, S.; Vaisitti, T.; Boros, S.; Grossi, P. A.; Trapani, S.; Lombardini, L.; Pezzotti, P.; Deaglio, S.; Brusaferrero, S.; Cardillo, M., HLA and ABO Polymorphisms May Influence SARS-CoV-2 Infection and COVID-19 Severity. *Transplantation* **2020**.
32. An, J.; Wei, R.; Zhou, H.; Luong, T. Q.; Gould, M. K.; Mefford, M. T.; Harrison, T. N.; Creekmur, B.; Lee, M. S.; Sim, J. J.; Brettler, J. W.; Martin, J. P.; Ong-Su, A. L.; Reynolds, K., Angiotensin-Converting Enzyme Inhibitors or Angiotensin Receptor Blockers Use and COVID-19 Infection Among 824,650 Patients with Hypertension from a US integrated Healthcare System. *J Am Heart Assoc* **2020**, e017773.
33. Anand, S.; Montez-Rath, M.; Han, J.; Bozeman, J.; Kerschmann, R.; Beyer, P.; Parsonnet, J.; Chertow, G. M., Prevalence of SARS-CoV-2 antibodies in a large nationwide sample of patients on dialysis in the USA: a cross-sectional study. *The Lancet* **2020**. [https://doi.org/10.1016/S0140-6736\(20\)32009-2](https://doi.org/10.1016/S0140-6736(20)32009-2)
34. Anastassopoulou, C.; Gkizarioti, Z.; Patrinos, G. P.; Tsakris, A., Human genetic factors associated with susceptibility to SARS-CoV-2 infection and COVID-19 disease severity. *Hum Genomics* **2020**, *14* (1), 40.
35. Andersen, K. G.; Rambaut, A.; Lipkin, W. I.; Holmes, E. C.; Garry, R. F., The proximal origin of SARS-CoV-2. *Nature Medicine* **2020**. <https://doi.org/10.1038/s41591-020-0820-9>
36. Anderson, E. L.; Turnham, P.; Griffin, J. R.; Clarke, C. C., Consideration of the Aerosol Transmission for COVID-19 and Public Health. *Risk Analysis* **2020**, *40* (5), 902-907. <https://onlinelibrary.wiley.com/doi/abs/10.1111/risa.13500>
37. Anderson, K., Estimates of the clock and TMRCA for 2019-nCoV based on 27 genomes. <http://virological.org/t/clock-and-tmrca-based-on-27-genomes/347> (accessed 01/26/2020).
38. Angus, D. C.; Derde, L.; Al-Beidh, F.; Annane, D.; Arabi, Y.; Beane, A.; van Bentum-Puijk, W.; Berry, L.; Bhimani, Z.; Bonten, M.; Bradbury, C.; Brunkhorst, F.; Buxton, M.; Buzgau, A.; Cheng, A. C.; de Jong, M.; Detry, M.; Estcourt, L.; Fitzgerald, M.; Goossens, H.; Green, C.; Haniffa, R.; Higgins, A. M.; Horvat, C.; Hullegie, S. J.; Kruger, P.; Lamontagne, F.; Lawler, P. R.; Linstrum, K.; Litton, E.; Lorenzi, E.; Marshall, J.; McAuley, D.; McGlothlin, A.; McGuinness, S.; McVerry, B.; Montgomery, S.; Mouncey, P.; Murthy, S.; Nichol, A.; Parke, R.; Parker, J.; Rowan, K.; Sanil, A.; Santos, M.; Saunders, C.; Seymour, C.; Turner, A.; van de Veerdonk, F.; Venkatesh, B.; Zarychanski, R.; Berry, S.; Lewis, R. J.; McArthur, C.; Webb, S. A.; Gordon, A. C., Effect of Hydrocortisone on Mortality and Organ Support in Patients With Severe COVID-19: The REMAP-CAP COVID-19 Corticosteroid Domain Randomized Clinical Trial. *Jama* **2020**. <https://jamanetwork.com/journals/jama/fullarticle/2770278>
39. Arentz, M.; Yim, E.; Klaff, L.; Lokhandwala, S.; Riedo, F. X.; Chong, M.; Lee, M., Characteristics and Outcomes of 21 Critically Ill Patients With COVID-19 in Washington State. *JAMA* **2020**. <https://doi.org/10.1001/jama.2020.4326>
40. Argenziano, M. G.; Bruce, S. L.; Slater, C. L.; Tiao, J. R.; Baldwin, M. R.; Barr, R. G.; Chang, B. P.; Chau, K. H.; Choi, J. J.; Gavin, N.; Goyal, P.; Mills, A. M.; Patel, A. A.; Romney, M.-L. S.; Safford, M. M.; Schluger, N. W.; Sengupta, S.; Sobieszczyk, M. E.; Zucker, J. E.; Asadourian, P. A.; Bell, F. M.; Boyd, R.; Cohen, M. F.; Colquhoun, M. I.; Colville, L. A.; de Jonge, J. H.; Dershowitz, L. B.; Dey, S. A.; Eiseman, K. A.; Girvin, Z. P.; Goni, D. T.; Harb, A. A.; Herzik, N.; Householder, S.; Karaaslan, L. E.; Lee, H.; Lieberman, E.; Ling, A.; Lu, R.; Shou, A. Y.; Sisti, A. C.; Snow, Z. E.; Sperring, C. P.; Xiong, Y.; Zhou, H. W.; Natarajan, K.; Hripcsak, G.;

Chen, R., Characterization and Clinical Course of 1000 Patients with COVID-19 in New York: retrospective case series. *medRxiv* **2020**, 2020.04.20.20072116.

<https://www.medrxiv.org/content/medrxiv/early/2020/04/22/2020.04.20.20072116.full.pdf>

41. Arons, M. M.; Hatfield, K. M.; Reddy, S. C.; Kimball, A.; James, A.; Jacobs, J. R.; Taylor, J.; Spicer, K.; Bardossy, A. C.; Oakley, L. P.; Tanwar, S.; Dyal, J. W.; Harney, J.; Chisty, Z.; Bell, J. M.; Methner, M.; Paul, P.; Carlson, C. M.; McLaughlin, H. P.; Thornburg, N.; Tong, S.; Tamin, A.; Tao, Y.; Uehara, A.; Harcourt, J.; Clark, S.; Brostrom-Smith, C.; Page, L. C.; Kay, M.; Lewis, J.; Montgomery, P.; Stone, N. D.; Clark, T. A.; Honein, M. A.; Duchin, J. S.; Jernigan, J. A., Presymptomatic SARS-CoV-2 Infections and Transmission in a Skilled Nursing Facility. *New England Journal of Medicine* **2020**.

<https://www.nejm.org/doi/full/10.1056/NEJMoa2008457>

42. Asadi, S.; Cappa, C. D.; Barreda, S.; Wexler, A. S.; Bouvier, N. M.; Ristenpart, W. D., Efficacy of masks and face coverings in controlling outward aerosol particle emission from expiratory activities. *Scientific Reports* **2020**, *10* (1), 15665. <https://doi.org/10.1038/s41598-020-72798-7>

43. Assis, M. S.; Araújo, R.; Lopes, A. M. M., Safety alert for hospital environments and health professional: chlorhexidine is ineffective for coronavirus. *Rev Assoc Med Bras (1992)* **2020**, *66* Suppl 2 (Suppl 2), 124-129.

44. AstraZeneca, AZD1222 vaccine met primary efficacy endpoint in preventing COVID-19.

<https://www.astrazeneca.com/media-centre/press-releases/2020/azd1222h1r.html>.

45. Auger, K. A.; Shah, S. S.; Richardson, T.; Hartley, D.; Hall, M.; Warniment, A.; Timmons, K.; Bosse, D.; Ferris, S. A.; Brady, P. W.; Schondelmeyer, A. C.; Thomson, J. E., Association Between Statewide School Closure and COVID-19 Incidence and Mortality in the US. *JAMA* **2020**.

<https://doi.org/10.1001/jama.2020.14348>

46. Avanzato, V. A.; Matson, M. J.; Seifert, S. N.; Pryce, R.; Williamson, B. N.; Anzick, S. L.; Barbian, K.; Judson, S. D.; Fischer, E. R.; Martens, C.; Bowden, T. A.; de Wit, E.; Riedo, F. X.; Munster, V. J., Case Study: Prolonged infectious SARS-CoV-2 shedding from an asymptomatic immunocompromised cancer patient. *Cell* **2020**. <https://doi.org/10.1016/j.cell.2020.10.049>

47. Aziz, M.; Fatima, R.; Assaly, R., Elevated Interleukin-6 and Severe COVID-19: A Meta-Analysis. *J Med Virol* **2020**.

48. Badr, H. S.; Du, H.; Marshall, M.; Dong, E.; Squire, M. M.; Gardner, L. M., Association between mobility patterns and COVID-19 transmission in the USA: a mathematical modelling study. *The Lancet Infectious Diseases* **2020**. [https://doi.org/10.1016/S1473-3099\(20\)30553-3](https://doi.org/10.1016/S1473-3099(20)30553-3)

49. Bae, S. H.; Shin, H.; Koo, H.-Y.; Lee, S. W.; Yang, J. M.; Yon, D. K., Asymptomatic Transmission of SARS-CoV-2 on Evacuation Flight. *Emerging Infectious Disease journal* **2020**, *26* (11).

https://wwwnc.cdc.gov/eid/article/26/11/20-3353_article

50. Bai, Y.; Yao, L.; Wei, T.; Tian, F.; Jin, D.-Y.; Chen, L.; Wang, M., Presumed Asymptomatic Carrier Transmission of COVID-19. *JAMA*.

51. Baig, A. M., Chronic COVID Syndrome: Need for an appropriate medical terminology for Long-COVID and COVID Long-Haulers. *Journal of Medical Virology* **2020**, *n/a* (n/a).

<https://onlinelibrary.wiley.com/doi/abs/10.1002/jmv.26624>

52. Bailey, L. C.; Razzaghi, H.; Burrows, E. K.; Bunnell, H. T.; Camacho, P. E. F.; Christakis, D. A.; Eckrich, D.; Kitzmiller, M.; Lin, S. M.; Magnusen, B. C.; Newland, J.; Pajor, N. M.; Ranade, D.; Rao, S.; Sofela, O.; Zahner, J.; Bruno, C.; Forrest, C. B., Assessment of 135 794 Pediatric Patients Tested for Severe Acute Respiratory Syndrome Coronavirus 2 Across the United States. *JAMA Pediatrics* **2020**.

<https://doi.org/10.1001/jamapediatrics.2020.5052>

53. Baldassarri, M.; Picchiotti, N.; Fava, F.; Fallerini, C.; Benetti, E.; Daga, S.; Valentino, F.; Doddato, G.; Furini, S.; Giliberti, A.; Tita, R.; Amitrano, S.; Bruttini, M.; Croci, S.; Meloni, I.; Pinto, A. M.; Gabbi, C.; Sciarra, F.; Venneri, M. A.; Gori, M.; Sanarico, M.; Crawley, F. P.; Pagotto, U.; Fanelli, F.; Mezzullo, M.; Dominguez-Garrido, E.; Planas-Serra, L.; Schluter, A.; Colobran, R.; Soler-Palacin, P.; Lapunzina, P.;

- Tenorio, J.; Pujol, A.; Castagna, M. G.; Marcelli, M.; Isidori, A. M.; Renieri, A.; Frullanti, E.; Mari, F., Shorter androgen receptor polyQ alleles protect against life-threatening COVID-19 disease in males. *medRxiv* **2020**, 2020.11.04.20225680.
<http://medrxiv.org/content/early/2020/11/05/2020.11.04.20225680.abstract>
54. Bao, L.; Gao, H.; Deng, W.; Lv, Q.; Yu, H.; Liu, M.; Yu, P.; Liu, J.; Qu, Y.; Gong, S.; Lin, K.; Qi, F.; Xu, Y.; Li, F.; Xiao, C.; Xue, J.; Song, Z.; Xiang, Z.; Wang, G.; Wang, S.; Liu, X.; Zhao, W.; Han, Y.; Wei, Q.; Qin, C., Transmission of SARS-CoV-2 via close contact and respiratory droplets among hACE2 mice. *The Journal of Infectious Diseases* **2020**. <https://doi.org/10.1093/infdis/jiaa281>
55. Barakat, T.; Muylkens, B.; Su, B.-L., Is Particulate Matter of Air Pollution a Vector of Covid-19 Pandemic? *Matter* **2020**, 3 (4), 977-980.
<http://www.sciencedirect.com/science/article/pii/S2590238520305129>
56. Barnkob, M. B.; Pottegård, A.; Støvring, H.; Haunstrup, T. M.; Homburg, K.; Larsen, R.; Hansen, M. B.; Titlestad, K.; Aagaard, B.; Møller, B. K.; Barington, T., Reduced prevalence of SARS-CoV-2 infection in ABO blood group O. *Blood Advances* **2020**, 4 (20), 4990-4993.
<https://doi.org/10.1182/bloodadvances.2020002657>
57. Barrington, L.; Cornwell, A., China's Sinopharm begins late stage trial of COVID-19 vaccine in UAE. <https://www.reuters.com/article/us-health-coronavirus-emirates-vaccine/chinas-sinopharm-begins-late-stage-trial-of-covid-19-vaccine-in-abu-dhabi-idUSKCN24H14T>.
58. Bartlett, S. L.; Diel, D. G.; Wang, L.; Zec, S.; Laverack, M.; Martins, M.; Caserta, L. C.; Killian, M. L.; Terio, K.; Olmstead, C.; Delaney, M. A.; Stokol, T.; Ivančić, M.; Jenkins-Moore, M.; Ingerman, K.; Teegan, T.; McCann, C.; Thomas, P.; McAloose, D.; Sykes, J. M.; Calle, P. P., SARS-CoV-2 Infection And Longitudinal Fecal Screening In Malayan Tigers (Panthera tigris jacksoni), Amur Tigers (Panthera tigris altaica), And African Lions (Panthera leo krugeri) At The Bronx Zoo, New York, USA. *bioRxiv* **2020**, 2020.08.14.250928.
<https://www.biorxiv.org/content/biorxiv/early/2020/08/14/2020.08.14.250928.full.pdf>
59. Bazant, M. Z.; Bush, J. W. M., Beyond Six Feet: A Guideline to Limit Indoor Airborne Transmission of COVID-19. *medRxiv* **2020**, 2020.08.26.20182824.
<https://www.medrxiv.org/content/medrxiv/early/2020/11/03/2020.08.26.20182824.full.pdf>
60. Bedford, T.; Neher, R., Genomic epidemiology of novel coronavirus (nCoV) using data from GISAID. <https://nextstrain.org/ncov>.
61. Bedrosian, N.; Mitchell, E.; Rohm, E.; Rothe, M.; Kelly, C.; String, G.; Lantagne, D., A Systematic Review of Surface Contamination, Stability, and Disinfection Data on SARS-CoV-2 (Through July 10, 2020). *Environ Sci Technol* **2020**.
62. Behzadinasab, S.; Chin, A.; Hosseini, M.; Poon, L. L. M.; Ducker, W. A., A Surface Coating that Rapidly Inactivates SARS-CoV-2. *ACS Applied Materials & Interfaces* **2020**.
<https://doi.org/10.1021/acsami.0c11425>
63. Beigel, J. H.; Tomashek, K. M.; Dodd, L. E.; Mehta, A. K.; Zingman, B. S.; Kalil, A. C.; Hohmann, E.; Chu, H. Y.; Luetkemeyer, A.; Kline, S.; Lopez de Castilla, D.; Finberg, R. W.; Dierberg, K.; Tapson, V.; Hsieh, L.; Patterson, T. F.; Paredes, R.; Sweeney, D. A.; Short, W. R.; Touloumi, G.; Lye, D. C.; Ohmagari, N.; Oh, M.-d.; Ruiz-Palacios, G. M.; Benfield, T.; Fätkenheuer, G.; Kortepeter, M. G.; Atmar, R. L.; Creech, C. B.; Lundgren, J.; Babiker, A. G.; Pett, S.; Neaton, J. D.; Burgess, T. H.; Bonnett, T.; Green, M.; Makowski, M.; Osinusi, A.; Nayak, S.; Lane, H. C., Remdesivir for the Treatment of Covid-19 — Final Report. *New England Journal of Medicine* **2020**. <https://doi.org/10.1056/NEJMoa2007764>
64. Bellos, I.; Pandita, A.; Panza, R., Maternal and perinatal outcomes in pregnant women infected by SARS-CoV-2: A meta-analysis. *European Journal of Obstetrics & Gynecology and Reproductive Biology* **2021**, 256, 194-204. <http://www.sciencedirect.com/science/article/pii/S0301211520307491>
65. Bi, Q.; Lessler, J.; Eckerle, I.; Lauer, S. A.; Kaiser, L.; Vuilleumier, N.; Cummings, D. A.; Flahault, A.; Petrovic, D.; Guessous, I.; Stringhini, S.; Azman, A. S., Household Transmission of SARS-COV-2: Insights

- from a Population-based Serological Survey. *medRxiv* **2020**, 2020.11.04.20225573.
<https://www.medrxiv.org/content/medrxiv/early/2020/11/04/2020.11.04.20225573.full.pdf>
66. Bidra, A. S.; Pelletier, J. S.; Westover, J. B.; Frank, S.; Brown, S. M.; Tessema, B., Rapid In-Vitro Inactivation of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Using Povidone-Iodine Oral Antiseptic Rinse. *Journal of Prosthodontics* **2020**, n/a (n/a).
<https://onlinelibrary.wiley.com/doi/abs/10.1111/jopr.13209>
67. Biggerstaff, M.; Cowling, B.; Cucunubá, Z.; Dinh, L.; Ferguson, N.; Gao, H.; Hill, V.; Imai, N.; Johansson, M.; Kada, S.; Morgan, O.; Pastore y Piontti, A.; Polonsky, J.; Prasad, P. V.; Quandelacy, T.; Rambaut, A.; Tappero, J.; Vandemaële, K.; Vespignani, A.; Warmbrod, K. L.; Wong, J., Early Insights from Statistical and Mathematical Modeling of Key Epidemiologic Parameters of COVID-19. *Emerging Infectious Disease journal* **2020**, 26 (11). https://wwwnc.cdc.gov/eid/article/26/11/20-1074_article
68. Biryukov, J.; Boydston, J. A.; Dunning, R. A.; Yeager, J. J.; Wood, S.; Reese, A. L.; Ferris, A.; Miller, D.; Weaver, W.; Zeitouni, N. E.; Phillips, A.; Freeburger, D.; Hooper, I.; Ratnesar-Shumate, S.; Yolitz, J.; Krause, M.; Williams, G.; Dawson, D. G.; Herzog, A.; Dabisch, P.; Wahl, V.; Hevey, M. C.; Altamura, L. A., Increasing Temperature and Relative Humidity Accelerates Inactivation of SARS-CoV-2 on Surfaces. *mSphere* **2020**, 5 (4), e00441-20. <https://msphere.asm.org/content/msph/5/4/e00441-20.full.pdf>
69. Bixler, D.; Miller, A. D.; Mattison, C. P.; al., e., SARS-CoV-2–Associated Deaths Among Persons Aged <21 Years — United States, February 12–July 31, 2020. *Morbidity and Mortality Weekly Report* **2020**, 2020 (69), 1324-1329. <https://www.cdc.gov/mmwr/volumes/69/wr/mm6937e4.htm>
70. Blackburn, J.; Yiannoutsos, C. T.; Carroll, A. E.; Halverson, P. K.; Menachemi, N., Infection Fatality Ratios for COVID-19 Among Noninstitutionalized Persons 12 and Older: Results of a Random-Sample Prevalence Study. *Annals of Internal Medicine* **2020**, 0 (0), null.
<https://www.acpijournals.org/doi/abs/10.7326/M20-5352>
71. Blair, R. V.; Vaccari, M.; Doyle-Meyers, L. A.; Roy, C. J.; Russell-Lodrigue, K.; Fahlberg, M.; Monjure, C. J.; Beddingfield, B.; Plante, K. S.; Plante, J. A.; Weaver, S. C.; Qin, X.; Midkiff, C. C.; Lehmicke, G.; Golden, N.; Threton, B.; Penney, T.; Allers, C.; Barnes, M. B.; Pattison, M.; Datta, P. K.; Maness, N. J.; Birnbaum, A.; Bohm, R. P.; Rappaport, J., ARDS and Cytokine Storm in SARS-CoV-2 Infected Caribbean Vervets. *bioRxiv* **2020**, 2020.06.18.157933.
<http://biorxiv.org/content/early/2020/06/19/2020.06.18.157933.abstract>
72. Böhmer, M. M.; Buchholz, U.; Corman, V. M.; Hoch, M.; Katz, K.; Marosevic, D. V.; Böhm, S.; Woudenberg, T.; Ackermann, N.; Konrad, R.; Eberle, U.; Treis, B.; Dangel, A.; Bengs, K.; Fingerle, V.; Berger, A.; Hörmansdorfer, S.; Ippisch, S.; Wicklein, B.; Grahl, A.; Pörtner, K.; Müller, N.; Zeitlmann, N.; Boender, T. S.; Cai, W.; Reich, A.; An der Heiden, M.; Rexroth, U.; Hamouda, O.; Schneider, J.; Veith, T.; Mühlemann, B.; Wölfel, R.; Antwerpen, M.; Walter, M.; Protzer, U.; Liebl, B.; Haas, W.; Sing, A.; Drosten, C.; Zapf, A., Investigation of a COVID-19 outbreak in Germany resulting from a single travel-associated primary case: a case series. *The Lancet. Infectious diseases* **2020**, S1473-3099(20)30314-5.
<https://pubmed.ncbi.nlm.nih.gov/32422201>
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7228725/>
73. Boni, M. F.; Lemey, P.; Jiang, X.; Lam, T. T.-Y.; Perry, B. W.; Castoe, T. A.; Rambaut, A.; Robertson, D. L., Evolutionary origins of the SARS-CoV-2 sarbecovirus lineage responsible for the COVID-19 pandemic. *Nature Microbiology* **2020**. <https://doi.org/10.1038/s41564-020-0771-4>
74. Bosco-Lauth, A. M.; Hartwig, A. E.; Porter, S. M.; Gordy, P. W.; Nehring, M.; Byas, A. D.; VandeWoude, S.; Ragan, I. K.; Maison, R. M.; Bowen, R. A., Pathogenesis, transmission and response to re-exposure of SARS-CoV-2 in domestic cats. *bioRxiv* **2020**, 2020.05.28.120998.
<http://biorxiv.org/content/early/2020/05/29/2020.05.28.120998.abstract>
75. Boukli, N.; Le Mene, M.; Schnuriger, A.; Cuervo, N. S.; Laroche, C.; Morand-Joubert, L.; Gozlan, J., High incidence of false positive results in patients with other acute infections, using the LIAISON® SARS-CoV-2 commercial chemiluminescent micro-particle immunoassay for detection of IgG anti SARS-CoV-2

- antibodies. *Journal of Clinical Microbiology* **2020**, JCM.01352-20.
<https://jcm.asm.org/content/jcm/early/2020/08/25/JCM.01352-20.full.pdf>
76. Boulware, D. R.; Pullen, M. F.; Bangdiwala, A. S.; Pastick, K. A.; Lofgren, S. M.; Okafor, E. C.; Skipper, C. P.; Nascene, A. A.; Nicol, M. R.; Abassi, M.; Engen, N. W.; Cheng, M. P.; LaBar, D.; Lother, S. A.; MacKenzie, L. J.; Drobot, G.; Marten, N.; Zarychanski, R.; Kelly, L. E.; Schwartz, I. S.; McDonald, E. G.; Rajasingham, R.; Lee, T. C.; Hulsiek, K. H., A Randomized Trial of Hydroxychloroquine as Postexposure Prophylaxis for Covid-19. *New England Journal of Medicine* **2020**.
<https://www.nejm.org/doi/full/10.1056/NEJMoa2016638>
77. Bozzi, G.; Mangioni, D.; Minoia, F.; Aliberti, S.; Grasselli, G.; Barbeta, L.; Castelli, V.; Palomba, E.; Alagna, L.; Lombardi, A.; Ungaro, R.; Agostoni, C.; Baldini, M.; Blasi, F.; Cesari, M.; Costantino, G.; Fracanzani, A. L.; Montano, N.; Monzani, V.; Pesenti, A.; Peyvandi, F.; Sottocorno, M.; Muscatello, A.; Filocamo, G.; Gori, A.; Bandera, A., Anakinra combined with methylprednisolone in patients with severe COVID-19 pneumonia and hyperinflammation: an observational cohort study. *J Allergy Clin Immunol* **2020**.
78. Bradburne, A. F.; Bynoe, M. L.; Tyrrell, D. A., Effects of a "new" human respiratory virus in volunteers. *British medical journal* **1967**, 3 (5568), 767-769. <https://pubmed.ncbi.nlm.nih.gov/6043624>
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1843247/>
79. Brady, T., Irish company develops groundbreaking Covid spray that will provide near complete protection. <https://www.independent.ie/irish-news/health/irish-company-develops-groundbreaking-covid-spray-that-will-provide-near-complete-protection-39717080.html> (accessed 09 Nov 2020).
80. Bramante, C. T.; Ingraham, N. E.; Murray, T. A.; Marmor, S.; Hovertsen, S.; Gronski, J.; McNeil, C.; Feng, R.; Guzman, G.; Abdelwahab, N.; King, S.; Tamariz, L.; Meehan, T.; Pendleton, K. M.; Benson, B.; Vojta, D.; Tignanelli, C. J., Metformin and risk of mortality in patients hospitalised with COVID-19: a retrospective cohort analysis. *The Lancet Healthy Longevity*. [https://doi.org/10.1016/S2666-7568\(20\)30033-7](https://doi.org/10.1016/S2666-7568(20)30033-7)
81. Braun, J.; Loyal, L.; Frentsch, M.; Wendisch, D.; Georg, P.; Kurth, F.; Hippenstiel, S.; Dingeldej, M.; Kruse, B.; Fauchere, F.; Baysal, E.; Mangold, M.; Henze, L.; Lauster, R.; Mall, M.; Beyer, K.; Roehmel, J.; Schmitz, J.; Miltenyi, S.; Mueller, M. A.; Witzernath, M.; Suttorp, N.; Kern, F.; Reimer, U.; Wenschuh, H.; Drosten, C.; Corman, V. M.; Giesecke-Thiel, C.; Sander, L.-E.; Thiel, A., Presence of SARS-CoV-2 reactive T cells in COVID-19 patients and healthy donors. *medRxiv* **2020**, 2020.04.17.20061440.
<https://www.medrxiv.org/content/medrxiv/early/2020/04/22/2020.04.17.20061440.full.pdf>
82. Brennan, Z., FDA issues 2nd EUA for decontamination system for N95 masks. *Regulatory Focus* 2020.
<https://www.raps.org/news-and-articles/news-articles/2020/4/fda-issues-2nd-eua-for-decontamination-system-for>
83. Brosseau, L. M., COMMENTARY: COVID-19 transmission messages should hinge on science.
<http://www.cidrap.umn.edu/news-perspective/2020/03/commentary-covid-19-transmission-messages-should-hinge-science>.
84. Brosseau, L. M.; Jones, R., Commentary: Protecting health workers from airborne MERS-CoV - learning from SARS. <http://www.cidrap.umn.edu/news-perspective/2014/05/commentary-protecting-health-workers-airborne-mers-cov-learning-sars>.
85. Brotons, P.; Launes, C.; Buetas, E.; Fumado, V.; Henares, D.; de Sevilla, M. F.; Redin, A.; Fuente-Soro, L.; Cuadras, D.; Mele, M.; Jou, C.; Millat, P.; Jordan, I.; Garcia-Garcia, J. J.; Bassat, Q.; Muñoz-Almagro, C.; Group, o. b. o. K. C. S., Susceptibility to Sars-COV-2 Infection Among Children And Adults: A Seroprevalence Study of Family Households in the Barcelona Metropolitan Region, Spain. *Clinical Infectious Diseases* **2020**. <https://doi.org/10.1093/cid/ciaa1721>
86. Bryner, J., First US infant death linked to COVID-19 reported in Illinois. *LiveScience* 2020.
<https://www.livescience.com/us-infant-dies-coronavirus.html>

87. Buitrago-Garcia, D.; Egli-Gany, D.; Counotte, M. J.; Hossmann, S.; Imeri, H.; Ipekci, A. M.; Salanti, G.; Low, N., Occurrence and transmission potential of asymptomatic and presymptomatic SARS-CoV-2 infections: A living systematic review and meta-analysis. *PLOS Medicine* **2020**, *17* (9), e1003346. <https://doi.org/10.1371/journal.pmed.1003346>
88. Bulfone, T. C.; Malekinejad, M.; Rutherford, G. W.; Razani, N., Outdoor Transmission of SARS-CoV-2 and Other Respiratory Viruses, a Systematic Review. *The Journal of Infectious Diseases* **2020**. <https://doi.org/10.1093/infdis/jiaa742>
89. Bundgaard, H.; Bundgaard, J. S.; Raaschou-Pedersen, D. E. T.; al., e., Effectiveness of Adding a Mask Recommendation to Other Public Health Measures to Prevent SARS-CoV-2 Infection in Danish Mask Wearers. *Annals of Internal Medicine* **2020**, *0* (0), null. <https://www.acpjournals.org/doi/abs/10.7326/M20-6817>
90. Burbelo, P. D.; Riedo, F. X.; Morishima, C.; Rawlings, S.; Smith, D.; Das, S.; Strich, J. R.; Chertow, D. S.; Davey, R. T.; Cohen, J. I., Detection of Nucleocapsid Antibody to SARS-CoV-2 is More Sensitive than Antibody to Spike Protein in COVID-19 Patients. *J Infect Dis* **2020**.
91. Bussani, R.; Schneider, E.; Zentilin, L.; Collesi, C.; Ali, H.; Braga, L.; Volpe, M. C.; Colliva, A.; Zanconati, F.; Berlot, G.; Silvestri, F.; Zacchigna, S.; Giacca, M., Persistence of viral RNA, pneumocyte syncytia and thrombosis are hallmarks of advanced COVID-19 pathology. *EBioMedicine* **2020**. <https://doi.org/10.1016/j.ebiom.2020.103104>
92. Bustin, S.; Coward, A.; Sadler, G.; Teare, L.; Nolan, T., CoV2-ID, a MIQE-compliant sub-20-min 5-plex RT-PCR assay targeting SARS-CoV-2 for the diagnosis of COVID-19. *Scientific Reports* **2020**, *10* (1), 22214. <https://doi.org/10.1038/s41598-020-79233-x>
93. Byambasuren, O.; Cardona, M.; Bell, K.; Clark, J.; McLaws, M.-L.; Glasziou, P., Estimating the extent of true asymptomatic COVID-19 and its potential for community transmission: systematic review and meta-analysis. *Available at SSRN 3586675* **2020**.
94. Callaway, E., Russia announces positive COVID-vaccine results from controversial trial. <https://www.nature.com/articles/d41586-020-03209-0>.
95. Callow, K.; Parry, H.; Sergeant, M.; Tyrrell, D., The time course of the immune response to experimental coronavirus infection of man. *Epidemiology & Infection* **1990**, *105* (2), 435-446.
96. Callow, K. A.; Parry, H. F.; Sergeant, M.; Tyrrell, D. A., The time course of the immune response to experimental coronavirus infection of man. *Epidemiology and Infection* **1990**, *105* (2), 435-446. <https://pubmed.ncbi.nlm.nih.gov/2170159>
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2271881/>
97. Cao, B.; Wang, Y.; Wen, D.; Liu, W.; Wang, J.; Fan, G.; Ruan, L.; Song, B.; Cai, Y.; Wei, M.; Li, X.; Xia, J.; Chen, N.; Xiang, J.; Yu, T.; Bai, T.; Xie, X.; Zhang, L.; Li, C.; Yuan, Y.; Chen, H.; Li, H.; Huang, H.; Tu, S.; Gong, F.; Liu, Y.; Wei, Y.; Dong, C.; Zhou, F.; Gu, X.; Xu, J.; Liu, Z.; Zhang, Y.; Li, H.; Shang, L.; Wang, K.; Li, K.; Zhou, X.; Dong, X.; Qu, Z.; Lu, S.; Hu, X.; Ruan, S.; Luo, S.; Wu, J.; Peng, L.; Cheng, F.; Pan, L.; Zou, J.; Jia, C.; Wang, J.; Liu, X.; Wang, S.; Wu, X.; Ge, Q.; He, J.; Zhan, H.; Qiu, F.; Guo, L.; Huang, C.; Jaki, T.; Hayden, F. G.; Horby, P. W.; Zhang, D.; Wang, C., A Trial of Lopinavir–Ritonavir in Adults Hospitalized with Severe Covid-19. *New England Journal of Medicine* **2020**. <https://www.nejm.org/doi/full/10.1056/NEJMoa2001282>
98. Carfi, A.; Bernabei, R.; Landi, F.; Group, f. t. G. A. C.-P.-A. C. S., Persistent Symptoms in Patients After Acute COVID-19. *JAMA* **2020**. <https://doi.org/10.1001/jama.2020.12603>
99. Caronna, E.; Ballvé, A.; Llauradó, A.; Gallardo, V. J.; María Ariron, D.; Lallana, S.; Maza, S. L.; Gadea, M. O.; Quibus, L.; Restrepo, J. L.; Rodrigo-Gisbert, M.; Vilaseca, A.; Gonzalez, M. H.; Gallo, M. M.; Alpuente, A.; Torres-Ferrus, M.; Borrell, R. P.; Alvarez-Sabin, J.; Pozo-Rosich, P., Headache: A striking prodromal and persistent symptom, predictive of COVID-19 clinical evolution. *Cephalalgia* **2020**, *40* (13), 1410-1421. <https://doi.org/10.1177/0333102420965157>

100. Casey, M.; Griffin, J.; McAloon, C. G.; Byrne, A. W.; Madden, J. M.; McEvoy, D.; Collins, A. B.; Hunt, K.; Barber, A.; Butler, F.; Lane, E. A.; O'Brien, K.; Wall, P.; Walsh, K. A.; More, S. J., Estimating pre-symptomatic transmission of COVID-19: a secondary analysis using published data. *medRxiv* **2020**, 2020.05.08.20094870.
<https://www.medrxiv.org/content/medrxiv/early/2020/05/11/2020.05.08.20094870.full.pdf>
101. Cauchois, R.; Koubi, M.; Delarbre, D.; Manet, C.; Carvelli, J.; Blasco, V. B.; Jean, R.; Fouche, L.; Bornet, C.; Pauly, V.; Mazodier, K.; Pestre, V.; Jarrot, P.-A.; Dinarello, C. A.; Kaplanski, G., Early IL-1 receptor blockade in severe inflammatory respiratory failure complicating COVID-19. *Proceedings of the National Academy of Sciences* **2020**, 202009017.
<http://www.pnas.org/content/early/2020/07/21/2009017117.abstract>
102. Cavalcanti, A. B.; Zampieri, F. G.; Rosa, R. G.; Azevedo, L. C. P.; Veiga, V. C.; Avezum, A.; Damiani, L. P.; Marcadenti, A.; Kawano-Dourado, L.; Lisboa, T.; Junqueira, D. L. M.; de Barros e Silva, P. G. M.; Tramuja, L.; Abreu-Silva, E. O.; Laranjeira, L. N.; Soares, A. T.; Echenique, L. S.; Pereira, A. J.; Freitas, F. G. R.; Gebara, O. C. E.; Dantas, V. C. S.; Furtado, R. H. M.; Milan, E. P.; Golin, N. A.; Cardoso, F. F.; Maia, I. S.; Hoffmann Filho, C. R.; Kormann, A. P. M.; Amazonas, R. B.; Bocchi de Oliveira, M. F.; Serpa-Neto, A.; Falavigna, M.; Lopes, R. D.; Machado, F. R.; Berwanger, O., Hydroxychloroquine with or without Azithromycin in Mild-to-Moderate Covid-19. *New England Journal of Medicine* **2020**.
<https://www.nejm.org/doi/full/10.1056/NEJMoa2019014>
103. CDC, About Masks. <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/about-face-coverings.html>.
104. CDC, ACIP Evidence to Recommendations for Use of Pfizer-BioNTech COVID-19 Vaccine under an Emergency Use Authorization. <https://www.cdc.gov/vaccines/acip/recs/grade/covid-19-pfizer-biontech-etr.html#:~:text=Pfizer%2DBioNTech%20COVID%2D19%20vaccine%20is%20recommended%20for%20prevention%20of,under%20an%20Emergency%20Use%20Authorization>.
105. CDC, Confirmation of COVID-19 in Two Pet Cats in New York. Centers for Disease Control and Prevention: 2020. <https://www.cdc.gov/media/releases/2020/s0422-covid-19-cats-NYC.html>
106. CDC, COVID-19 Forecasts. <https://www.cdc.gov/coronavirus/2019-ncov/covid-data/forecasting-us.html>.
107. CDC, Interim healthcare infection prevention and control recommendations for patients under investigation for 2019 novel coronavirus. <https://www.cdc.gov/coronavirus/2019-ncov/infection-control.html>.
108. CDC, Recommendation Regarding the Use of Cloth Face Coverings, Especially in Areas of Significant Community-Based Transmission. **2020**. <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html>
109. CDC, Scientific Brief: Community Use of Cloth Masks to Control the Spread of SARS-CoV-2. <https://www.cdc.gov/coronavirus/2019-ncov/more/masking-science-sars-cov2.html>.
110. CDC, Scientific Brief: SARS-CoV-2 and Potential Airborne Transmission. <https://www.cdc.gov/coronavirus/2019-ncov/more/scientific-brief-sars-cov-2.html>.
111. CDC, Situation summary. <https://www.cdc.gov/coronavirus/2019-nCoV/summary.html>.
112. CDC, Symptoms of Coronavirus. <https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html>.
113. CDC, C., China's CDC detects a large number of new coronaviruses in the South China seafood market in Wuhan http://www.chinacdc.cn/yw_9324/202001/t20200127_211469.html (accessed 01/27/2020).
114. CEID, Nowcasts for the US, states, and territories. <http://2019-coronavirus-tracker.com/nowcast.html>.

115. Centers for Disease Control and Prevention (CDC), Coronavirus Disease 2019 (COVID-19) 2020 Interim Case Definition, Approved August 5 2020. <https://www.cdc.gov/nndss/conditions/coronavirus-disease-2019-covid-19/case-definition/2020/08/05/> (accessed 21 Sept 2020).
116. Centers for Disease Control and Prevention (CDC), Overview of Testing for SARS-CoV-2 (COVID-19). <https://www.cdc.gov/coronavirus/2019-ncov/hcp/testing-overview.html> (accessed 22 September 2020).
117. Cevik, M.; Marcus, J.; Buckee, C.; Smith, T., SARS-CoV-2 transmission dynamics should inform policy. *Available at SSRN 3692807* **2020**.
118. Cevik, M.; Tate, M.; Lloyd, O.; Maraolo, A. E.; Schafers, J.; Ho, A., SARS-CoV-2, SARS-CoV, and MERS-CoV viral load dynamics, duration of viral shedding, and infectiousness: a systematic review and meta-analysis. *The Lancet Microbe* **2020**. [https://doi.org/10.1016/S2666-5247\(20\)30172-5](https://doi.org/10.1016/S2666-5247(20)30172-5)
119. Chan, J. F.-W.; Yuan, S.; Kok, K.-H.; To, K. K.-W.; Chu, H.; Yang, J.; Xing, F.; Liu, J.; Yip, C. C.-Y.; Poon, R. W.-S.; Tsoi, H.-W.; Lo, S. K.-F.; Chan, K.-H.; Poon, V. K.-M.; Chan, W.-M.; Ip, J. D.; Cai, J.-P.; Cheng, V. C.-C.; Chen, H.; Hui, C. K.-M.; Yuen, K.-Y., A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. *The Lancet* **2020**. <https://www.sciencedirect.com/science/article/pii/S0140673620301549>
120. Chan, J. F.; Zhang, A. J.; Yuan, S.; Poon, V. K.; Chan, C. C.; Lee, A. C.; Chan, W. M.; Fan, Z.; Tsoi, H. W.; Wen, L.; Liang, R.; Cao, J.; Chen, Y.; Tang, K.; Luo, C.; Cai, J. P.; Kok, K. H.; Chu, H.; Chan, K. H.; Sridhar, S.; Chen, Z.; Chen, H.; To, K. K.; Yuen, K. Y., Simulation of the clinical and pathological manifestations of Coronavirus Disease 2019 (COVID-19) in golden Syrian hamster model: implications for disease pathogenesis and transmissibility. *Clin Infect Dis* **2020**. <https://www.ncbi.nlm.nih.gov/pubmed/32215622>
121. Chande, A. T.; Gussler, W.; Harris, M.; Lee, S.; Rishishwar, L.; Jordan, I. K.; Andris, C. M.; Weitz, J. S., Interactive COVID-19 Event Risk Assessment Planning Tool. <http://covid19risk.biosci.gatech.edu/>.
122. Chandrashekar, A.; Liu, J.; Martinot, A. J.; McMahan, K.; Mercado, N. B.; Peter, L.; Tostanoski, L. H.; Yu, J.; Maliga, Z.; Nekorchuk, M.; Busman-Sahay, K.; Terry, M.; Wrijil, L. M.; Ducat, S.; Martinez, D. R.; Atyeo, C.; Fischinger, S.; Burke, J. S.; Slein, M. D.; Pessaint, L.; Van Ry, A.; Greenhouse, J.; Taylor, T.; Blade, K.; Cook, A.; Finneyfrock, B.; Brown, R.; Teow, E.; Velasco, J.; Zahn, R.; Wegmann, F.; Abbink, P.; Bondzie, E. A.; Dagotto, G.; Gebre, M. S.; He, X.; Jacob-Dolan, C.; Kordana, N.; Li, Z.; Lifton, M. A.; Mahrokhian, S. H.; Maxfield, L. F.; Nityanandam, R.; Nkolola, J. P.; Schmidt, A. G.; Miller, A. D.; Baric, R. S.; Alter, G.; Sorger, P. K.; Estes, J. D.; Andersen, H.; Lewis, M. G.; Barouch, D. H., SARS-CoV-2 infection protects against rechallenge in rhesus macaques. *Science* **2020**, eabc4776. <https://science.sciencemag.org/content/sci/early/2020/05/19/science.abc4776.full.pdf>
123. Chang, S.; Pierson, E.; Koh, P. W.; Gerardin, J.; Redbird, B.; Grusky, D.; Leskovec, J., Mobility network models of COVID-19 explain inequities and inform reopening. *Nature* **2020**. <https://doi.org/10.1038/s41586-020-2923-3>
124. Changzheng, L. J. L., Experts in the medical treatment team: Wuhan's unexplained viral pneumonia patients can be controlled more. <https://www.cn-healthcare.com/article/20200110/content-528579.html>.
125. Chen, C.; Cao, M.; Peng, L.; Guo, X.; Yang, F.; Wu, W.; Chen, L.; Yang, Y.; Liu, Y.; Wang, F., Coronavirus Disease-19 Among Children Outside Wuhan, China. *SSRN* **2020**. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3546071
126. Chen, Q.; Song, Y.; Wang, L.; Zhang, Y.; Han, L.; Liu, J.; Yang, M.; Ma, J.; Wang, T., Corticosteroids treatment in severe patients with COVID-19: a propensity score matching study. *Expert Rev Respir Med* **2020**.
127. Cheng, H.-Y.; Jian, S.-W.; Liu, D.-P.; Ng, T.-C.; Huang, W.-T.; Lin, H.-H.; Team, f. t. T. C.-O. I., Contact Tracing Assessment of COVID-19 Transmission Dynamics in Taiwan and Risk at Different Exposure Periods Before and After Symptom Onset. *JAMA Internal Medicine* **2020**. <https://doi.org/10.1001/jamainternmed.2020.2020>

128. Chhatwal, J.; Ayer, T.; Linas, B. P. D., O. O.; Mueller, P.; Adey, M.; Ladd, M. A.; Xiao, J. Y. X., COVID-19. <https://www.covid19sim.org/>.
129. Chin, A.; Chu, J.; Perera, M.; Hui, K.; Yen, H.-L.; Chan, M.; Peiris, M.; Poon, L., Stability of SARS-CoV-2 in different environmental conditions. *medRxiv* **2020**, 2020.03.15.20036673. <https://www.medrxiv.org/content/medrxiv/early/2020/03/27/2020.03.15.20036673.full.pdf>
130. Chin, A. W. H.; Chu, J. T. S.; Perera, M. R. A.; Hui, K. P. Y.; Yen, H.-L.; Chan, M. C. W.; Peiris, M.; Poon, L. L. M., Stability of SARS-CoV-2 in different environmental conditions. *The Lancet Microbe* **2020**, *1* (1), e10. [https://doi.org/10.1016/S2666-5247\(20\)30003-3](https://doi.org/10.1016/S2666-5247(20)30003-3)
131. Chin, A. W. H.; Chu, J. T. S.; Perera, M. R. A.; Hui, K. P. Y.; Yen, H.-L.; Chan, M. C. W.; Peiris, M.; Poon, L. L. M., Stability of SARS-CoV-2 in different environmental conditions. *The Lancet Microbe*. [https://doi.org/10.1016/S2666-5247\(20\)30003-3](https://doi.org/10.1016/S2666-5247(20)30003-3)
132. Choe, P. G.; Kang, C. K.; Suh, H. J.; Jung, J.; Kang, E.; Lee, S. Y.; Song, K.-H.; Kim, H. B.; Kim, N. J.; Park, W. B.; Kim, E. S.; Oh, M.-d., Antibody Responses to SARS-CoV-2 at 8 Weeks Postinfection in Asymptomatic Patients. *Emerging Infectious Disease journal* **2020**, *26* (10), 2484. https://wwwnc.cdc.gov/eid/article/26/10/20-2211_article
133. Choi, E.; Chu, D. K. W.; Cheng, P. K. C.; Tsang, D. N. C.; Peiris, M.; Bausch, D.; Poon, L. L. M.; Watson-Jones, D., In-Flight Transmission of Severe Acute Respiratory Syndrome Coronavirus 2. *Emerging Infectious Disease journal* **2020**, *26* (11). https://wwwnc.cdc.gov/eid/article/26/11/20-3254_article
134. Christensen, B.; Favalaro, E. J.; Lippi, G.; Van Cott, E. M., Hematology Laboratory Abnormalities in Patients with Coronavirus Disease 2019 (COVID-19). *Semin Thromb Hemost* **2020**, (EFirst).
135. Chu, D. K.; Akl, E. A.; Duda, S.; Solo, K.; Yaacoub, S.; Schünemann, H. J.; Chu, D. K.; Akl, E. A.; El-harakeh, A.; Bognanni, A.; Lotfi, T.; Loeb, M.; Hajizadeh, A.; Bak, A.; Izcovich, A.; Cuello-Garcia, C. A.; Chen, C.; Harris, D. J.; Borowiack, E.; Chamseddine, F.; Schünemann, F.; Morgano, G. P.; Muti Schünemann, G. E. U.; Chen, G.; Zhao, H.; Neumann, I.; Chan, J.; Khabsa, J.; Hneiny, L.; Harrison, L.; Smith, M.; Rizk, N.; Giorgi Rossi, P.; AbiHanna, P.; El-khoury, R.; Stalteri, R.; Baldeh, T.; Piggott, T.; Zhang, Y.; Saad, Z.; Khamis, A.; Reinap, M.; Duda, S.; Solo, K.; Yaacoub, S.; Schünemann, H. J., Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. *The Lancet* **2020**. [https://doi.org/10.1016/S0140-6736\(20\)31142-9](https://doi.org/10.1016/S0140-6736(20)31142-9)
136. Clapp, P. W.; Sickbert-Bennett, E. E.; Samet, J. M.; Berntsen, J.; Zeman, K. L.; Anderson, D. J.; Weber, D. J.; Bennett, W. D.; Control, U. C. f. D.; Program, P. E., Evaluation of Cloth Masks and Modified Procedure Masks as Personal Protective Equipment for the Public During the COVID-19 Pandemic. *JAMA Internal Medicine* **2020**. <https://doi.org/10.1001/jamainternmed.2020.8168>
137. Clark, K. E. N.; Collas, O.; Lachmann, H.; Singh, A.; Buckley, J.; Bhagani, S., Safety of intravenous Anakinra in COVID-19 with evidence of hyperinflammation, a case series. *Rheumatology Advances in Practice* **2020**. <https://doi.org/10.1093/rap/rkaa040>
138. Clean Flow, Clean Flow Healthcare Mini. https://cleanworkscorp.com/wp-content/uploads/2020/04/Clean_Works_Healthcare_Mini.pdf (accessed 09 Nov 2020).
139. Clift, A. K.; Coupland, C. A. C.; Keogh, R. H.; Hemingway, H., COVID-19 Mortality Risk in Down Syndrome: Results From a Cohort Study Of 8 Million Adults. *Annals of Internal Medicine* **2020**, *0* (0), null. <https://www.acpjournals.org/doi/abs/10.7326/M20-4986>
140. Clover, A Controlled Phase 2/3 Study of Adjuvanted Recombinant SARS-CoV-2 Trimeric S-protein Vaccine (SCB-2019) for the Prevention of COVID-19 (SCB-2019). <https://clinicaltrials.gov/ct2/show/NCT04672395>.
141. Cockrell, A. S.; Yount, B. L.; Scobey, T.; Jensen, K.; Douglas, M.; Beall, A.; Tang, X.-C.; Marasco, W. A.; Heise, M. T.; Baric, R. S., A mouse model for MERS coronavirus-induced acute respiratory distress syndrome. *Nature microbiology* **2016**, *2* (2), 1-11.

142. Cohen, J., Mining coronavirus genomes for clues to the outbreak's origins. *Science* 2020. <https://www.sciencemag.org/news/2020/01/mining-coronavirus-genomes-clues-outbreak-s-origins>
143. Cohen, J., Wuhan seafood market may not be source of novel virus spreading globally. <https://www.sciencemag.org/news/2020/01/wuhan-seafood-market-may-not-be-source-novel-virus-spreading-globally> (accessed 01/27/2020).
144. Control, E. C. f. D. P. a., Rapid Risk Assessment: Detection of new SARS-CoV-2 variants related to mink. *European Centre for Disease Prevention and Control* 2020. <https://www.ecdc.europa.eu/en/publications-data/detection-new-sars-cov-2-variants-mink?ftag=MSF0951a18>
145. Costa, V. d. O.; de Almeida, G. B. C.; Nicolini, E. M.; Rodrigues, G. d. A.; da Costa, B. M. A.; Carvalho, G. H.; dos Reis, Á. L. S.; Colen, D. P., Acute arterial occlusion of the lower limb as the main clinical manifestation in a patient with Covid-19 – Case Report. *International Journal of Surgery Case Reports* 2020, 77, 454-458. <http://www.sciencedirect.com/science/article/pii/S2210261220310695>
146. Courtemanche, C.; Garuccio, J.; Le, A.; Pinkston, J.; Yelowitz, A., Strong Social Distancing Measures In The United States Reduced The COVID-19 Growth Rate. *Health Affairs* 2020, 10.1377/hlthaff.2020.00608. <https://doi.org/10.1377/hlthaff.2020.00608>
147. Coutard, B.; Valle, C.; de Lamballerie, X.; Canard, B.; Seidah, N.; Decroly, E., The spike glycoprotein of the new coronavirus 2019-nCoV contains a furin-like cleavage site absent in CoV of the same clade. *Antiviral research* 2020, 176, 104742.
148. CureVac, A Study to Determine the Safety and Efficacy of SARS-CoV-2 mRNA Vaccine CVnCoV in Adults. <https://clinicaltrials.gov/ct2/show/NCT04652102>.
149. Cutts, T.; Kasloff, S.; Safronetz, D.; Krishnan, J., Decontamination of Common Healthcare Facility Surfaces Contaminated with SARS-CoV-2 using Peracetic Acid Dry Fogging. *bioRxiv* 2020, 2020.12.04.412585. <https://www.biorxiv.org/content/biorxiv/early/2020/12/07/2020.12.04.412585.full.pdf>
150. da Rosa Mesquita, R.; Francelino Silva Junior, L. C.; Santos Santana, F. M.; Farias de Oliveira, T.; Campos Alcântara, R.; Monteiro Arnozo, G.; Rodrigues da Silva Filho, E.; Galdino dos Santos, A. G.; Oliveira da Cunha, E. J.; Salgueiro de Aquino, S. H.; Freire de Souza, C. D., Clinical manifestations of COVID-19 in the general population: systematic review. *Wiener klinische Wochenschrift* 2020. <https://doi.org/10.1007/s00508-020-01760-4>
151. Damas, J.; Hughes, G. M.; Keough, K. C.; Painter, C. A.; Persky, N. S.; Corbo, M.; Hiller, M.; Koepfli, K.-P.; Pfenning, A. R.; Zhao, H.; Genereux, D. P.; Swofford, R.; Pollard, K. S.; Ryder, O. A.; Nweeia, M. T.; Lindblad-Toh, K.; Teeling, E. C.; Karlsson, E. K.; Lewin, H. A., Broad host range of SARS-CoV-2 predicted by comparative and structural analysis of ACE2 in vertebrates. *Proceedings of the National Academy of Sciences* 2020, 202010146. <https://www.pnas.org/content/pnas/early/2020/08/20/2010146117.full.pdf>
152. Dasgupta, S.; Bowen, V. B. L., A.; al., e., Association Between Social Vulnerability and a County's Risk for Becoming a COVID-19 Hotspot — United States, June 1–July 25, 2020. *Morbidity and Mortality Weekly Report* 2020, 2020 (69), 1535-1541. <https://www.cdc.gov/mmwr/volumes/69/wr/mm6942a3.htm>
153. Dattner, I.; Goldberg, Y.; Katriel, G.; Yaari, R.; Gal, N.; Miron, Y.; Ziv, A.; Sheffer, R.; Hamo, Y.; Huppert, A., The role of children in the spread of COVID-19: Using household data from Bnei Brak, Israel, to estimate the relative susceptibility and infectivity of children. *medRxiv* 2020, 2020.06.03.20121145. <https://www.medrxiv.org/content/medrxiv/early/2020/10/11/2020.06.03.20121145.full.pdf>
154. Davies, A.; Thompson, K. A.; Giri, K.; Kafatos, G.; Walker, J.; Bennett, A., Testing the efficacy of homemade masks: would they protect in an influenza pandemic? *Disaster Med Public Health Prep* 2013, 7 (4), 413-8. <https://www.ncbi.nlm.nih.gov/pubmed/24229526>
155. De Albuquerque, N.; Baig, E.; Ma, X.; Zhang, J.; He, W.; Rowe, A.; Habal, M.; Liu, M.; Shalev, I.; Downey, G. P.; Gorczynski, R.; Butany, J.; Leibowitz, J.; Weiss, S. R.; McGilvray, I. D.; Phillips, M. J.; Fish, E.

- N.; Levy, G. A., Murine hepatitis virus strain 1 produces a clinically relevant model of severe acute respiratory syndrome in A/J mice. *J Virol* **2006**, *80* (21), 10382-94.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1641767/pdf/0747-06.pdf>
156. de Haan, C. A. M.; Haijema, B. J.; Schellen, P.; Schreur, P. W.; te Lintelo, E.; Vennema, H.; Rottier, P. J. M., Cleavage of Group 1 Coronavirus Spike Proteins: How Furin Cleavage Is Traded Off against Heparan Sulfate Binding upon Cell Culture Adaptation. *Journal of Virology* **2008**, *82* (12), 6078-6083.
<https://jvi.asm.org/content/jvi/82/12/6078.full.pdf>
157. de Vries, R. D.; Schmitz, K. S.; Bovier, F. T.; Noack, D.; Haagmans, B. L.; Biswas, S.; Rockx, B.; Gellman, S. H.; Alabi, C. A.; de Swart, R. L.; Moscona, A.; Porotto, M., Intranasal fusion inhibitory lipopeptide prevents direct contact SARS-CoV-2 transmission in ferrets. *bioRxiv* **2020**, 2020.11.04.361154.
<https://www.biorxiv.org/content/biorxiv/early/2020/11/05/2020.11.04.361154.full.pdf>
158. Dediego, M. L.; Pewe, L.; Alvarez, E.; Rejas, M. T.; Perlman, S.; Enjuanes, L., Pathogenicity of severe acute respiratory coronavirus deletion mutants in hACE-2 transgenic mice. *Virology* **2008**, *376* (2), 379-389. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2810402/>
159. Degeys, N. F.; Wang, R. C.; Kwan, E.; Fahimi, J.; Noble, J. A.; Raven, M. C., Correlation Between N95 Extended Use and Reuse and Fit Failure in an Emergency Department. *JAMA* **2020**.
<https://doi.org/10.1001/jama.2020.9843>
160. Delahoy, M. J.; Whitaker, M.; O'Halloran, A.; et al., Characteristics and Maternal and Birth Outcomes of Hospitalized Pregnant Women with Laboratory-Confirmed COVID-19 — COVID-NET, 13 States, March 1–August 22, 2020. *Morbidity and Mortality Weekly Report* **2020**, *ePub*: 16 September 2020. https://www.cdc.gov/mmwr/volumes/69/wr/mm6938e1.htm?s_cid=mm6938e1_w
161. Demichev, V.; Tober-Lau, P.; Nazarenko, T.; Thibeault, C.; Whitwell, H.; Lemke, O.; Röhl, A.; Freiwald, A.; Szyrwiel, L.; Ludwig, D.; Correia-Melo, C.; Helbig, E. T.; Stubbemann, P.; Grüning, N.-M.; Blyuss, O.; Vernardis, S.; White, M.; Messner, C. B.; Joannidis, M.; Sonnweber, T.; Klein, S. J.; Pizzini, A.; Wohlfarter, Y.; Sahanic, S.; Hilbe, R.; Schaefer, B.; Wagner, S.; Mittermaier, M.; Machleidt, F.; Garcia, C.; Ruwwe-Glösenkamp, C.; Lingscheid, T.; de Jarcy, L. B.; Stegemann, M. S.; Pfeiffer, M.; Jürgens, L.; Denker, S.; Zickler, D.; Enghard, P.; Zelezniak, A.; Campbell, A.; Hayward, C.; Porteous, D. J.; Marionni, R. E.; Uhrig, A.; Müller-Redetzky, H.; Zoller, H.; Löffler-Ragg, J.; Keller, M. A.; Tancevski, I.; Timms, J. F.; Zaikin, A.; Hippenstiel, S.; Ramharter, M.; Witzernath, M.; Suttorp, N.; Lilley, K.; Müllleder, M.; Sander, L. E.; Ralser, M.; Kurth, F., A time-resolved proteomic and diagnostic map characterizes COVID-19 disease progression and predicts outcome. *medRxiv* **2020**, 2020.11.09.20228015.
<https://www.medrxiv.org/content/medrxiv/early/2020/11/12/2020.11.09.20228015.full.pdf>
162. Denas, G.; Gennaro, N.; Ferroni, E.; Fedeli, U.; Lorenzoni, G.; Gregori, D.; Iliceto, S.; Pengo, V., Reduction in all-cause mortality in COVID-19 patients on chronic oral anticoagulation: A population-based propensity score matched study. *Int J Cardiol* **2020**.
<https://www.sciencedirect.com/science/article/pii/S0167527320342728?via%3Dihub>
163. Deng, W.; Bao, L.; Gao, H.; Xiang, Z.; Qu, Y.; Song, Z.; Gong, S.; Liu, J.; Liu, J.; Yu, P.; Qi, F.; Xu, Y.; Li, F.; Xiao, C.; Lv, Q.; Xue, J.; Wei, Q.; Liu, M.; Wang, G.; Wang, S.; Yu, H.; Chen, T.; Liu, X.; Zhao, W.; Han, Y.; Qin, C., Ocular conjunctival inoculation of SARS-CoV-2 can cause mild COVID-19 in rhesus macaques. *Nature Communications* **2020**, *11* (1), 4400. <https://doi.org/10.1038/s41467-020-18149-6>
164. Deng, W.; Bao, L.; Gao, H.; Xiang, Z.; Qu, Y.; Song, Z.; Gong, S.; Liu, J.; Liu, J.; Yu, P.; Qi, F.; Xu, Y.; Li, F.; Xiao, C.; Lv, Q.; Xue, J.; Wei, Q.; Liu, M.; Wang, G.; Wang, S.; Yu, H.; Liu, X.; Zhao, W.; Han, Y.; Qin, C., Ocular conjunctival inoculation of SARS-CoV-2 can cause mild COVID-19 in Rhesus macaques. *bioRxiv* **2020**.
165. Deng, W.; Bao, L.; Liu, J.; Xiao, C.; Liu, J.; Xue, J.; Lv, Q.; Qi, F.; Gao, H.; Yu, P.; Xu, Y.; Qu, Y.; Li, F.; Xiang, Z.; Yu, H.; Gong, S.; Liu, M.; Wang, G.; Wang, S.; Song, Z.; Liu, Y.; Zhao, W.; Han, Y.; Zhao, L.; Liu, X.; Wei, Q.; Qin, C., Primary exposure to SARS-CoV-2 protects against reinfection in rhesus macaques.

Science **2020**, eabc5343.

<https://science.sciencemag.org/content/sci/early/2020/07/01/science.abc5343.full.pdf>

166. Dentali, F.; Sironi, A. P.; Ageno, W.; Turato, S.; Bonfanti, C.; Frattini, F.; Crestani, S.; Franchini, M., In *Non-O blood type is the commonest genetic risk factor for VTE: results from a meta-analysis of the literature*, Seminars in thrombosis and hemostasis, Thieme Medical Publishers: 2012; pp 535-548.

167. Dequin, P. F.; Heming, N.; Meziani, F.; Plantefève, G.; Voiriot, G.; Badié, J.; François, B.; Aubron, C.; Ricard, J. D.; Ehrmann, S.; Jouan, Y.; Guillon, A.; Leclerc, M.; Coffre, C.; Bourgoin, H.; Lengellé, C.; Caille-Fénérol, C.; Tavernier, E.; Zohar, S.; Giraudeau, B.; Annane, D.; Le Gouge, A., Effect of Hydrocortisone on 21-Day Mortality or Respiratory Support Among Critically Ill Patients With COVID-19: A Randomized Clinical Trial. *Jama* **2020**. <https://jamanetwork.com/journals/jama/fullarticle/2770276>

168. DHS, Estimated Airborne Decay of SARS-CoV-2. <https://www.dhs.gov/science-and-technology/sars-airborne-calculator>.

169. DHS, Estimated Natural Decay of SARS-CoV-2 (virus that causes COVID-19) on surfaces under a range of temperatures and relative humidity. <https://www.dhs.gov/science-and-technology/sars-calculator>.

170. DHS, *Low-Cost Decontamination of N95 Respirators*; Department of Homeland Security Science & Technology Directorate: 2020.

https://www.dhs.gov/sites/default/files/publications/multicooker_n95_decontamination_factsheet_v9_2020_06_15.pdf

171. Ding, X.; Yin, K.; Li, Z.; Lalla, R. V.; Ballesteros, E.; Sfeir, M. M.; Liu, C., Ultrasensitive and visual detection of SARS-CoV-2 using all-in-one dual CRISPR-Cas12a assay. *Nature Communications* **2020**, *11* (1), 4711. <https://doi.org/10.1038/s41467-020-18575-6>

172. Doi, Y.; Hibino, M.; Hase, R.; Yamamoto, M.; Kasamatsu, Y.; Hirose, M.; Mutoh, Y.; Homma, Y.; Terada, M.; Ogawa, T.; Kashizaki, F.; Yokoyama, T.; Koba, H.; Kasahara, H.; Yokota, K.; Kato, H.; Yoshida, J.; Kita, T.; Kato, Y.; Kamio, T.; Kodama, N.; Uchida, Y.; Ikeda, N.; Shinoda, M.; Nakagawa, A.; Nakatsumi, H.; Horiguchi, T.; Iwata, M.; Matsuyama, A.; Banno, S.; Koseki, T.; Teramachi, M.; Miyata, M.; Tajima, S.; Maeki, T.; Nakayama, E.; Taniguchi, S.; Lim, C. K.; Saijo, M.; Imai, T.; Yoshida, H.; Kabata, D.; Shintani, A.; Yuzawa, Y.; Kondo, M., A prospective, randomized, open-label trial of early versus late favipiravir in hospitalized patients with COVID-19. *Antimicrob Agents Chemother* **2020**.

173. Dollard, P.; Griffin, I.; Berro, A.; al., e., Risk Assessment and Management of COVID-19 Among Travelers Arriving at Designated U.S. Airports, January 17–September 13, 2020. *Morbidity and Mortality Weekly Report* **2020**, *2020* (69), 1681-1685.

<https://www.cdc.gov/mmwr/volumes/69/wr/mm6945a4.htm>

174. Dong, Y.; Mo, X.; Hu, Y.; Qi, X.; Jiang, F.; Jiang, Z.; Tong, S., Epidemiological Characteristics of 2143 Pediatric Patients With 2019 Coronavirus Disease in China. *Pediatrics* **2020**, e20200702.

<https://pediatrics.aappublications.org/content/pediatrics/early/2020/03/16/peds.2020-0702.full.pdf>

175. Dooling, K., Phased Allocation of COVID-19 Vaccines.

<https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2020-12/slides-12-20/02-COVID-Dooling.pdf>.

176. Doung-Ngern, P.; Suphanchaimat, R.; Panjangampathana, A.; Janekrongtham, C.; Ruampoom, D.; Daochaeng, N.; Eungkanit, N.; Pisitpayat, N.; Srisong, N.; Yasopa, O.; Plernprom, P.; Promduangsi, P.; Kumphon, P.; Suangtho, P.; Watakulsin, P.; Chaiya, S.; Kripattanapong, S.; Chantian, T.; Bloss, E.; Namwat, C.; Limmathurotsakul, D., Case-Control Study of Use of Personal Protective Measures and Risk for Severe Acute Respiratory Syndrome Coronavirus 2 Infection, Thailand. *Emerg Infect Dis* **2020**, *26* (11).

177. Du, Z.; Xu, X.; Wang, L.; Fox, S. J.; Cowling, B. J.; Galvani, A. P.; Meyers, L. A., Effects of Proactive Social Distancing on COVID-19 Outbreaks in 58 Cities, China. *Emerg Infect Dis* **2020**, *26* (9).

178. Du, Z.; Xu, X.; Wu, Y.; Wang, L.; Cowling, B. J.; Meyers, L. A., COVID-19 serial interval estimates based on confirmed cases in public reports from 86 Chinese cities. *medRxiv* **2020**, 2020.04.23.20075796. <https://www.medrxiv.org/content/medrxiv/early/2020/04/27/2020.04.23.20075796.full.pdf>
179. Du, Z.; Xu, X.; Wu, Y.; Wang, L.; Cowling, B. J.; Meyers, L. A., The serial interval of COVID-19 from publicly reported confirmed cases. *medRxiv* **2020**, 2020.02.19.20025452. <https://www.medrxiv.org/content/medrxiv/early/2020/03/13/2020.02.19.20025452.full.pdf>
180. Dufort, E. M.; Koumans, E. H.; Chow, E. J.; Rosenthal, E. M.; Muse, A.; Rowlands, J.; Barranco, M. A.; Maxted, A. M.; Rosenberg, E. S.; Easton, D.; Udo, T.; Kumar, J.; Pulver, W.; Smith, L.; Hutton, B.; Blog, D.; Zucker, H., Multisystem Inflammatory Syndrome in Children in New York State. *New England Journal of Medicine* **2020**, *383* (4), 347-358. <https://www.nejm.org/doi/full/10.1056/NEJMoa2021756>
181. Dunker, S.; Hornick, T.; Szczepankiewicz, G.; Maier, M.; Bastl, M.; Bumberger, J.; Treudler, R.; Liebert, U. G.; Simon, J.-C., No SARS-CoV-2 detected in air samples (pollen and particulate matter) in Leipzig during the first spread. *Science of The Total Environment* **2020**, 142881. <http://www.sciencedirect.com/science/article/pii/S0048969720364111>
182. Dzien, C.; Halder, W.; Winner, H.; Lechleitner, M., Covid-19 screening: are forehead temperature measurements during cold outdoor temperatures really helpful? *Wiener Klinische Wochenschrift* **2020**, 1-5. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7582437/>
183. ECDC, *Rapid increase of a SARS-CoV-2 variant with multiple spike protein mutations observed in the United Kingdom* European Centre for Disease Prevention and Control: 20 December 2020, 2020. <https://www.ecdc.europa.eu/sites/default/files/documents/SARS-CoV-2-variant-multiple-spike-protein-mutations-United-Kingdom.pdf>
184. Edridge, A. W. D.; Kaczorowska, J.; Hoste, A. C. R.; Bakker, M.; Klein, M.; Jebbink, M. F.; Matser, A.; Kinsella, C. M.; Rueda, P.; Prins, M.; Sastre, P.; Deijs, M.; Hoek, L. v. d., Coronavirus protective immunity is short-lasting *Pre-print* **2020**. <https://www.medrxiv.org/content/10.1101/2020.05.11.20086439v2.full.pdf>
185. Eikenberry, S. E.; Mancuso, M.; Iboi, E.; Phan, T.; Eikenberry, K.; Kuang, Y.; Kostelich, E.; Gumel, A. B., To mask or not to mask: Modeling the potential for face mask use by the general public to curtail the COVID-19 pandemic. *Infectious Disease Modelling* **2020**.
186. Ellume Health, FDA Authorizes Ellume COVID-19 Home Test as First Over-the-Counter Fully At-Home Diagnostic Test. <https://www.globenewswire.com/news-release/2020/12/15/2145612/0/en/FDA-Authorizes-Ellume-COVID-19-Home-Test-as-First-Over-the-Counter-Fully-At-Home-Diagnostic-Test.html> (accessed 16 Dec 2020).
187. Endeman, H.; van der Zee, P.; van Genderen, M. E.; van den Akker, J. P. C.; Gommers, D., Progressive respiratory failure in COVID-19: a hypothesis. *The Lancet Infectious Diseases* **2020**. [https://doi.org/10.1016/S1473-3099\(20\)30366-2](https://doi.org/10.1016/S1473-3099(20)30366-2)
188. Endo, A.; Abbott, S.; Kucharski, A.; Funk, S., Estimating the overdispersion in COVID-19 transmission using outbreak sizes outside China [version 1; peer review: 1 approved, 1 approved with reservations]. *Wellcome Open Research* **2020**, *5* (67). <https://wellcomeopenresearch.org/articles/5-67/v1>
189. Environmental Protection Agency (EPA), List N: Disinfectants for Use Against SARS-CoV-2 (COVID-19). <https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2-covid-19> (accessed 21 Sept 2020).
190. Environmental Protection Agency (EPA), Section 18 Emergency Exemption Requests and Coronavirus (COVID-19). <https://www.epa.gov/pesticide-registration/section-18-emergency-exemption-requests-and-coronavirus-covid-19> (accessed 31 August 2020).
191. Eythorsson, E.; Helgason, D.; Ingvarsson, R. F.; Bjornsson, H. K.; Olafsdottir, L. B.; Bjarnadottir, V.; Runolfsson, H. L.; Bjarnadottir, S.; Agustsson, A. S.; Oskarsdottir, K.; Thorvaldsson, H. H.; Kristjansdottir, G.; Armannsdottir, B.; Bjarnason, A.; Johannsson, B.; Gudlaugsson, O.; Gottfredsson, M.; Sigurdsson, M. I.; Indridason, O. S.; Palsson, R., Clinical spectrum of coronavirus disease 2019 in Iceland:

- population based cohort study. *BMJ* **2020**, *371*, m4529.
<https://www.bmj.com/content/bmj/371/bmj.m4529.full.pdf>
192. Fabre Estremera, M.; Ruiz-Martinez, S.; Monserrat, M. E.; Cortizo Garrido, S.; Beunza Fabra, Z.; PerÄn, M.; Benito, R.; Mateo, P.; Paules, C.; OrÃ³s, D., EXPRESS: SARS-CoV-2 immunochromatographic IgM/IgG rapid test in pregnancy: a false friend? *Annals of Clinical Biochemistry* **2020**, 0004563220980495. <https://doi.org/10.1177/0004563220980495>
193. Facchetti, F.; Bugatti, M.; Drera, E.; Tripodo, C.; Sartori, E.; Cancila, V.; Papaccio, M.; Castellani, R.; Casola, S.; Boniotti, M. B.; Cavadini, P.; Lavazza, A., SARS-CoV2 vertical transmission with adverse effects on the newborn revealed through integrated immunohistochemical, electron microscopy and molecular analyses of Placenta. *EBioMedicine* **2020**, *59*. <https://doi.org/10.1016/j.ebiom.2020.102951>
194. Fagre, A.; Lewis, J.; Eckley, M.; Zhan, S.; Rocha, S. M.; Sexton, N. R.; Burke, B.; Geiss, B. J.; Peersen, O.; Kading, R.; Rovnak, J.; Ebel, G. D.; Tjalkens, R. B.; Aboellail, T.; Schountz, T., SARS-CoV-2 infection, neuropathogenesis and transmission among deer mice: Implications for reverse zoonosis to New World rodents. *bioRxiv* **2020**, 2020.08.07.241810.
<http://biorxiv.org/content/early/2020/08/07/2020.08.07.241810.abstract>
195. FDA, Coronavirus (COVID-19) Update: FDA Authorizes First Test that Detects Neutralizing Antibodies from Recent or Prior SARS-CoV-2 Infection. Food and Drug Administration: 2020.
<https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-authorizes-first-test-detects-neutralizing-antibodies-recent-or>
196. FDA, Coronavirus (COVID-19) Update: FDA Revokes Emergency Use Authorization for Chloroquine and Hydroxychloroquine. U.S. Food and Drug Administration: 2020. <https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-revokes-emergency-use-authorization-chloroquine-and>
197. FDA, COVID-19 Update: FDA Broadens Emergency Use Authorization for Veklury (remdesivir) to Include All Hospitalized Patients for Treatment of COVID-19. Food and Drug Administration: 2020.
<https://www.fda.gov/news-events/press-announcements/covid-19-update-fda-broadens-emergency-use-authorization-veklury-remdesivir-include-all-hospitalized>
198. FDA, *Emergency Use Authorization*; Food and Drug Administration: 2020.
<https://www.fda.gov/media/136529/download>
199. FDA, FAQs on Shortages of Surgical Masks and Gowns. <https://www.fda.gov/medical-devices/personal-protective-equipment-infection-control/faqs-shortages-surgical-masks-and-gowns#kn95>.
200. FDA, FAQs on Testing for SARS-CoV-2. <https://www.fda.gov/medical-devices/emergency-situations-medical-devices/faqs-testing-sars-cov-2#nolonger>.
201. FDA, FDA Takes Additional Action in Fight Against COVID-19 By Issuing Emergency Use Authorization for Second COVID-19 Vaccine. <https://www.fda.gov/news-events/press-announcements/fda-takes-additional-action-fight-against-covid-19-issuing-emergency-use-authorization-second-covid>.
202. FDA, FDA Takes Key Action in Fight Against COVID-19 By Issuing Emergency Use Authorization for First COVID-19 Vaccine. <https://www.fda.gov/news-events/press-announcements/fda-takes-key-action-fight-against-covid-19-issuing-emergency-use-authorization-first-covid-19>.
203. FDA, Protective Barrier Enclosures Without Negative Pressure Used During the COVID-19 Pandemic May Increase Risk to Patients and Health Care Providers - Letter to Health Care Providers. Food and Drug Administration: 2020. <https://www.fda.gov/medical-devices/letters-health-care-providers/protective-barrier-enclosures-without-negative-pressure-used-during-covid-19-pandemic-may-increase>
204. FDA, Quest Diagnostics RC COVID-19 +Flu RT-PCR. <https://www.fda.gov/media/144180/download>.
205. FDA, Respirator Models Removed from Appendix A.
<https://www.fda.gov/media/137928/download> (accessed 05/15/2020).

206. FDA, U. S., FDA Approves First Treatment for COVID-19. 2020. <https://www.fda.gov/news-events/press-announcements/fda-approves-first-treatment-covid-19>
207. FDA, U. S., FDA Issues Emergency Use Authorization for Convalescent Plasma as Potential Promising COVID-19 Treatment, Another Achievement in Administration's Fight Against Pandemic. 2020. <https://www.fda.gov/news-events/press-announcements/fda-issues-emergency-use-authorization-convalescent-plasma-potential-promising-covid-19-treatment>
208. Fears, A.; Klimstra, W.; Duprex, P.; Hartman, A.; Weaver, S.; Plante, K.; Mirchandani, D.; Plante, J. A.; Aguilar, P.; Fernández, D.; Nalca, A.; Tatura, A.; Dyer, D.; Kearney, B.; Lackemeyer, M.; Bohannon, J. K.; Johnson, R.; Garry, R.; Reed, D.; Roy, C., Persistence of Severe Acute Respiratory Syndrome Coronavirus 2 in Aerosol Suspensions. *Emerging Infectious Disease journal* **2020**, *26* (9). https://wwwnc.cdc.gov/eid/article/26/9/20-1806_article
209. Feldman, O.; Meir, M.; Shavit, D.; Idelman, R.; Shavit, I., Exposure to a Surrogate Measure of Contamination From Simulated Patients by Emergency Department Personnel Wearing Personal Protective Equipment. *JAMA* **2020**. <https://doi.org/10.1001/jama.2020.6633>
210. Ferguson, N.; Laydon, D.; Nedjati-Gilani, G.; Imai, N.; Ainslie, K.; Baguelin, M.; Bhatia, S.; Boonyasiri, A.; Cucunuba, Z.; Cuomo-Dannenburg, G.; Dighe, A.; Dorigatti, I.; Fu, H.; Gaythorpe, K.; Green, W.; Hamlet, A.; Hinsley, W.; Okell, L.; van Elsland, S.; Thompson, H.; Verity, R.; Volz, E.; Wang, H.; Wang, Y.; Walker, P.; Walters, C.; Winskill, P.; Whittaker, C.; Donnelly, C.; Riley, S.; Ghani, A., *Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand*; 2020. <https://www.imperial.ac.uk/media/imperial-college/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-NPI-modelling-16-03-2020.pdf>
211. Figueiredo-Campos, P.; Blankenhaus, B.; Mota, C.; Gomes, A.; Serrano, M.; Ariotti, S.; Costa, C.; Nunes-Cabaço, H.; Mendes, A. M.; Gaspar, P.; Pereira-Santos, M. C.; Rodrigues, F.; Condeço, J.; Escoval, M. A.; Santos, M.; Ramirez, M.; Melo-Cristino, J.; Simas, J. P.; Vasconcelos, E.; Afonso, Â.; Veldhoen, M., Seroprevalence of anti-SARS-CoV-2 antibodies in COVID-19 patients and healthy volunteers up to six months post disease onset. *European Journal of Immunology* n/a (n/a). <https://onlinelibrary.wiley.com/doi/abs/10.1002/eji.202048970>
212. Fiolet, T.; Guihur, A.; Rebeaud, M.; Mulot, M.; Peiffer-Smadja, N.; Mahamat-Saleh, Y., Effect of hydroxychloroquine with or without azithromycin on the mortality of COVID-19 patients: a systematic review and meta-analysis. *Clinical Microbiology and Infection* **2020**. <http://www.sciencedirect.com/science/article/pii/S1198743X2030505X>
213. Firth, J. A.; Hellewell, J.; Klepac, P.; Kissler, S. M.; Group, C. C.-W.; Kucharski, A. J.; Spurgin, L. G., Combining fine-scale social contact data with epidemic modelling reveals interactions between contact tracing, quarantine, testing and physical distancing for controlling COVID-19. *Preprint* **2020**. https://cmmid.github.io/topics/covid19/reports/2020_05_25_firth_et_al_manuscript.pdf
214. Fischer, E. P.; Fischer, M. C.; Grass, D.; Henrion, I.; Warren, W. S.; Westman, E., Low-cost measurement of facemask efficacy for filtering expelled droplets during speech. *Science Advances* **2020**, *07 August 2020*.
215. Fischer, K. A.; Olson, S. M.; Tenforde, M. W.; al., e., Telerwork Before Illness Onset Among Symptomatic Adults Aged ≥ 18 Years With and Without COVID-19 in 11 Outpatient Health Care Facilities — United States, July 2020. *Morbidity and Mortality Weekly Report* **2020**, *2020* (69), 1648-1653. https://www.cdc.gov/mmwr/volumes/69/wr/mm6944a4.htm?s_cid=mm6944a4_w
216. Fischer, R.; Morris, D.; van Doremalen, N.; Sarchette, S.; Matson, M. J.; Bushmaker, T.; Yinda, C. K.; Seifert, S.; Gamble, A.; Williamson, B.; Judson, S.; de Wit, E.; Lloyd-Smith, J.; Munster, V., Effectiveness of N95 Respirator Decontamination and Reuse against SARS-CoV-2 Virus. *Emerging Infectious Disease journal* **2020**, *26* (9), 2253. https://wwwnc.cdc.gov/eid/article/26/9/20-1524_article
217. Fischer, R.; Morris, D. H.; van Doremalen, N.; Sarchette, S.; Matson, J.; Bushmaker, T.; Yinda, C. K.; Seifert, S.; Gamble, A.; Williamson, B.; Judson, S.; de Wit, E.; Lloyd-Smith, J.; Munster, V., Assessment of

- N95 respirator decontamination and re-use for SARS-CoV-2. *medRxiv* **2020**, 2020.04.11.20062018.
<https://www.medrxiv.org/content/medrxiv/early/2020/04/24/2020.04.11.20062018.full.pdf>
218. Fisher, D.; Reilly, A.; Zheng, A. K. E.; Cook, A. R.; Anderson, D. E., Seeding of outbreaks of COVID-19 by contaminated fresh and frozen food. *bioRxiv* **2020**, 2020.08.17.255166.
<https://www.biorxiv.org/content/biorxiv/early/2020/08/18/2020.08.17.255166.full.pdf>
219. Fisher, K. A., Factors associated with cloth face covering use among adults during the COVID-19 pandemic—United States, April and May 2020. *MMWR. Morbidity and Mortality Weekly Report* **2020**, *69*.
220. Fisher, K. A.; Tenforde, M. W.; Feldstein, L. R.; al., e., Community and Close Contact Exposures Associated with COVID-19 Among Symptomatic Adults ≥18 Years in 11 Outpatient Health Care Facilities — United States, July 2020. *Morbidity and Mortality Weekly Report* **2020**, *2020* (69), 1258-1264.
<https://www.cdc.gov/mmwr/volumes/69/wr/mm6936a5.htm>
221. Fisman, D. N.; Greer, A. L.; Tuite, A. R., Bidirectional impact of imperfect mask use on reproduction number of COVID-19: A next generation matrix approach. *Infectious Disease Modelling* **2020**, *5*, 405-408.
<http://www.sciencedirect.com/science/article/pii/S2468042720300191>
222. Fitzpatrick, J.; DeSalvo, K., Helping public health officials combat COVID-19. Google: 2020.
<https://www.blog.google/technology/health/covid-19-community-mobility-reports?hl=en>
223. Flahault, A.; Manetti, E.; Simonson, T.; Lee, G.; Choirat, C., COVID-19 Forecasting.
https://renkulab.shinyapps.io/COVID-19-Epidemic-Forecasting/_w_e0463e1e/#shiny-tab-about.
224. Flannery, D. D.; Gouma, S.; Dhudasia, M. B.; Mukhopadhyay, S.; Pfeifer, M. R.; Woodford, E. C.; Gerber, J. S.; Arevalo, C. P.; Bolton, M. J.; Weirick, M. E.; Goodwin, E. C.; Anderson, E. M.; Greenplate, A. R.; Kim, J.; Han, N.; Pattekar, A.; Dougherty, J.; Kuthuru, O.; Mathew, D.; Baxter, A. E.; Vella, L. A.; Weaver, J.; Verma, A.; Leite, R.; Morris, J. S.; Rader, D. J.; Elovitz, M. A.; Wherry, E. J.; Puopolo, K. M.; Hensley, S. E., SARS-CoV-2 seroprevalence among parturient women in Philadelphia. *Science Immunology* **2020**, *5* (49), eabd5709.
<https://immunology.sciencemag.org/content/immunology/5/49/eabd5709.full.pdf>
225. Flores-Alanis, A.; Sandner-Miranda, L.; Delgado, G.; Cravioto, A.; Morales-Espinosa, R., The receptor binding domain of SARS-CoV-2 spike protein is the result of an ancestral recombination between the bat-CoV RaTG13 and the pangolin-CoV MP789. *BMC Research Notes* **2020**, *13* (1), 398.
<https://doi.org/10.1186/s13104-020-05242-8>
226. Food and Drug Administration (FDA), Coronavirus (COVID-19) Update: December 16, 2020.
<https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-december-16-2020> (accessed 17 Dec 2020).
227. Food and Drug Administration (FDA), Coronavirus (COVID-19) Update: FDA Authorizes Antigen Test as First Over-the-Counter Fully At-Home Diagnostic Test for COVID-19. <https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-authorizes-antigen-test-first-over-counter-fully-home-diagnostic> (accessed 17 Dec 2020).
228. Food and Drug Administration (FDA), Coronavirus (COVID-19) Update: FDA Authorizes First COVID-19 Test for Self-Testing at Home. <https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-authorizes-first-covid-19-test-self-testing-home> (accessed 30 Nov 2020).
229. Food and Drug Administration (FDA), Coronavirus (COVID-19) Update: FDA Issues New Authorization for the BinaxNOW COVID-19 Ag Card Home Test. <https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-issues-new-authorization-binaxnow-covid-19-ag-card-home-test> (accessed 17 Dec 2020).
230. Food and Drug Administration (FDA), SARS-CoV-2 Reference Panel Comparative Data.
<https://www.fda.gov/medical-devices/coronavirus-covid-19-and-medical-devices/sars-cov-2-reference-panel-comparative-data> (accessed 28 Sept 2020).

231. Frank, S.; Brown, S. M.; Capriotti, J. A.; Westover, J. B.; Pelletier, J. S.; Tessema, B., In Vitro Efficacy of a Povidone-Iodine Nasal Antiseptic for Rapid Inactivation of SARS-CoV-2. *JAMA Otolaryngology–Head & Neck Surgery* **2020**. <https://doi.org/10.1001/jamaoto.2020.3053>
232. Fraser, D. D.; Slessarev, M.; Martin, C. M.; Daley, M.; Patel, M. A.; Miller, M. R.; Patterson, E. K.; O’Gorman, D. B.; Gill, S. E.; Wishart, D. S.; Mandal, R.; Cepinskas, G.; Team, O. b. o. t. L. C. S., Metabolomics Profiling of Critically Ill Coronavirus Disease 2019 Patients: Identification of Diagnostic and Prognostic Biomarkers. *Critical Care Explorations* **2020**, 2 (10), e0272. https://journals.lww.com/ccejournal/Fulltext/2020/10000/Metabolomics_Profiling_of_Critically_Ill.44.aspx
233. Freuling, C. M.; Breithaupt, A.; Müller, T.; Sehl, J.; Balkema-Buschmann, A.; Rissmann, M.; Klein, A.; Wylezich, C.; Höper, D.; Wernike, K.; Aebischer, A.; Hoffmann, D.; Friedrichs, V.; Dorhoi, A.; Groschup, M. H.; Beer, M.; Mettenleiter, T. C., Susceptibility of raccoon dogs for experimental SARS-CoV-2 infection. *bioRxiv* **2020**, 2020.08.19.256800. <http://biorxiv.org/content/early/2020/08/20/2020.08.19.256800.abstract>
234. FUJIFILM Toyama Chemical Co., L., Anti-influenza drug Avigan® Tablet Meets Primary Endpoint in Phase III Clinical Trial in Japan for COVID-19 patients. Fujifilm, 2020. <https://www.fujifilm.com/news/n200923.html>
235. Gaebler, C.; Wang, Z.; Lorenzi, J. C. C.; Muecksch, F.; Finkin, S.; Tokuyama, M.; Ladinsky, M.; Cho, A.; Jankovic, M.; Schaefer-Babajew, D.; Oliveira, T. Y.; Cipolla, M.; Viant, C.; Barnes, C. O.; Hurley, A.; Turroja, M.; Gordon, K.; Millard, K. G.; Ramos, V.; Schmidt, F.; Weisblum, Y.; Jha, D.; Tankelevich, M.; Yee, J.; Shmeliovich, I.; Robbiani, D. F.; Zhao, Z.; Gazumyan, A.; Hatziioannou, T.; Bjorkman, P. J.; Mehandru, S.; Bieniasz, P. D.; Caskey, M.; Nussenzweig, M. C., Evolution of Antibody Immunity to SARS-CoV-2. *bioRxiv* **2020**, 2020.11.03.367391. <https://www.biorxiv.org/content/biorxiv/early/2020/11/05/2020.11.03.367391.full.pdf>
236. Gallaway, M. S.; Rigler, J.; Robinson, S.; al., e., Trends in COVID-19 Incidence After Implementation of Mitigation Measures — Arizona, January 22–August 7, 2020. *Morbidity and Mortality Weekly Report* **2020**, 2020 (69), 1460-1463.
237. Gamaleya, SECOND INTERIM ANALYSIS OF CLINICAL TRIAL DATA SHOWED A 91.4% EFFICACY FOR THE SPUTNIK V VACCINE ON DAY 28 AFTER THE FIRST DOSE; VACCINE EFFICACY IS OVER 95% 42 DAYS AFTER THE FIRST DOSE. <https://sputnikvaccine.com/newsroom/pressreleases/second-interim-analysis-of-clinical-trial-data-showed-a-91-4-efficacy-for-the-sputnik-v-vaccine-on-d/>.
238. Gao, G.; Wang, A.; Wang, S.; Qian, F.; Chen, M.; Yu, F.; Zhang, J.; Wang, X.; Ma, X.; Zhao, T.; Zhang, F.; Chen, Z., A retrospective evaluation on the efficacy of Lopinavir/ritonavir and chloroquine to treat non-severe COVID-19 patients. *J Acquir Immune Defic Syndr* **2020**.
239. Garg, M.; Sharma, A. L.; Singh, S., Advancement in biosensors for inflammatory biomarkers of SARS-CoV-2 during 2019–2020. *Biosensors and Bioelectronics* **2021**, 171, 112703. <http://www.sciencedirect.com/science/article/pii/S0956566320306928>
240. Garg, S., Hospitalization Rates and Characteristics of Patients Hospitalized with Laboratory-Confirmed Coronavirus Disease 2019—COVID-NET, 14 States, March 1–30, 2020. *MMWR. Morbidity and Mortality Weekly Report* **2020**, 69.
241. Garvin, M. R.; Alvarez, C.; Miller, J. I.; Prates, E. T.; Walker, A. M.; Amos, B. K.; Mast, A. E.; Justice, A.; Aronow, B.; Jacobson, D., A mechanistic model and therapeutic interventions for COVID-19 involving a RAS-mediated bradykinin storm. *eLife* **2020**, 9, e59177. <https://doi.org/10.7554/eLife.59177>
242. Gasser, R.; Cloutier, M.; Prévost, J.; Fink, C.; Ducas, É.; Ding, S.; Dussault, N.; Landry, P.; Tremblay, T.; Laforce-Lavoie, A.; Lewin, A.; Beaudoin-Bussièrès, G.; Laumaea, A.; Medjahed, H.; Larochelle, C.; Richard, J.; Dekaban, G. A.; Dikeakos, J. D.; Bazin, R.; Finzi, A., Major role of IgM in the neutralizing activity of convalescent plasma against SARS-CoV-2. *bioRxiv* **2020**, 2020.10.09.333278. <https://www.biorxiv.org/content/biorxiv/early/2020/10/09/2020.10.09.333278.full.pdf>

243. Gatto, M.; Bertuzzo, E.; Mari, L.; Miccoli, S.; Carraro, L.; Casagrandi, R.; Rinaldo, A., Spread and dynamics of the COVID-19 epidemic in Italy: Effects of emergency containment measures. *Proceedings of the National Academy of Sciences* **2020**, 202004978.
<https://www.pnas.org/content/pnas/early/2020/04/22/2004978117.full.pdf>
244. Gendelman, O.; Amital, H.; Bragazzi, N. L.; Watad, A.; Chodick, G., Continuous hydroxychloroquine or colchicine therapy does not prevent infection with SARS-CoV-2: Insights from a large healthcare database analysis. *Autoimmunity Reviews* **2020**, 102566.
<http://www.sciencedirect.com/science/article/pii/S1568997220301282>
245. Giacomet, V.; Stracuzzi, M.; Paradiso, L.; Di Cosimo, M. E.; Rubinacci, V.; Zuccotti, G., Defining the clinical phenotype of COVID-19 in children. *Pediatric Allergy and Immunology* **2020**, 31 (S26), 82-84.
<https://onlinelibrary.wiley.com/doi/abs/10.1111/pai.13355>
246. GlobenNewswire, Delta 9 Develops Proprietary Decontamination Technology to Help Fight COVID-19 Pandemic. <https://www.globenewswire.com/news-release/2020/11/25/2134134/0/en/Delta-9-Develops-Proprietary-Decontamination-Technology-to-Help-Fight-COVID-19-Pandemic.html> (accessed 30 Nov 2020).
247. Godfred-Cato, S.; Bryant, B.; Leung, J.; Oster, M. E.; Conklin, L.; Abrams, J.; Roguski, K.; Wallace, B.; Prezzato, E.; Koumans, E. H.; Lee, E. H.; Geevarughese, A.; Lash, M. K.; Reilly, K. H.; Pulver, W. P.; Thomas, D.; Feder, K. A.; Hsu, K. K.; Pliapat, N.; Richardson, G.; Reid, H.; Lim, S.; Schmitz, A.; Pierce, T.; Hrapcak, S.; Datta, D.; Morris, S. B.; Clarke, K.; Belay, E.; Team, C. M.-C. R., COVID-19–Associated Multisystem Inflammatory Syndrome in Children — United States, March–July 2020.
https://www.cdc.gov/mmwr/volumes/69/wr/mm6932e2.htm?s_cid=mm6932e2_w.
248. Godoy, M., Mystery Inflammatory Syndrome In Kids And Teens Likely Linked To COVID-19. *NPR* 2020. <https://www.npr.org/sections/health-shots/2020/05/07/851725443/mystery-inflammatory-syndrome-in-kids-and-teens-likely-linked-to-covid-19>
249. Gold, J. A.; Rossen, L. M.; Ahmad, F. B.; al., e., Race, Ethnicity, and Age Trends in Persons Who Died from COVID-19 — United States, May–August 2020. *Morbidity and Mortality Weekly Report* **2020**, ePub: 16 October 2020. <https://www.cdc.gov/mmwr/volumes/69/wr/mm6942e1.htm>
250. Goldbaum, C., Is the Subway Risky? It May Be Safer Than You Think. *The New York Times* 2020. <https://www.nytimes.com/2020/08/02/nyregion/nyc-subway-coronavirus-safety.html>
251. Goldstein, E.; Lipsitch, M.; Cevik, M., On the Effect of Age on the Transmission of SARS-CoV-2 in Households, Schools, and the Community. *The Journal of Infectious Diseases* **2020**.
<https://doi.org/10.1093/infdis/jiaa691>
252. Golinelli, D.; Boetto, E.; Maietti, E.; Fantini, M. P., The association between ABO blood group and SARS-CoV-2 infection: A meta-analysis. *PLOS ONE* **2020**, 15 (9), e0239508.
<https://doi.org/10.1371/journal.pone.0239508>
253. Google, U.S. COVID-19 Public Forecasts. <https://datastudio.google.com/reporting/52f6e744-66c6-47aa-83db-f74201a7c4df/page/EfwUB?s=ou-b6M0HXag>.
254. Goren, A.; Vaño-Galván, S.; Wambier, C. G.; McCoy, J.; Gomez-Zubiaur, A.; Moreno-Arrones, O. M.; Shapiro, J.; Sinclair, R. D.; Gold, M. H.; Kovacevic, M.; Mesinkovska, N. A.; Goldust, M.; Washenik, K., A preliminary observation: Male pattern hair loss among hospitalized COVID-19 patients in Spain – A potential clue to the role of androgens in COVID-19 severity. *Journal of Cosmetic Dermatology n/a (n/a)*.
<https://onlinelibrary.wiley.com/doi/abs/10.1111/jocd.13443>
255. Goren, A.; Wambier, C. G.; Herrera, S.; McCoy, J.; Vaño-Galván, S.; Gioia, F.; Comeche, B.; Ron, R.; Serrano-Villar, S.; Ramos, P. M.; Cadegiani, F. A.; Kovacevic, M.; Tosti, A.; Shapiro, J.; Sinclair, R., Anti-androgens may protect against severe COVID-19 outcomes: results from a prospective cohort study of 77 hospitalized men. *J Eur Acad Dermatol Venereol* **2020**.

256. Götzinger, F.; Santiago-García, B.; Noguera-Julián, A.; al., e., COVID-19 in children and adolescents in Europe: a multinational, multicentre cohort study. *The Lancet Child & Adolescent Health* **2020**. [https://doi.org/10.1016/S2352-4642\(20\)30177-2](https://doi.org/10.1016/S2352-4642(20)30177-2)
257. Goyal, M. K.; Simpson, J. N.; Boyle, M. D.; Badolato, G. M.; Delaney, M.; McCarter, R.; Cora-Bramble, D., Racial/Ethnic and Socioeconomic Disparities of SARS-CoV-2 Infection Among Children. *Pediatrics* **2020**, e2020009951. <https://pediatrics.aappublications.org/content/pediatrics/early/2020/08/03/peds.2020-009951.full.pdf>
258. Griffin, B. D.; Chan, M.; Tailor, N.; Mendoza, E. J.; Leung, A.; Warner, B. M.; Duggan, A. T.; Moffat, E.; He, S.; Garnett, L.; Tran, K. N.; Banadyga, L.; Albiets, A.; Tierney, K.; Audet, J.; Bello, A.; Vendramelli, R.; Boese, A. S.; Fernando, L.; Lindsay, L. R.; Jardine, C. M.; Wood, H.; Poliquin, G.; Strong, J. E.; Drebot, M.; Safronetz, D.; Embury-Hyatt, C.; Kobasa, D., North American deer mice are susceptible to SARS-CoV-2. *bioRxiv* **2020**, 2020.07.25.221291. <http://biorxiv.org/content/early/2020/07/26/2020.07.25.221291.abstract>
259. Griffin, J.; Casey, M.; Collins, Á.; Hunt, K.; McEvoy, D.; Byrne, A.; McAloon, C.; Barber, A.; Lane, E. A.; More, S., Rapid review of available evidence on the serial interval and generation time of COVID-19. *BMJ Open* **2020**, 10 (11), e040263. <https://bmjopen.bmj.com/content/bmjopen/10/11/e040263.full.pdf>
260. Griffin, S., Covid-19: Lopinavir-ritonavir does not benefit hospitalised patients, UK trial finds. *BMJ* **2020**, 370, m2650. <http://www.bmj.com/content/370/bmj.m2650.abstract>
261. Grifoni, A.; Weiskopf, D.; Ramirez, S. I.; Mateus, J.; Dan, J. M.; Moderbacher, C. R.; Rawlings, S. A.; Sutherland, A.; Premkumar, L.; Jadi, R. S., Targets of T cell responses to SARS-CoV-2 coronavirus in humans with COVID-19 disease and unexposed individuals. *Cell* **2020**.
262. Grijalva, C. G.; Rolfes, M. A.; Zhu, Y.; al., e., Transmission of SARS-COV-2 Infections in Households — Tennessee and Wisconsin, April–September 2020. *Morbidity and Mortality Weekly Report* **2020**, ePub (30 October 2020). https://www.cdc.gov/mmwr/volumes/69/wr/mm6944e1.htm?s_cid=mm6944e1_w
263. Group, C. s. T. a. F., *Update on Children, Schools and Transmission*; Scientific Advisory Group for Emergencies (SAGE): 4 November 2020, 2020. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/935125/tfc-covid-19-children-transmission-s0860-041120.pdf
264. GSK, Medicago and GSK announce start of Phase 2/3 clinical trials of adjuvanted COVID-19 vaccine candidate. <https://www.gsk.com/en-gb/media/press-releases/medicago-and-gsk-announce-start-of-phase-23-clinical-trials-of-adjuvanted-covid-19-vaccine-candidate/>.
265. Gu, Y., COVID-19 Projections Using Machine Learning. <https://covid19-projections.com/#view-projections>.
266. Guan, L.; Zhou, L.; Zhang, J.; Peng, W.; Chen, R., More awareness is needed for severe acute respiratory syndrome coronavirus 2019 transmission through exhaled air during non-invasive respiratory support: experience from China. *European Respiratory Journal* **2020**, 55 (3), 2000352. <https://erj.ersjournals.com/content/erj/55/3/2000352.full.pdf>
267. Guan, W.-j.; Ni, Z.-y.; Hu, Y.; Liang, W.-h.; Ou, C.-q.; He, J.-x.; Liu, L.; Shan, H.; Lei, C.-l.; Hui, D. S. C.; Du, B.; Li, L.-j.; Zeng, G.; Yuen, K.-Y.; Chen, R.-c.; Tang, C.-l.; Wang, T.; Chen, P.-y.; Xiang, J.; Li, S.-y.; Wang, J.-l.; Liang, Z.-j.; Peng, Y.-x.; Wei, L.; Liu, Y.; Hu, Y.-h.; Peng, P.; Wang, J.-m.; Liu, J.-y.; Chen, Z.; Li, G.; Zheng, Z.-j.; Qiu, S.-q.; Luo, J.; Ye, C.-j.; Zhu, S.-y.; Zhong, N.-s., Clinical Characteristics of Coronavirus Disease 2019 in China. *New England Journal of Medicine* **2020**, 382, 1708-1720. https://www.nejm.org/doi/full/10.1056/NEJMoa2002032?query=recirc_artType_railA_article
268. Guardian, Covid patients have lung damage 'weeks after leaving hospital'. *The Guardian* 2020. <https://www.theguardian.com/world/2020/sep/06/covid-patients-have-lung-damage-weeks-after-leaving-hospital>
269. Gudbjartsson, D. F.; Norddahl, G. L.; Melsted, P.; Gunnarsdottir, K.; Holm, H.; Eythorsson, E.; Arnthorsson, A. O.; Helgason, D.; Bjarnadottir, K.; Ingvarsson, R. F.; Thorsteinsdottir, B.; Kristjansdottir,

- S.; Birgisdottir, K.; Kristinsdottir, A. M.; Sigurdsson, M. I.; Arnadottir, G. A.; Ivarsdottir, E. V.; Andresdottir, M.; Jonsson, F.; Agustsdottir, A. B.; Berglund, J.; Eiriksdottir, B.; Fridriksdottir, R.; Gardarsdottir, E. E.; Gottfredsson, M.; Gretarsdottir, O. S.; Gudmundsdottir, S.; Gudmundsson, K. R.; Gunnarsdottir, T. R.; Gylfason, A.; Helgason, A.; Jensson, B. O.; Jonasdottir, A.; Jonsson, H.; Kristjansson, T.; Kristinsson, K. G.; Magnúsdottir, D. N.; Magnússon, O. T.; Olafsdottir, L. B.; Rognvaldsson, S.; le Roux, L.; Sigmundsdottir, G.; Sigurdsson, A.; Sveinbjornsson, G.; Sveinsdottir, K. E.; Sveinsdottir, M.; Thorarensen, E. A.; Thorbjornsson, B.; Thordardottir, M.; Saemundsdottir, J.; Kristjansson, S. H.; Josefsdottir, K. S.; Masson, G.; Georgsson, G.; Kristjansson, M.; Moller, A.; Palsson, R.; Gudnason, T.; Thorsteinsdottir, U.; Jonsdottir, I.; Sulem, P.; Stefansson, K., Humoral Immune Response to SARS-CoV-2 in Iceland. *New England Journal of Medicine* **2020**.
<https://www.nejm.org/doi/full/10.1056/NEJMoa2026116>
270. Gudmundsdottir, Á.; Scheving, R.; Lindberg, F.; Stefansson, B., Inactivation of SARS-CoV-2 and HCoV-229E in vitro by ColdZyme® a medical device mouth spray against common cold. *Journal of Medical Virology* n/a (n/a). <https://onlinelibrary.wiley.com/doi/abs/10.1002/jmv.26554>
271. Guilamo-Ramos, V.; Benzekri, A.; Thimm-Kaiser, M.; Hidalgo, A.; Perlman, D. C., Reconsidering assumptions of adolescent and young adult SARS-CoV-2 transmission dynamics. *Clinical Infectious Diseases* **2020**. <https://doi.org/10.1093/cid/ciaa1348>
272. Gussow, A. B.; Auslander, N.; Faure, G.; Wolf, Y. I.; Zhang, F.; Koonin, E. V., Genomic determinants of pathogenicity in SARS-CoV-2 and other human coronaviruses. *Proceedings of the National Academy of Sciences* **2020**, 202008176. <https://www.pnas.org/content/pnas/early/2020/06/09/2008176117.full.pdf>
273. Halfmann, P. J.; Hatta, M.; Chiba, S.; Maemura, T.; Fan, S.; Takeda, M.; Kinoshita, N.; Hattori, S. I.; Sakai-Tagawa, Y.; Iwatsuki-Horimoto, K.; Imai, M.; Kawaoka, Y., Transmission of SARS-CoV-2 in Domestic Cats. *N Engl J Med* **2020**.
274. Hall, J. S.; Knowles, S.; Nashold, S. W.; Ip, H. S.; Leon, A. E.; Roche, T.; Keller, S.; Carossino, M.; Balasuriya, U.; Hofmeister, E., Experimental challenge of a North American bat species, big brown bat (*Eptesicus fuscus*), with SARS-CoV-2. *Transboundary and Emerging Diseases* **2020**, n/a (n/a).
<https://onlinelibrary.wiley.com/doi/abs/10.1111/tbed.13949>
275. Han, J.; Zhang, X.; He, S.; Jia, P., Can the coronavirus disease be transmitted from food? A review of evidence, risks, policies and knowledge gaps. *Environmental Chemistry Letters* **2020**.
<https://doi.org/10.1007/s10311-020-01101-x>
276. Hao, X.; Cheng, S.; Wu, D.; Wu, T.; Lin, X.; Wang, C., Reconstruction of the full transmission dynamics of COVID-19 in Wuhan. *Nature* **2020**. <https://doi.org/10.1038/s41586-020-2554-8>
277. Harbourt, D.; Haddow, A.; Piper, A.; Bloomfield, H.; Kearney, B.; Gibson, K.; Minogue, T., Modeling the Stability of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) on Skin, Currency, and Clothing. *medRxiv* **2020**, 2020.07.01.20144253.
<https://www.medrxiv.org/content/medrxiv/early/2020/07/03/2020.07.01.20144253.full.pdf>
278. Harris, J. E., Data from the COVID-19 epidemic in Florida suggest that younger cohorts have been transmitting their infections to less socially mobile older adults. *Review of Economics of the Household* **2020**. <https://doi.org/10.1007/s11150-020-09496-w>
279. Hart, B.; Tu, Y. P.; Jennings, R.; Verma, P.; Padgett, L. R.; Rains, D.; Vojta, D.; Berke, E. M., A comparison of health care worker-collected foam and polyester nasal swabs in convalescent COVID-19 patients. *PLoS One* **2020**, 15 (10), e0241100.
280. Hartman, A. L.; Nambulli, S.; McMillen, C. M.; White, A. G.; Tilston-Lunel, N.; Albe, J. R.; Cottle, E. L.; Dunn, M. D.; Frye, L. J.; Gilliland, T. H.; Olsen, E. L.; Malley, K. J.; Schwarz, M. M.; Tomko, J. A.; Walker, R. C.; Xia, M.; Hartman, M. S.; Klein, E.; Scanga, C.; Flynn, J. L.; Klimstra, W. B.; McElroy, A. K.; Reed, D. S.; Duprex, W. P., SARS-CoV-2 infection of African green monkeys results in mild respiratory disease discernible by PET/CT imaging and prolonged shedding of infectious virus from both respiratory and

- gastrointestinal tracts. *bioRxiv* **2020**, 2020.06.20.137687.
<http://biorxiv.org/content/early/2020/06/21/2020.06.20.137687.abstract>
281. Harvey, A. P.; Fuhrmeister, E. R.; Cantrell, M.; Pitol, A. K.; Swarthout, J. M.; Powers, J. E.; Nadimpalli, M. L.; Julian, T. R.; Pickering, A. J., Longitudinal monitoring of SARS-CoV-2 RNA on high-touch surfaces in a community setting. *medRxiv* **2020**, 2020.10.27.20220905.
<https://www.medrxiv.org/content/medrxiv/early/2020/11/01/2020.10.27.20220905.full.pdf>
282. He, R.; Lu, Z.; Zhang, L.; Fan, T.; Xiong, R.; Shen, X.; Feng, H.; Meng, H.; Lin, W.; Jiang, W.; Geng, Q., The clinical course and its correlated immune status in COVID-19 pneumonia. *Journal of Clinical Virology* **2020**, 127, 104361. <http://www.sciencedirect.com/science/article/pii/S1386653220301037>
283. He, X.; Lau, E. H. Y.; Wu, P.; Deng, X.; Wang, J.; Hao, X.; Lau, Y. C.; Wong, J. Y.; Guan, Y.; Tan, X.; Mo, X.; Chen, Y.; Liao, B.; Chen, W.; Hu, F.; Zhang, Q.; Zhong, M.; Wu, Y.; Zhao, L.; Zhang, F.; Cowling, B. J.; Li, F.; Leung, G. M., Temporal dynamics in viral shedding and transmissibility of COVID-19. *Nature Medicine* **2020**. <https://doi.org/10.1038/s41591-020-0869-5>
284. Hermine, O.; Mariette, X.; Tharoux, P.-L.; Resche-Rigon, M.; Porcher, R.; Ravaud, P.; Group, C.-C., Effect of Tocilizumab vs Usual Care in Adults Hospitalized With COVID-19 and Moderate or Severe Pneumonia: A Randomized Clinical Trial. *JAMA Internal Medicine* **2020**.
<https://doi.org/10.1001/jamainternmed.2020.6820>
285. Hernández-Mora, M. G.; Cabello Úbeda, A.; Pérez, L. P.; Álvarez, F. V.; Álvarez, B.; Rodríguez Nieto, M. J.; Acosta, I. C.; Ormaechea, I. F.; Al-Hayani, A. W. M.; Carballosa, P.; Martínez, S. C.; Ezzine, F.; González, M. C.; Naya, A.; de Las Heras, M. L.; Rodríguez Guzmán, M. J.; Guijarro, A. C.; Lavado, A. B.; Valcayo, A. M.; García, M. M.; Martínez, J. B.; Roblas, R. F.; Piris Pinilla, M.; Alen, J. F.; Pernaute, O. S.; Bueno, F. R.; Frades, S. H.; Romero, G. P. B., Compassionate Use of Tocilizumab in Severe SARS-CoV2 Pneumonia. *Int J Infect Dis* **2020**.
286. Hippich, M.; Holthaus, L.; Assfalg, R.; Zapardiel-Gonzalo, J.; Kapfelsperger, H.; Heigermoser, M.; Haupt, F.; Ewald, D. A.; Welzhofer, T. C.; Marcus, B. A.; Heck, S.; Koelln, A.; Stock, J.; Voss, F.; Secchi, M.; Piemonti, L.; de la Rosa, K.; Protzer, U.; Boehmer, M.; Achenbach, P.; Lampasona, V.; Bonifacio, E.; Ziegler, A.-G., A Public Health Antibody Screening Indicates a 6-Fold Higher SARS-CoV-2 Exposure Rate than Reported Cases in Children. *Med* **2020**. <https://doi.org/10.1016/j.medj.2020.10.003>
287. Hobbs, C. V.; Martin, L. M.; Kim, S. S.; al., e., Factors Associated with Positive SARS-CoV-2 Test Results in Outpatient Health Facilities and Emergency Departments Among Children and Adolescents Aged <18 Years — Mississippi, September–November 2020. *Morbidity and Mortality Weekly Report* **2020**, 2020 (69), 1925-1929. <https://www.cdc.gov/mmwr/volumes/69/wr/mm6950e3.htm>
288. Hoehl, S.; Karaca, O.; Kohmer, N.; Westhaus, S.; Graf, J.; Goetsch, U.; Ciesek, S., Assessment of SARS-CoV-2 Transmission on an International Flight and Among a Tourist Group. *JAMA Network Open* **2020**, 3 (8), e2018044-e2018044. <https://doi.org/10.1001/jamanetworkopen.2020.18044>
289. Hoiland, R. L.; Fergusson, N. A.; Mitra, A. R.; Griesdale, D. E. G.; Devine, D. V.; Stukas, S.; Cooper, J.; Thiara, S.; Foster, D.; Chen, L. Y. C.; Lee, A. Y. Y.; Conway, E. M.; Wellington, C. L.; Sekhon, M. S., The association of ABO blood group with indices of disease severity and multiorgan dysfunction in COVID-19. *Blood Advances* **2020**, 4 (20), 4981-4989. <https://doi.org/10.1182/bloodadvances.2020002623>
290. Holmes, L.; Enwere, M.; Williams, J.; Ogundele, B.; Chavan, P.; Piccoli, T.; Chinacherem, C.; Comeaux, C.; Pelaez, L.; Okundaye, O.; Stalnaker, L.; Kalle, F.; Deepika, K.; Philipicien, G.; Poleon, M.; Ogungbade, G.; Elmi, H.; John, V.; Dabney, K. W., Black–White Risk Differentials in COVID-19 (SARS-COV2) Transmission, Mortality and Case Fatality in the United States: Translational Epidemiologic Perspective and Challenges. *International Journal of Environmental Research and Public Health* **2020**, 17 (12), 4322. <https://www.mdpi.com/1660-4601/17/12/4322>
291. Honein, M. A.; Christie, A.; Rose, D. A.; al., e., Summary of Guidance for Public Health Strategies to Address High Levels of Community Transmission of SARS-CoV-2 and Related Deaths, December 2020.

Morbidity and Mortality Weekly Report **2020**, ePub: 4 December 2020.

<https://www.cdc.gov/mmwr/volumes/69/wr/mm6949e2.htm>

292. HongyingLi; YewLeong, F.; GeorgeXu; ZhengweiGe; WeiKang, C.; HuiLim, K., Dispersion of evaporating cough droplets in tropical outdoor environment. *Physics of Fluids* **2020**, 32 (11), 113301.

<https://aip.scitation.org/doi/abs/10.1063/5.0026360>

293. Horby, P.; Lim, W. S.; Emberson, J.; Mafham, M.; Bell, J.; Linsell, L.; Staplin, N.; Brightling, C.; Ustianowski, A.; Elmahi, E.; Prudon, B.; Green, C.; Felton, T.; Chadwick, D.; Rege, K.; Fegan, C.; Chappell, L. C.; Faust, S. N.; Jaki, T.; Jeffery, K.; Montgomery, A.; Rowan, K.; Juszczak, E.; Baillie, J. K.; Haynes, R.; Landray, M. J., Effect of Dexamethasone in Hospitalized Patients with COVID-19: Preliminary Report. *medRxiv* **2020**, 2020.06.22.20137273.

<https://www.medrxiv.org/content/medrxiv/early/2020/06/22/2020.06.22.20137273.full.pdf>

294. Horby, P.; Openshaw, P. J. M.; Hayward, A. H.; Lim, W. S.; Edmunds, J.; Ferguson, N.; Dingwall, R.; Cevik, M.; Barclay, W.; Rubin, J.; Connell, D.; McMenemy, J.; Semple, C.; Evans, C., *NERVTAG meeting on SARS-CoV-2 variant under investigation VUI-202012/01*; New and Emerging Respiratory Virus Threats Advisory Group: 2020. <https://khub.net/documents/135939561/338928724/SARS-CoV-2+variant+under+investigation%2C+meeting+minutes.pdf/962e866b-161f-2fd5-1030-32b6ab467896?t=1608470511452>

295. Hou, Y. J.; Chiba, S.; Halfmann, P.; Ehre, C.; Kuroda, M.; Dinno, K. H.; Leist, S. R.; Schäfer, A.; Nakajima, N.; Takahashi, K.; Lee, R. E.; Mascenik, T. M.; Graham, R.; Edwards, C. E.; Tse, L. V.; Okuda, K.; Markmann, A. J.; Bartelt, L.; de Silva, A.; Margolis, D. M.; Boucher, R. C.; Randell, S. H.; Suzuki, T.; Gralinski, L. E.; Kawaoka, Y.; Baric, R. S., SARS-CoV-2 D614G variant exhibits efficient replication ex vivo and transmission in vivo. *Science* **2020**, eabe8499.

<https://science.sciencemag.org/content/sci/early/2020/11/11/science.abe8499.full.pdf>

296. Hu, M.; Lin, H.; Wang, J.; Xu, C.; Tatem, A. J.; Meng, B.; Zhang, X.; Liu, Y.; Wang, P.; Wu, G.; Xie, H.; Lai, S., The risk of COVID-19 transmission in train passengers: an epidemiological and modelling study. *Clinical Infectious Diseases* **2020**. <https://doi.org/10.1093/cid/ciaa1057>

297. Hu, Z.; Song, C.; Xu, C.; Jin, G.; Chen, Y.; Xu, X.; Ma, H.; Chen, W.; Lin, Y.; Zheng, Y.; Wang, J.; Hu, Z.; Yi, Y.; Shen, H., Clinical characteristics of 24 asymptomatic infections with COVID-19 screened among close contacts in Nanjing, China. *Science China Life Sciences* **2020**. <https://doi.org/10.1007/s11427-020-1661-4>

298. Huang, C.; Wang, Y.; Li, X.; Ren, L.; Zhao, J.; Hu, Y.; Zhang, L.; Fan, G.; Xu, J.; Gu, X.; Cheng, Z.; Yu, T.; Xia, J.; Wei, Y.; Wu, W.; Xie, X.; Yin, W.; Li, H.; Liu, M.; Xiao, Y.; Gao, H.; Guo, L.; Xie, J.; Wang, G.; Jiang, R.; Gao, Z.; Jin, Q.; Wang, J.; Cao, B., Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet* **2020**. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30183-5/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30183-5/fulltext)

299. Huang, L.; Xu, S.; Wang, Z.; Xue, K.; Su, J.; Song, Y.; Chen, S.; Zhu, C.; Tang, B. Z.; Ye, R., Self-Reporting and Photothermally Enhanced Rapid Bacterial Killing on a Laser-Induced Graphene Mask. *ACS Nano* **2020**, 14 (9), 12045-12053. <https://doi.org/10.1021/acsnano.0c05330>

300. Huang, R.; Xia, J.; Chen, Y.; Shan, C.; Wu, C., A family cluster of SARS-CoV-2 infection involving 11 patients in Nanjing, China. *The Lancet Infectious Diseases* **2020**, 20 (5), 534-535. [https://doi.org/10.1016/S1473-3099\(20\)30147-X](https://doi.org/10.1016/S1473-3099(20)30147-X)

301. Huang, Y.; Lyu, X.; Li, D.; Wang, Y.; Wang, L.; Zou, W.; Wei, Y.; Wu, X., A cohort study of 223 patients explores the clinical risk factors for the severity diagnosis of COVID-19. *medRxiv* **2020**, 2020.04.18.20070656.

<https://www.medrxiv.org/content/medrxiv/early/2020/04/24/2020.04.18.20070656.full.pdf>

302. Huang, Z.; Tian, D.; Liu, Y.; Lin, Z.; Lyon, C. J.; Lai, W.; Fusco, D.; Drouin, A.; Yin, X.; Hu, T.; Ning, B., Ultra-sensitive and high-throughput CRISPR-powered COVID-19 diagnosis. *Biosensors and Bioelectronics* **2020**, 164, 112316. <http://www.sciencedirect.com/science/article/pii/S0956566320303110>

303. Hutchins, H. J.; Wolff, B.; Leeb, R.; al., e., COVID-19 Mitigation Behaviors by Age Group — United States, April–June 2020. *Morbidity and Mortality Weekly Report* **2020**, 2020 (69), 1584-1590. https://www.cdc.gov/mmwr/volumes/69/wr/mm6943e4.htm?s_cid=mm6943e4_w
304. Hyde, Z., COVID-19, children and schools: overlooked and at risk. *Medical Journal of Australia* **2020**, 213 (10), 444-446.e1. <https://onlinelibrary.wiley.com/doi/abs/10.5694/mja2.50823>
305. Ibrahim, D.; Dulipsingh, L.; Zapatka, L.; Eadie, R.; Crowell, R.; Williams, K.; Wakefield, D. B.; Cook, L.; Puff, J.; Hussain, S. A., Factors Associated with Good Patient Outcomes Following Convalescent Plasma in COVID-19: A Prospective Phase II Clinical Trial. *Infect Dis Ther* **2020**, 1-14.
306. IHME, COVID-19 Projections. <https://covid19.healthdata.org/united-states-of-america>.
307. IHME, First COVID-19 Global Forecast: IHME Projects Three-Quarters of a Million Lives Could be Saved by January 1. Institute for Health Metrics and Evaluation: 2020. <https://www.prnewswire.com/il/news-releases/first-covid-19-global-forecast-ihme-projects-three-quarters-of-a-million-lives-could-be-saved-by-january-1-807013447.html>
308. Institute of Museum and Library Services; OCLC; Battelle, REopening Archives, Libraries, and Museums (REALM) Test 5: Natural attenuation as a decontamination approach for SARS-CoV-2 on textile materials. <https://www.webjunction.org/content/dam/WebJunction/Documents/webJunction/realm/test5-report.pdf> (accessed 26 Oct 2020).
309. Institute, S. S., Public Health Authority, State Serum Institute, Report of Findings. 2020. https://coronasmitte.dk/-/media/mediefiler/corona/mink/risikovurdering-af-human-sundhed-ved-fortsat-minkavl_03112020.pdf?la=da&hash=721871D898F1D9F1F9D99E3A002C35F9537F5CEA
310. International Commission on Microbiological Specifications for Foods (ICMSF), ICMSF opinion on SARS-CoV-2 and its relationship to food safety. https://www.icmsf.org/wp-content/uploads/2020/09/ICMSF2020-Letterhead-COVID-19-opinion-final-03-Sept-2020.BF_.pdf (accessed 08 Sept 2020).
311. Ionescu, F.; Jaiyesimi, I.; Petrescu, I.; Lawler, P. R.; Castillo, E.; Munoz-Maldonado, Y.; Imam, Z.; Narasimhan, M.; Abbas, A. E.; Konde, A.; Nair, G. B., Association of Anticoagulation Dose and Survival in Hospitalized COVID-19 Patients: A Retrospective Propensity Score Weighted Analysis. *Eur J Haematol* **2020**.
312. IQ, H., COVID-19 Forecast for United States. <https://app.hospiq.com/covid19?region=>.
313. Ismail, S. A.; Saliba, V.; Lopez Bernal, J.; Ramsay, M. E.; Ladhani, S. N., SARS-CoV-2 infection and transmission in educational settings: a prospective, cross-sectional analysis of infection clusters and outbreaks in England. *The Lancet Infectious Diseases* **2020**. [https://doi.org/10.1016/S1473-3099\(20\)30882-3](https://doi.org/10.1016/S1473-3099(20)30882-3)
314. Iwata, K.; Doi, A.; Miyakoshi, C., Was School Closure Effective in Mitigating Coronavirus Disease 2019 (COVID-19)? Time Series Analysis Using Bayesian Inference. **2020**.
315. Janssen, A Study of Ad26.COV2.S for the Prevention of SARS-CoV-2-Mediated COVID-19 in Adult Participants (ENSEMBLE). <https://clinicaltrials.gov/ct2/show/NCT04505722>.
316. Jarvis, C. I.; Van Zandvoort, K.; Gimma, A.; Prem, K.; Klepac, P.; Rubin, G. J.; Edmunds, W. J., Quantifying the impact of physical distance measures on the transmission of COVID-19 in the UK. *BMC Med* **2020**, 18 (1), 124.
317. Jenco, M., CDC details COVID-19-related inflammatory syndrome in children. *AAP News* 2020. <https://www.aappublications.org/news/2020/05/14/covid19inflammatory051420>
318. JHU, Coronavirus COVID-19 Global Cases by Johns Hopkins CSSE. <https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6>.
319. Jiang, N.; Chen, Z.; Yin, X.; Liu, L.; Yang, H.; Tan, X.; Wang, J.; Li, H.; Tian, M.; Lu, Z.; Xiong, N.; Gong, Y., Association of metformin with mortality or ARDS in patients with COVID-19 and type 2 diabetes: a

retrospective cohort study. *Diabetes Research and Clinical Practice* **2020**, 108619.

<http://www.sciencedirect.com/science/article/pii/S0168822720308767>

320. John, A. R.; Raju, S.; Cadnum, J. L.; Lee, K.; McClellan, P.; Akkus, O.; Miller, S. K.; Jennings, W. D.; Buehler, J. A.; Li, D. F.; Redmond, S. N.; Braskie, M.; Hoyer, C. K.; Donskey, C. J., Scalable In-hospital Decontamination of N95 Filtering Facepiece Respirator with a Peracetic Acid Room Disinfection System. *Infection Control & Hospital Epidemiology* **2020**, 1-26. <https://www.cambridge.org/core/article/scalable-inhospital-decontamination-of-n95-filtering-facepiece-respirator-with-a-peracetic-acid-room-disinfection-system/4B56043CF6D905CA6E8EF07B19FCF054>

321. Johnston, S. C.; Jay, A.; Raymond, J. L.; Rossi, F.; Zeng, X.; Scruggs, J.; Dyer, D.; Frick, O.; Moore, J.; Berrier, K.; Esham, H.; Shamblin, J.; Sifford, W.; Fiallos, J.; Klosterman, L.; Stevens, S.; White, L.; Bowling, P.; Garcia, T.; Jensen, C.; Ghering, J.; Nyakiti, D.; Bellanca, S.; Kearney, B.; Giles, W.; Alli, N.; Paz, F.; Akers, K.; Danner, D.; Barth, J.; Johnson, J. A.; Durant, M.; Kim, R.; Pitt, M. L. M.; Nalca, A., Development of a Coronavirus Disease 2019 Nonhuman Primate Model Using Airborne Exposure. *bioRxiv* **2020**, 2020.06.26.174128. <http://biorxiv.org/content/early/2020/06/26/2020.06.26.174128.abstract>

322. Jones, R. M., Relative contributions of transmission routes for COVID-19 among healthcare personnel providing patient care. *Journal of Occupational and Environmental Hygiene* **2020**, 1-8. <https://doi.org/10.1080/15459624.2020.1784427>

323. Jonmarker, S.; Hollenberg, J.; Dahlberg, M.; Stackelberg, O.; Litorell, J.; Everhov Å, H.; Järnbert-Pettersson, H.; Söderberg, M.; Grip, J.; Schandl, A.; Günther, M.; Cronhjort, M., Dosing of thromboprophylaxis and mortality in critically ill COVID-19 patients. *Crit Care* **2020**, 24 (1), 653.

324. Joyner, M. J.; Bruno, K. A.; Klassen, S. A.; Kunze, K. L.; Johnson, P. W.; Lesser, E. R.; Wiggins, C. C.; Senefeld, J. W.; Klompas, A. M.; Hodge, D. O.; Shepherd, J. R. A.; Rea, R. F.; Whelan, E. R.; Clayburn, A. J.; Spiegel, M. R.; Baker, S. E.; Larson, K. F.; Ripoll, J. G.; Andersen, K. J.; Buras, M. R.; Vogt, M. N. P.; Herasevich, V.; Dennis, J. J.; Regimbal, R. J.; Bauer, P. R.; Blair, J. E.; Van Buskirk, C. M.; Winters, J. L.; Stubbs, J. R.; van Helmond, N.; Butterfield, B. P.; Sexton, M. A.; Diaz Soto, J. C.; Paneth, N. S.; Verdun, N. C.; Marks, P.; Casadevall, A.; Fairweather, D.; Carter, R. E.; Wright, R. S., Safety Update: COVID-19 Convalescent Plasma in 20,000 Hospitalized Patients. *Mayo Clinic Proceedings* **2020**. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7368917/>

325. Joyner, M. J.; Senefeld, J. W.; Klassen, S. A.; Mills, J. R.; Johnson, P. W.; Theel, E. S.; Wiggins, C. C.; Bruno, K. A.; Klompas, A. M.; Lesser, E. R.; Kunze, K. L.; Sexton, M. A.; Diaz Soto, J. C.; Baker, S. E.; Shepherd, J. R. A.; van Helmond, N.; van Buskirk, C. M.; Winters, J. L.; Stubbs, J. R.; Rea, R. F.; Hodge, D. O.; Herasevich, V.; Whelan, E. R.; Clayburn, A. J.; Larson, K. F.; Ripoll, J. G.; Andersen, K. J.; Buras, M. R.; Vogt, M. N. P.; Dennis, J. J.; Regimbal, R. J.; Bauer, P. R.; Blair, J. E.; Paneth, N. S.; Fairweather, D.; Wright, R. S.; Carter, R. E.; Casadevall, A., Effect of Convalescent Plasma on Mortality among Hospitalized Patients with COVID-19: Initial Three-Month Experience. *medRxiv* **2020**, 2020.08.12.20169359. <http://medrxiv.org/content/early/2020/08/12/2020.08.12.20169359.abstract>

326. Jüni, P.; Rothenbühler, M.; Bobos, P.; Thorpe, K. E.; da Costa, B. R.; Fisman, D. N.; Slutsky, A. S.; Gesink, D., Impact of climate and public health interventions on the COVID-19 pandemic: A prospective cohort study. *Canadian Medical Association Journal* **2020**, cmaj.200920. <https://www.cmaj.ca/content/cmaj/early/2020/05/08/cmaj.200920.full.pdf>

327. Kalil, A. C.; Patterson, T. F.; Mehta, A. K.; Tomashek, K. M.; Wolfe, C. R.; Ghazaryan, V.; Marconi, V. C.; Ruiz-Palacios, G. M.; Hsieh, L.; Kline, S.; Tapson, V.; Iovine, N. M.; Jain, M. K.; Sweeney, D. A.; El Sahly, H. M.; Branche, A. R.; Regalado Pineda, J.; Lye, D. C.; Sandkovsky, U.; Luetkemeyer, A. F.; Cohen, S. H.; Finberg, R. W.; Jackson, P. E. H.; Taiwo, B.; Paules, C. I.; Arguinchona, H.; Goepfert, P.; Ahuja, N.; Frank, M.; Oh, M.-d.; Kim, E. S.; Tan, S. Y.; Mularski, R. A.; Nielsen, H.; Ponce, P. O.; Taylor, B. S.; Larson, L.; Rouphael, N. G.; Saklawi, Y.; Cantos, V. D.; Ko, E. R.; Engemann, J. J.; Amin, A. N.; Watanabe, M.; Billings, J.; Elie, M.-C.; Davey, R. T.; Burgess, T. H.; Ferreira, J.; Green, M.; Makowski, M.; Cardoso, A.; de Bono, S.; Bonnett, T.; Proshan, M.; Deye, G. A.; Dempsey, W.; Nayak, S. U.; Dodd, L. E.; Beigel, J. H., Baricitinib

- plus Remdesivir for Hospitalized Adults with Covid-19. *New England Journal of Medicine* **2020**.
<https://doi.org/10.1056/NEJMoa2031994>
328. Karnakov, P.; Arampatzis, G.; Kičić, I.; Wermelinger, F.; Wälchli, D.; Papadimitriou, C.; Koumoutsakos, P., Data driven inference of the reproduction number (R0) for COVID-19 before and after interventions for 51 European countries. **2020**.
329. Kawasuji, H.; Takegoshi, Y.; Kaneda, M.; Ueno, A.; Miyajima, Y.; Kawago, K.; Fukui, Y.; Yoshida, Y.; Kimura, M.; Yamada, H.; Sakamaki, I.; Tani, H.; Morinaga, Y.; Yamamoto, Y., Transmissibility of COVID-19 depends on the viral load around onset in adult and symptomatic patients. *PLOS ONE* **2020**, *15* (12), e0243597. <https://doi.org/10.1371/journal.pone.0243597>
330. Keller, M. J.; Kitsis, E. A.; Arora, S.; Chen, J. T.; Agarwal, S.; Ross, M. J.; Tomer, Y.; Southern, W., Effect of Systemic Glucocorticoids on Mortality or Mechanical Ventilation in Patients With COVID-19. *Journal of Hospital Medicine* **2020**, *Online First, July 22nd, 2020*.
331. Kelly, M.; O'Connor, R.; Townsend, L.; Coghlan, M.; Relihan, E.; Moriarty, M.; Carr, B.; Melanophy, G.; Doyle, C.; Bannan, C.; O'Riordan, R.; Merry, C.; Clarke, S.; Bergin, C., Clinical outcomes and adverse events in patients hospitalised with COVID -19, treated with off- label hydroxychloroquine and azithromycin. *Br J Clin Pharmacol* **2020**.
332. Kemp, S. A.; Datir, R. P.; Collier, D. A.; Ferreira, I.; Carabelli, A.; Harvey, W.; Robertson, D. L.; Gupta, R. K., Recurrent emergence and transmission of a SARS-CoV-2 Spike deletion Δ H69/ Δ V70. *bioRxiv* **2020**, 2020.12.14.422555. <http://biorxiv.org/content/early/2020/12/15/2020.12.14.422555.abstract>
333. Kennedy, M.; Helfand, B. K. I.; Gou, R. Y.; Gartaganis, S. L.; Webb, M.; Moccia, J. M.; Bruursema, S. N.; Dokic, B.; McCulloch, B.; Ring, H.; Margolin, J. D.; Zhang, E.; Anderson, R.; Babine, R. L.; Hshieh, T.; Wong, A. H.; Taylor, R. A.; Davenport, K.; Teresi, B.; Fong, T. G.; Inouye, S. K., Delirium in Older Patients With COVID-19 Presenting to the Emergency Department. *JAMA Network Open* **2020**, *3* (11), e2029540-e2029540. <https://doi.org/10.1001/jamanetworkopen.2020.29540>
334. Kennedy, M.; Lee, S. J.; Epstein, M., Modeling aerosol transmission of SARS-CoV-2 in multi-room facility. *Journal of Loss Prevention in the Process Industries* **2020**, 104336.
<http://www.sciencedirect.com/science/article/pii/S0950423020306239>
335. Kerr, C. C.; Stuart, R. M.; Mistry, D.; Abeyseriya, R. G.; Hart, G.; Rosenfeld, K.; Selvaraj, P.; Nunez, R. C.; Hagedorn, B.; George, L.; Izzo, A.; Palmer, A.; Delport, D.; Bennette, C.; Wagner, B.; Chang, S.; Cohen, J. A.; Panovska-Griffiths, J.; Jastrzebski, M.; Oron, A. P.; Wenger, E.; Famulare, M.; Klein, D. J., Covasim: an agent-based model of COVID-19 dynamics and interventions. *medRxiv* **2020**, 2020.05.10.20097469. <https://www.medrxiv.org/content/medrxiv/early/2020/05/15/2020.05.10.20097469.full.pdf>
336. Khanh, N. C.; Thai, P. Q.; Quach, H.-L.; Thi, N.-A. H.; Dinh, P. C.; Duong, T. N.; Mai, L. T. Q.; Nghia, N. D.; Tu, T. A.; Quang, L. N.; Quang, T. D.; Nguyen, T.-T.; Vogt, F.; Anh, D. D., Transmission of Severe Acute Respiratory Syndrome Coronavirus 2 During Long Flight. *Emerging Infectious Disease journal* **2020**, *26* (11). https://wwwnc.cdc.gov/eid/article/26/11/20-3299_article
337. Kim, S. E.; Jeong, H. S.; Yu, Y.; Shin, S. U.; Kim, S.; Oh, T. H.; Kim, U. J.; Kang, S. J.; Jang, H. C.; Jung, S. I.; Park, K. H., Viral kinetics of SARS-CoV-2 in asymptomatic carriers and presymptomatic patients. *Int J Infect Dis* **2020**.
338. Kim, U. J.; Lee, S. Y.; Lee, J. Y.; Lee, A.; Kim, S. E.; Choi, O.-J.; Lee, J. S.; Kee, S.-J.; Jang, H.-C., Air and Environmental Contamination Caused by COVID-19 Patients: a Multi-Center Study. *J Korean Med Sci* **2020**, *35* (37). <https://doi.org/10.3346/jkms.2020.35.e332>
339. Kim, Y.-I.; Kim, S.-G.; Kim, S.-M.; Kim, E.-H.; Park, S.-J.; Yu, K.-M.; Chang, J.-H.; Kim, E. J.; Lee, S.; Casel, M. A. B.; Um, J.; Song, M.-S.; Jeong, H. W.; Lai, V. D.; Kim, Y.; Chin, B. S.; Park, J.-S.; Chung, K.-H.; Foo, S.-S.; Poo, H.; Mo, I.-P.; Lee, O.-J.; Webby, R. J.; Jung, J. U.; Choi, Y. K., Infection and Rapid Transmission of SARS-CoV-2 in Ferrets. *Cell Host & Microbe* **2020**.
<http://www.sciencedirect.com/science/article/pii/S1931312820301876>

340. King, J. A.; Whitten, T. A.; Bakal, J. A.; McAlister, F. A., Symptoms associated with a positive result for a swab for SARS-CoV-2 infection among children in Alberta. *Canadian Medical Association Journal* **2020**, cmaj.202065. <https://www.cmaj.ca/content/cmaj/early/2020/11/23/cmaj.202065.full.pdf>
341. Knight, S. R.; Ho, A.; Pius, R.; Buchan, I.; Carson, G.; Drake, T. M.; Dunning, J.; Fairfield, C. J.; Gamble, C.; Green, C. A.; Gupta, R.; Halpin, S.; Hardwick, H. E.; Holden, K. A.; Horby, P. W.; Jackson, C.; Mclean, K. A.; Merson, L.; Nguyen-Van-Tam, J. S.; Norman, L.; Noursadeghi, M.; Olliaro, P. L.; Pritchard, M. G.; Russell, C. D.; Shaw, C. A.; Sheikh, A.; Solomon, T.; Sudlow, C.; Swann, O. V.; Turtle, L. C.; Openshaw, P. J.; Baillie, J. K.; Semple, M. G.; Docherty, A. B.; Harrison, E. M., Risk stratification of patients admitted to hospital with covid-19 using the ISARIC WHO Clinical Characterisation Protocol: development and validation of the 4C Mortality Score. *BMJ* **2020**, *370*, m3339. <https://www.bmj.com/content/bmj/370/bmj.m3339.full.pdf>
342. Koh, W. C.; Naing, L.; Chaw, L.; Rosledzana, M. A.; Alikhan, M. F.; Jamaludin, S. A.; Amin, F.; Omar, A.; Shazli, A.; Griffith, M.; Pastore, R.; Wong, J., What do we know about SARS-CoV-2 transmission? A systematic review and meta-analysis of the secondary attack rate and associated risk factors. *PLOS ONE* **2020**, *15* (10), e0240205. <https://doi.org/10.1371/journal.pone.0240205>
343. Konda, A.; Prakash, A.; Moss, G. A.; Schmoldt, M.; Grant, G. D.; Guha, S., Aerosol Filtration Efficiency of Common Fabrics Used in Respiratory Cloth Masks. *ACS Nano* **2020**. <https://www.ncbi.nlm.nih.gov/pubmed/32329337>
344. Kong, D.; Zheng, Y.; Wu, H.; Pan, H.; Wagner, A. L.; Zheng, Y.; Gong, X.; Zhu, Y.; Jin, B.; Xiao, W.; Mao, S.; Lin, S.; Han, R.; Yu, X.; Cui, P.; Jiang, C.; Fang, Q.; Lu, Y.; Fu, C., Pre-symptomatic transmission of novel coronavirus in community settings. *Influenza and Other Respiratory Viruses* **2020**, *n/a* (n/a). <https://onlinelibrary.wiley.com/doi/abs/10.1111/irv.12773>
345. Kong, T.-k., Longer incubation period of coronavirus disease 2019 (COVID-19) in older adults. *AGING MEDICINE* **2020**, *3* (2), 102-109. <https://onlinelibrary.wiley.com/doi/abs/10.1002/agm2.12114>
346. Koo, J. R.; Cook, A. R.; Park, M.; Sun, Y.; Sun, H.; Lim, J. T.; Tam, C.; Dickens, B. L., Interventions to mitigate early spread of SARS-CoV-2 in Singapore: a modelling study. *The Lancet Infectious Diseases* **2020**, *20* (6), 678-688. [https://doi.org/10.1016/S1473-3099\(20\)30162-6](https://doi.org/10.1016/S1473-3099(20)30162-6)
347. Korber, B.; Fischer, W. M.; Gnanakaran, S.; Yoon, H.; Theiler, J.; Abfalterer, W.; Hengartner, N.; Giorgi, E. E.; Bhattacharya, T.; Foley, B.; Hastie, K. M.; Parker, M. D.; Partridge, D. G.; Evans, C. M.; Freeman, T. M.; de Silva, T. I.; McDanal, C.; Perez, L. G.; Tang, H.; Moon-Walker, A.; Whelan, S. P.; LaBranche, C. C.; Saphire, E. O.; Montefiori, D. C.; Angyal, A.; Brown, R. L.; Carrilero, L.; Green, L. R.; Groves, D. C.; Johnson, K. J.; Keeley, A. J.; Lindsey, B. B.; Parsons, P. J.; Raza, M.; Rowland-Jones, S.; Smith, N.; Tucker, R. M.; Wang, D.; Wyles, M. D., Tracking changes in SARS-CoV-2 Spike: evidence that D614G increases infectivity of the COVID-19 virus. *Cell* **2020**. <https://doi.org/10.1016/j.cell.2020.06.043>
348. Korevaar, H. M.; Becker, A. D.; Miller, I. F.; Grenfell, B. T.; Metcalf, C. J. E.; Mina, M. J., Quantifying the impact of US state non-pharmaceutical interventions on COVID-19 transmission. *medRxiv* **2020**, 2020.06.30.20142877. <https://www.medrxiv.org/content/medrxiv/early/2020/07/01/2020.06.30.20142877.full.pdf>
349. Korte, W.; Buljan, M.; Rösslein, M.; Wick, P.; Golubov, V.; Jentsch, J.; Reut, M.; Peier, K.; Nohynek, B.; Fischer, A.; Stolz, R.; Cettuzzi, M.; Nolte, O., SARS-CoV-2 IgG and IgA antibody response is gender dependent; and IgG antibodies rapidly decline early on. *Journal of Infection* **2020**. <https://doi.org/10.1016/j.jinf.2020.08.032>
350. Kraemer, M. U. G.; Yang, C.-H.; Gutierrez, B.; Wu, C.-H.; Klein, B.; Pigott, D. M.; du Plessis, L.; Faria, N. R.; Li, R.; Hanage, W. P.; Brownstein, J. S.; Layan, M.; Vespignani, A.; Tian, H.; Dye, C.; Pybus, O. G.; Scarpino, S. V., The effect of human mobility and control measures on the COVID-19 epidemic in China. *Science* **2020**, eabb4218. <https://science.sciencemag.org/content/sci/early/2020/03/25/science.abb4218.full.pdf>

351. Kratzel, A.; Todt, D.; V'kovski, P.; Steiner, S.; Gultom, M. L.; Thao, T. T. N.; Ebert, N.; Holwerda, M.; Steinmann, J.; Niemeyer, D.; Dijkman, R.; Kampf, G.; Drosten, C.; Steinmann, E.; Thiel, V.; Pfaender, S., Efficient inactivation of SARS-CoV-2 by WHO-recommended hand rub formulations and alcohols. *bioRxiv* **2020**, 2020.03.10.986711.
<https://www.biorxiv.org/content/biorxiv/early/2020/03/17/2020.03.10.986711.full.pdf>
352. Kucharski, A. J.; Klepac, P.; Conlan, A. J. K.; Kissler, S. M.; Tang, M. L.; Fry, H.; Gog, J. R.; Edmunds, W. J., Effectiveness of isolation, testing, contact tracing, and physical distancing on reducing transmission of SARS-CoV-2 in different settings: a mathematical modelling study. *Lancet Infect Dis* **2020**.
353. Kucharski, A. J.; Russell, T. W.; Diamond, C.; Liu, Y.; Edmunds, J.; Funk, S.; Eggo, R. M.; Sun, F.; Jit, M.; Munday, J. D., Early dynamics of transmission and control of COVID-19: a mathematical modelling study. *The lancet infectious diseases* **2020**.
354. Kucirka, L. M.; Lauer, S. A.; Laeyendecker, O.; Boon, D., Variation in False-Negative Rate of Reverse Transcriptase Polymerase Chain Reaction–Based SARS-CoV-2 Tests by Time Since Exposure. *Annals of Internal Medicine* **2020**, 0 (0), null. <https://www.acpjournals.org/doi/abs/10.7326/M20-1495>
355. Kupferschmidt, K., Remdesivir and interferon fall flat in WHO's megastudy of COVID-19 treatments. *Science Magazine* **2020**, 1. <https://www.sciencemag.org/news/2020/10/remdesivir-and-interferon-fall-flat-who-s-megastudy-covid-19-treatments>
356. Lai, S.; Ruktanonchai, N. W.; Zhou, L.; Prosper, O.; Luo, W.; Floyd, J. R.; Wesolowski, A.; Santillana, M.; Zhang, C.; Du, X.; Yu, H.; Tatem, A. J., Effect of non-pharmaceutical interventions to contain COVID-19 in China. *Nature* **2020**. <https://doi.org/10.1038/s41586-020-2293-x>
357. Lalau, J. D.; Al-Salameh, A.; Hadjadj, S.; Goronflot, T.; Wiernsperger, N.; Pichelin, M.; Allix, I.; Amadou, C.; Bourron, O.; Duriez, T.; Gautier, J. F.; Dutour, A.; Gonfroy, C.; Gouet, D.; Joubert, M.; Julier, I.; Larger, E.; Marchand, L.; Marre, M.; Meyer, L.; Olivier, F.; Prevost, G.; Quiniou, P.; Raffaitin-Cardin, C.; Roussel, R.; Saulnier, P. J.; Seret-Begue, D.; Thivolet, C.; Vatier, C.; Desaillood, R.; Wargny, M.; Gourdy, P.; Cariou, B., Metformin use is associated with a reduced risk of mortality in patients with diabetes hospitalised for COVID-19. *Diabetes Metab* **2020**, 101216.
358. Lam, T. T.-Y.; Shum, M. H.-H.; Zhu, H.-C.; Tong, Y.-G.; Ni, X.-B.; Liao, Y.-S.; Wei, W.; Cheung, W. Y.-M.; Li, W.-J.; Li, L.-F.; Leung, G. M.; Holmes, E. C.; Hu, Y.-L.; Guan, Y., Identifying SARS-CoV-2 related coronaviruses in Malayan pangolins. *Nature* **2020**. <https://doi.org/10.1038/s41586-020-2169-0>
359. Lan, F.-Y.; Suharlim, C.; Kales, S. N.; Yang, J., Association between SARS-CoV-2 infection, exposure risk and mental health among a cohort of essential retail workers in the USA. *Occupational and Environmental Medicine* **2020**, oemed-2020-106774.
<https://oem.bmj.com/content/oemed/early/2020/10/11/oemed-2020-106774.full.pdf>
360. LANL, COVID-19 Confirmed and Forecasted Case Data. <https://covid-19.bsvgateway.org/>.
361. Lapin, T., About a dozen US mink farms in quarantine as officials probe COVID-19 outbreaks. *New York Post* **2020**. <https://nypost.com/2020/11/10/us-mink-farms-in-quarantine-as-officials-probe-covid-19-outbreaks/>
362. Larosa, E.; Djuric, O.; Cassinadri, M.; Cilloni, S.; Bisaccia, E.; Vicentini, M.; Venturelli, F.; Giorgi Rossi, P.; Pezzotti, P.; Bedeschi, E.; Group, t. R. E. C.-W., Secondary transmission of COVID-19 in preschool and school settings in northern Italy after their reopening in September 2020: a population-based study. *Eurosurveillance* **2020**, 25 (49), 2001911. <https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.49.2001911>
363. Larsen, J. R.; Martin, M. R.; Martin, J. D.; Kuhn, P.; Hicks, J. B., Modeling the Onset of Symptoms of COVID-19. *Frontiers in Public Health* **2020**, 8 (473).
<https://www.frontiersin.org/article/10.3389/fpubh.2020.00473>
364. Lasry, A.; Kidder, D.; Hast, M.; Poovey, J.; Sunshine, G.; Zviedrite, N.; Ahmed, F.; Ethier, K. A., Timing of community mitigation and changes in reported COVID-19 and community mobility—four US

- metropolitan areas, February 26–April 1, 2020. *morbidity and Mortality Weekly Report* **2020**, *69*, 451-457. <https://www.cdc.gov/mmwr/volumes/69/wr/mm6915e2.htm>
365. Lassaunière, R.; Frische, A.; Harboe, Z. B.; Nielsen, A. C.; Fomsgaard, A.; Krogfelt, K. A.; Jørgensen, C. S., Evaluation of nine commercial SARS-CoV-2 immunoassays. *medRxiv* **2020**, 2020.04.09.20056325. <https://www.medrxiv.org/content/medrxiv/early/2020/04/10/2020.04.09.20056325.full.pdf>
366. Latinne, A.; Hu, B.; Olival, K. J.; Zhu, G.; Zhang, L.; Li, H.; Chmura, A. A.; Field, H. E.; Zambrana-Torrel, C.; Epstein, J. H.; Li, B.; Zhang, W.; Wang, L.-F.; Shi, Z.-L.; Daszak, P., Origin and cross-species transmission of bat coronaviruses in China. *Nature Communications* **2020**, *11* (1), 4235. <https://doi.org/10.1038/s41467-020-17687-3>
367. Latz, C. A.; DeCarlo, C.; Boitano, L.; Png, C. Y. M.; Patell, R.; Conrad, M. F.; Eagleton, M.; Dua, A., Blood type and outcomes in patients with COVID-19. *Annals of Hematology* **2020**. <https://doi.org/10.1007/s00277-020-04169-1>
368. Lau, M. S. Y.; Grenfell, B.; Thomas, M.; Bryan, M.; Nelson, K.; Lopman, B., Characterizing superspreading events and age-specific infectiousness of SARS-CoV-2 transmission in Georgia, USA. *Proceedings of the National Academy of Sciences* **2020**, 202011802. <https://www.pnas.org/content/pnas/early/2020/08/19/2011802117.full.pdf>
369. Lauer, S. A.; Grantz, K. H.; Bi, Q.; Jones, F. K.; Zheng, Q.; Meredith, H. R.; Azman, A. S.; Reich, N. G.; Lessler, J., The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application. *Annals of Internal Medicine* **2020**. <https://doi.org/10.7326/M20-0504>
370. Lavery, A. M.; Preston, L. E.; Ko, J. Y.; et al., Characteristics of Hospitalized COVID-19 Patients Discharged and Experiencing Same-Hospital Readmission — United States, March–August 2020. *Morbidity and Mortality Weekly Report* **2020**, ePub: 9 November 2020. <https://www.cdc.gov/mmwr/volumes/69/wr/mm6945e2.htm>
371. Lavezzo, E.; Franchin, E.; Ciavarella, C.; Cuomo-Dannenburg, G.; Barzon, L.; Del Vecchio, C.; Rossi, L.; Manganelli, R.; Loregian, A.; Navarin, N.; Abate, D.; Sciro, M.; Merigliano, S.; De Canale, E.; Vanuzzo, M. C.; Besutti, V.; Saluzzo, F.; Onelia, F.; Pacenti, M.; Parisi, S.; Carretta, G.; Donato, D.; Flor, L.; Cocchio, S.; Masi, G.; Sperduti, A.; Cattarino, L.; Salvador, R.; Nicoletti, M.; Caldart, F.; Castelli, G.; Nieddu, E.; Labella, B.; Fava, L.; Drigo, M.; Gaythorpe, K. A. M.; Ainslie, K. E. C.; Baguelin, M.; Bhatt, S.; Boonyasiri, A.; Boyd, O.; Cattarino, L.; Ciavarella, C.; Coupland, H. L.; Cucunubá, Z.; Cuomo-Dannenburg, G.; Djafaara, B. A.; Donnelly, C. A.; Dorigatti, I.; van Elsland, S. L.; FitzJohn, R.; Flaxman, S.; Gaythorpe, K. A. M.; Green, W. D.; Hallett, T.; Hamlet, A.; Haw, D.; Imai, N.; Jeffrey, B.; Knock, E.; Laydon, D. J.; Mellan, T.; Mishra, S.; Nedjati-Gilani, G.; Nouvellet, P.; Okell, L. C.; Parag, K. V.; Riley, S.; Thompson, H. A.; Unwin, H. J. T.; Verity, R.; Vollmer, M. A. C.; Walker, P. G. T.; Walters, C. E.; Wang, H.; Wang, Y.; Watson, O. J.; Whittaker, C.; Whittles, L. K.; Xi, X.; Ferguson, N. M.; Brazzale, A. R.; Toppo, S.; Trevisan, M.; Baldo, V.; Donnelly, C. A.; Ferguson, N. M.; Dorigatti, I.; Crisanti, A.; Imperial College, C.-R. T., Suppression of a SARS-CoV-2 outbreak in the Italian municipality of Vo'. *Nature* **2020**. <https://doi.org/10.1038/s41586-020-2488-1>
372. Laws, R. L.; Chancey, R. J.; Rabold, E. M.; Chu, V. T.; Lewis, N. M.; Fajans, M.; Reses, H. E.; Duca, L. M.; Dawson, P.; Conners, E. E.; Gharpure, R.; Yin, S.; Buono, S.; Pomeroy, M.; Yousaf, A. R.; Owusu, D.; Wadhwa, A.; Pevzner, E.; Battey, K. A.; Njuguna, H.; Fields, V. L.; Salvatore, P.; O'Hegarty, M.; Vuong, J.; Gregory, C. J.; Banks, M.; Rispens, J.; Dietrich, E.; Marcenac, P.; Matanock, A.; Pray, I.; Westergaard, R.; Dasu, T.; Bhattacharyya, S.; Christiansen, A.; Page, L.; Dunn, A.; Atkinson-Dunn, R.; Christensen, K.; Kiphibane, T.; Willardson, S.; Fox, G.; Ye, D.; Nabity, S. A.; Binder, A.; Freeman, B. D.; Lester, S.; Mills, L.; Thornburg, N.; Hall, A. J.; Fry, A. M.; Tate, J. E.; Tran, C. H.; Kirking, H. L., Symptoms and Transmission of SARS-CoV-2 Among Children — Utah and Wisconsin, March–May 2020. *Pediatrics* **2020**, e2020027268. <https://pediatrics.aappublications.org/content/pediatrics/early/2020/12/01/peds.2020-027268.full.pdf>

373. Laxminarayan, R.; Wahl, B.; Dudala, S. R.; Gopal, K.; Mohan, C.; Neelima, S.; Jawahar Reddy, K. S.; Radhakrishnan, J.; Lewnard, J. A., Epidemiology and transmission dynamics of COVID-19 in two Indian states. *Science* **2020**, eabd7672.
<https://science.sciencemag.org/content/sci/early/2020/09/29/science.abd7672.full.pdf>
374. Le Bert, N.; Clapham, H. E.; Tan, A. T.; Chia, W. N.; Tham, C. Y.; Lim, J. M.; Kunasegaran, K.; Tan, L.; Dutertre, C.-A.; Shankar, N.; Lim, J. M.; Sun, L. J.; Zahari, M.; Tun, Z. M.; Kumar, V.; Lim, B. L.; Lim, S. H.; Chia, A.; Tan, Y.-J.; Tambyah, P. A.; Kalimuddin, S.; Lye, D. C.; Low, J. G.; Wang, L.-F.; Wan, W. Y.; Hsu, L. Y.; Bertolotti, A.; Tam, C. C., Highly functional virus-specific cellular immune response in asymptomatic SARS-CoV-2 infection. *bioRxiv* **2020**, 2020.11.25.399139.
<https://www.biorxiv.org/content/biorxiv/early/2020/11/27/2020.11.25.399139.full.pdf>
375. Le Bert, N.; Tan, A. T.; Kunasegaran, K.; Tham, C. Y. L.; Hafezi, M.; Chia, A.; Chng, M. H. Y.; Lin, M.; Tan, N.; Linster, M.; Chia, W. N.; Chen, M. I. C.; Wang, L.-F.; Ooi, E. E.; Kalimuddin, S.; Tambyah, P. A.; Low, J. G.-H.; Tan, Y.-J.; Bertolotti, A., SARS-CoV-2-specific T cell immunity in cases of COVID-19 and SARS, and uninfected controls. *Nature* **2020**. <https://doi.org/10.1038/s41586-020-2550-z>
376. Leclerc, Q.; Fuller, N.; Knight, L.; null, n.; Funk, S.; Knight, G., What settings have been linked to SARS-CoV-2 transmission clusters? [version 2; peer review: 2 approved]. *Wellcome Open Research* **2020**, 5 (83). <https://wellcomeopenresearch.org/articles/5-83/v2>
377. Lee, C. Y.-P.; Amrun, S. N.; Chee, R. S.-L.; Goh, Y. S.; Mak, T.-M.; Octavia, S.; Yeo, N. K.-W.; Chang, Z. W.; Tay, M. Z.; Torres-Ruesta, A.; Carissimo, G.; Poh, C. M.; Fong, S.-W.; Bei, W.; Lee, S.; Young, B. E.; Tan, S.-Y.; Leo, Y.-S.; Lye, D. C.; Lin, R. T. P.; Maurer-Stroh, S.; Lee, B.; Cheng-I, W.; Renia, L.; Ng, L. F. P., Neutralizing antibodies from early cases of SARS-CoV-2 infection offer cross-protection against the SARS-CoV-2 D614G variant. *bioRxiv* **2020**, 2020.10.08.332544.
<https://www.biorxiv.org/content/biorxiv/early/2020/10/09/2020.10.08.332544.full.pdf>
378. Lee, E. H.; Kepler, K. L.; Geevarughese, A.; Paneth-Pollak, R.; Dorsinville, M. S.; Ngai, S.; Reilly, K. H., Race/Ethnicity Among Children With COVID-19–Associated Multisystem Inflammatory Syndrome. *JAMA Network Open* **2020**, 3 (11), e2030280-e2030280.
<https://doi.org/10.1001/jamanetworkopen.2020.30280>
379. Lee, J.; Hughes, T.; Lee, M.-H.; Field, H.; Rovie-Ryan, J. J.; Sitam, F. T.; Sipangkui, S.; Nathan, S. K. S.; Ramirez, D.; Kumar, S. V.; Lasimbang, H.; Epstein, J. H.; Daszak, P., No evidence of coronaviruses or other potentially zoonotic viruses in Sunda pangolins (*Manis javanica*) entering the wildlife trade via Malaysia. *bioRxiv* **2020**, 2020.06.19.158717.
<https://www.biorxiv.org/content/biorxiv/early/2020/06/19/2020.06.19.158717.full.pdf>
380. Lee, Y.-H.; Hong, C. M.; Kim, D. H.; Lee, T. H.; Lee, J., Clinical Course of Asymptomatic and Mildly Symptomatic Patients with Coronavirus Disease Admitted to Community Treatment Centers, South Korea. *Emerging Infectious Disease journal* **2020**, 26 (10). https://wwwnc.cdc.gov/eid/article/26/10/20-1620_article
381. Lendvay, T. S.; Chen, J.; Harcourt, B. H.; Scholte, F. E. M.; Kilinc-Balci, F. S.; Lin, Y. L.; Lamb, M. M.; Chu, L. F.; Price, A.; Evans, D.; Lin, Y.-C.; Mores, C. N.; Sahni, J.; Kabra, K. B.; Haubruge, E.; Thiry, E.; Heyne, B.; Laperre, J.; Simmons, S.; Davies, J. M.; Cui, Y.; Wagner, T.; Clark, T.; Smit, S. J.; Parker, R.; Gallagher, T.; Timm, E.; Ludwig-Begall, L. F.; Macia, N.; Mackie, C.; Hope, K.; Page, K.; Reader, S.; Faris, P.; Joloi, O.; Patel, A.; Lemyre, J.-L.; Molloy-Simard, V.; Homdayjanakul, K.; Tritsch, S. R.; Wielick, C.; Mayo, M.; Malott, R.; Willaert, J.-F.; Nauwynck, H.; Dams, L.; De Jaeger, S.; Liao, L.; Zhao, M.; Chu, S.; Conly, J. M.; Chu, M. C., Addressing Personal Protective Equipment (PPE) Decontamination: Methylene Blue and Light Inactivates SARS-CoV-2 on N95 Respirators and Masks with Maintenance of Integrity and Fit. *medRxiv* **2020**, 2020.12.11.20236919.
<https://www.medrxiv.org/content/medrxiv/early/2020/12/12/2020.12.11.20236919.full.pdf>
382. Lenze, E. J.; Mattar, C.; Zorumski, C. F.; Stevens, A.; Schweiger, J.; Nicol, G. E.; Miller, J. P.; Yang, L.; Yingling, M.; Avidan, M. S.; Reiersen, A. M., Fluvoxamine vs Placebo and Clinical Deterioration in

Outpatients With Symptomatic COVID-19: A Randomized Clinical Trial. *JAMA* 2020.

<https://doi.org/10.1001/jama.2020.22760>

383. Letizia, A. G.; Ramos, I.; Obla, A.; Goforth, C.; Weir, D. L.; Ge, Y.; Bamman, M. M.; Dutta, J.; Ellis, E.; Estrella, L.; George, M.-C.; Gonzalez-Reiche, A. S.; Graham, W. D.; van de Guchte, A.; Gutierrez, R.; Jones, F.; Kalomoiri, A.; Lizewski, R.; Lizewski, S.; Marayag, J.; Marjanovic, N.; Millar, E. V.; Nair, V. D.; Nudelman, G.; Nunez, E.; Pike, B. L.; Porter, C.; Regeimbal, J.; Rirak, S.; Santa Ana, E.; Sealfon, R. S. G.; Sebra, R.; Simons, M. P.; Soares-Schanoski, A.; Sugiharto, V.; Termini, M.; Vangeti, S.; Williams, C.; Troyanskaya, O. G.; van Bakel, H.; Sealfon, S. C., SARS-CoV-2 Transmission among Marine Recruits during Quarantine. *New England Journal of Medicine* 2020.

<https://www.nejm.org/doi/full/10.1056/NEJMoa2029717>

384. Leung, N. H. L.; Chu, D. K. W.; Shiu, E. Y. C.; Chan, K.-H.; McDevitt, J. J.; Hau, B. J. P.; Yen, H.-L.; Li, Y.; Ip, D. K. M.; Peiris, J. S. M.; Seto, W.-H.; Leung, G. M.; Milton, D. K.; Cowling, B. J., Respiratory virus shedding in exhaled breath and efficacy of face masks. *Nature Medicine* 2020.

<https://doi.org/10.1038/s41591-020-0843-2>

385. Lewis, D., Is the coronavirus airborne? Experts can't agree. *Nature* 2020. 10.1038/d41586-020-00974-w

386. Lewis, N. M.; Chu, V. T.; Ye, D.; al., e., Household Transmission of SARS-CoV-2 in the United States. *Clinical Infectious Diseases* 2020. <https://doi.org/10.1093/cid/ciaa1166>

387. Li, D.; Jin, M.; Bao, P.; Zhao, W.; Zhang, S., Clinical Characteristics and Results of Semen Tests Among Men With Coronavirus Disease 2019. *JAMA Network Open* 2020, 3 (5), e208292-e208292.

<https://doi.org/10.1001/jamanetworkopen.2020.8292>

388. Li, K.; Wohlford-Lenane, C.; Perlman, S.; Zhao, J.; Jewell, A. K.; Reznikov, L. R.; Gibson-Corley, K. N.; Meyerholz, D. K.; McCray, P. B., Jr., Middle East Respiratory Syndrome Coronavirus Causes Multiple Organ Damage and Lethal Disease in Mice Transgenic for Human Dipeptidyl Peptidase 4. *J Infect Dis* 2016, 213 (5), 712-22. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4747621/pdf/jiv499.pdf>

389. Li, Q.; Guan, X.; Wu, P.; Wang, X.; Zhou, L.; Tong, Y.; Ren, R.; Leung, K. S. M.; Lau, E. H. Y.; Wong, J. Y.; Xing, X.; Xiang, N.; Wu, Y.; Li, C.; Chen, Q.; Li, D.; Liu, T.; Zhao, J.; Liu, M.; Tu, W.; Chen, C.; Jin, L.; Yang, R.; Wang, Q.; Zhou, S.; Wang, R.; Liu, H.; Luo, Y.; Liu, Y.; Shao, G.; Li, H.; Tao, Z.; Yang, Y.; Deng, Z.; Liu, B.; Ma, Z.; Zhang, Y.; Shi, G.; Lam, T. T. Y.; Wu, J. T.; Gao, G. F.; Cowling, B. J.; Yang, B.; Leung, G. M.; Feng, Z., Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. *New England Journal of Medicine* 2020. <https://www.nejm.org/doi/full/10.1056/NEJMoa2001316>

<https://www.nejm.org/doi/10.1056/NEJMoa2001316>

390. Li, Q.; Li, W.; Jin, Y.; Xu, W.; Huang, C.; Li, L.; Huang, Y.; Fu, Q.; Chen, L., Efficacy Evaluation of Early, Low-Dose, Short-Term Corticosteroids in Adults Hospitalized with Non-Severe COVID-19 Pneumonia: A Retrospective Cohort Study. *Infect Dis Ther* 2020.

391. Li, R.; Pei, S.; Chen, B.; Song, Y.; Zhang, T.; Yang, W.; Shaman, J., Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV2). *Science* 2020, eabb3221.

<https://science.sciencemag.org/content/sci/early/2020/03/13/science.abb3221.full.pdf>

392. Li, X.; Giorgi, E. E.; Marichannegowda, M. H.; Foley, B.; Xiao, C.; Kong, X.-P.; Chen, Y.; Gnanakaran, S.; Korber, B.; Gao, F., Emergence of SARS-CoV-2 through recombination and strong purifying selection. *Science Advances* 2020, eabb9153.

<https://advances.sciencemag.org/content/advances/early/2020/05/28/sciadv.abb9153.full.pdf>

393. Li, X.; Xiao, K.; Chen, X.; Liang, X.; Zhang, X.; Zhang, Z.; Zhai, J.; Wang, R.; Zhou, N.; Chen, Z.-J.; Su, R.; Zhou, F.; Holmes, E. C.; Irwin, D. M.; Chen, R.-A.; He, Q.; Wu, Y.-J.; Wang, C.; Du, X.-Q.; Peng, S.-M.; Xie, W.-J.; Shan, F.; Li, W.-P.; Dai, J.-W.; Shen, X.; Feng, Y.; Xiao, L.; Chen, W.; Shen, Y., Pathogenicity, tissue tropism and potential vertical transmission of SARS-CoV-2 in Malayan pangolins. *bioRxiv* 2020, 2020.06.22.164442. <http://biorxiv.org/content/early/2020/06/22/2020.06.22.164442.abstract>

394. Li, X.; Zai, J.; Zhao, Q.; Nie, Q.; Li, Y.; Foley, B. T.; Chaillon, A., Evolutionary history, potential intermediate animal host, and cross-species analyses of SARS-CoV-2. *Journal of Medical Virology* **2020**, n/a (n/a). <https://onlinelibrary.wiley.com/doi/abs/10.1002/jmv.25731>
395. Li, Y.; Campbell, H.; Kulkarni, D.; Harpur, A.; Nundy, M.; Wang, X.; Nair, H., The temporal association of introducing and lifting non-pharmaceutical interventions with the time-varying reproduction number (R) of SARS-CoV-2: a modelling study across 131 countries. *The Lancet Infectious Diseases* **2020**. [https://doi.org/10.1016/S1473-3099\(20\)30785-4](https://doi.org/10.1016/S1473-3099(20)30785-4)
396. Li, Y.; Qian, H.; Hang, J.; Chen, X.; Hong, L.; Liang, P.; Li, J.; Xiao, S.; Wei, J.; Liu, L.; Kang, M., Evidence for probable aerosol transmission of SARS-CoV-2 in a poorly ventilated restaurant. *medRxiv* **2020**, 2020.04.16.20067728. <https://www.medrxiv.org/content/medrxiv/early/2020/04/22/2020.04.16.20067728.full.pdf>
397. Li, Y.; Xie, Z.; Lin, W.; Cai, W.; Wen, C.; Guan, Y.; Mo, X.; Wang, J.; Wang, Y.; Peng, P.; Chen, X.; Hong, W.; Xiao, G.; Liu, J.; Zhang, L.; Hu, F.; Li, F.; Zhang, F.; Deng, X.; Li, L., Efficacy and safety of lopinavir/ritonavir or arbidol in adult patients with mild/moderate COVID-19: an exploratory randomized controlled trial. *Med*. <https://doi.org/10.1016/j.medj.2020.04.001>
398. Liao, J.; Fan, S.; Chen, J.; Wu, J.; Xu, S.; Guo, Y.; Li, C.; Zhang, X.; Wu, C.; Mou, H., Epidemiological and clinical characteristics of COVID-19 in adolescents and young adults. *The Innovation* **2020**, 1 (1), 100001.
399. Lieu, A.; Mah, J.; Zanichelli, V.; Exantus, R. C.; Longtin, Y., Impact of Extended Use and Decontamination with Vaporized Hydrogen Peroxide on N95 Respirator Fit. *American Journal of Infection Control* **2020**. <https://doi.org/10.1016/j.ajic.2020.08.010>
400. Lilly, E., Bamlanivimab for COVID-19. Eli Lilly: 2020. <https://www.lilly.com/news/media/media-kits/bamlanivimab-covid19>
401. Lilly, E., Lilly Statement Regarding NIH's ACTIV-3 Clinical Trial. Eli Lilly and Company: 2020. <https://www.lilly.com/news/stories/statement-activ3-clinical-trial-nih-covid19>
402. Liotta, E. M.; Batra, A.; Clark, J. R.; Shlobin, N. A.; Hoffman, S. C.; Orban, Z. S.; Korolnik, I. J., Frequent neurologic manifestations and encephalopathy-associated morbidity in Covid-19 patients. *Annals of Clinical and Translational Neurology* **2020**, n/a (n/a). <https://onlinelibrary.wiley.com/doi/abs/10.1002/acn3.51210>
403. Liotti, F. M.; Menchinelli, G.; Marchetti, S.; Posteraro, B.; Landi, F.; Sanguinetti, M.; Cattani, P., Assessment of SARS-CoV-2 RNA Test Results Among Patients Who Recovered From COVID-19 With Prior Negative Results. *JAMA Internal Medicine* **2020**. <https://doi.org/10.1001/jamainternmed.2020.7570>
404. Lisboa Bastos, M.; Tavaziva, G.; Abidi, S. K.; Campbell, J. R.; Haraoui, L.-P.; Johnston, J. C.; Lan, Z.; Law, S.; MacLean, E.; Trajman, A.; Menzies, D.; Benedetti, A.; Ahmad Khan, F., Diagnostic accuracy of serological tests for covid-19: systematic review and meta-analysis. *BMJ* **2020**, 370, m2516. <https://www.bmj.com/content/bmj/370/bmj.m2516.full.pdf>
405. Liu, J.; Zhang, S.; Dong, X.; Li, Z.; Xu, Q.; Feng, H.; Cai, J.; Huang, S.; Guo, J.; Zhang, L.; Chen, Y.; Zhu, W.; Du, H.; Liu, Y.; Wang, T.; Chen, L.; Wen, Z.; Annane, D.; Qu, J.; Chen, D., Corticosteroid treatment in severe COVID-19 patients with acute respiratory distress syndrome. *J Clin Invest* **2020**.
406. Liu, M.; Li, Q.; Zhou, J.; Ai, W.; Zheng, X.; Zeng, J.; Liu, Y.; Xiang, X.; Guo, R.; Li, X.; Wu, X.; Xu, H.; Jiang, L.; Zhang, H.; Chen, J.; Tian, L.; Luo, J.; Luo, C., Value of swab types and collection time on SARS-CoV-2 detection using RT-PCR assay. *Journal of Virological Methods* **2020**, 286, 113974. <http://www.sciencedirect.com/science/article/pii/S0166093420302263>
407. Liu, N.; Zhang, T.; Ma, L.; Zhang, H.; Wang, H.; Wei, W.; Pei, H.; Li, H., The impact of ABO blood group on COVID-19 infection risk and mortality: A systematic review and meta-analysis. *Blood Rev* **2020**, 100785.

408. Liu, P.; Chen, W.; Chen, J.-P., Viral Metagenomics Revealed Sendai Virus and Coronavirus Infection of Malayan Pangolins (*Manis javanica*). *Viruses* **2019**, *11* (11), 979. <https://www.mdpi.com/1999-4915/11/11/979>
409. Liu, P.; Jiang, J.-Z.; Wan, X.-F.; Hua, Y.; Li, L.; Zhou, J.; Wang, X.; Hou, F.; Chen, J.; Zou, J.; Chen, J., Are pangolins the intermediate host of the 2019 novel coronavirus (SARS-CoV-2)? *PLOS Pathogens* **2020**, *16* (5), e1008421. <https://doi.org/10.1371/journal.ppat.1008421>
410. Liu, P.; Jiang, J.-Z.; Wan, X.-F.; Hua, Y.; Wang, X.; Hou, F.; Chen, J.; Zou, J.; Chen, J., Are pangolins the intermediate host of the 2019 novel coronavirus (2019-nCoV) ? *bioRxiv* **2020**, 2020.02.18.954628. <http://biorxiv.org/content/early/2020/02/20/2020.02.18.954628.abstract>
411. Liu, S., U of Guelph team tests produce decontamination technology on hospital gowns. <https://www.cbc.ca/news/canada/kitchener-waterloo/decontaminate-hospital-gowns-1.5788587> (accessed 09 Nov 2020).
412. Liu, W.; Zhang, Q.; Chen, J.; Xiang, R.; Song, H.; Shu, S.; Chen, L.; Liang, L.; Zhou, J.; You, L.; Wu, P.; Zhang, B.; Lu, Y.; Xia, L.; Huang, L.; Yang, Y.; Liu, F.; Semple, M. G.; Cowling, B. J.; Lan, K.; Sun, Z.; Yu, H.; Liu, Y., Detection of Covid-19 in Children in Early January 2020 in Wuhan, China. *New England Journal of Medicine* **2020**. <https://www.nejm.org/doi/full/10.1056/NEJMc2003717>
413. Liu, Y.; Funk, S.; Flasche, S., *The Contribution of Pre-symptomatic Transmission to the COVID-19 Outbreak*; London School of Hygiene and Tropical Medicine: 2020. <https://cmmid.github.io/topics/covid19/control-measures/pre-symptomatic-transmission.html>
414. Liu, Y.; Li, T.; Deng, Y.; Liu, S.; Zhang, D.; Li, H.; Wang, X.; Jia, L.; Han, J.; Bei, Z.; Zhou, Y.; Li, L.; Li, J., Stability of SARS-CoV-2 on environmental surfaces and in human excreta. *medRxiv* **2020**, 2020.05.07.20094805. <https://www.medrxiv.org/content/medrxiv/early/2020/05/12/2020.05.07.20094805.full.pdf>
415. Liu, Z.; Li, J.; Long, W.; Zeng, W.; Gao, R.; Zeng, G.; Chen, D.; Wang, S.; Li, Q.; Hu, D.; Guo, L.; Li, Z.; Wu, X., Bilirubin Levels as Potential Indicators of Disease Severity in Coronavirus Disease Patients: A Retrospective Cohort Study. *Frontiers in Medicine* **2020**, *7* (799). <https://www.frontiersin.org/article/10.3389/fmed.2020.598870>
416. Long, Q.-X.; Liu, B.-Z.; Deng, H.-J.; Wu, G.-C.; Deng, K.; Chen, Y.-K.; Liao, P.; Qiu, J.-F.; Lin, Y.; Cai, X.-F.; Wang, D.-Q.; Hu, Y.; Ren, J.-H.; Tang, N.; Xu, Y.-Y.; Yu, L.-H.; Mo, Z.; Gong, F.; Zhang, X.-L.; Tian, W.-G.; Hu, L.; Zhang, X.-X.; Xiang, J.-L.; Du, H.-X.; Liu, H.-W.; Lang, C.-H.; Luo, X.-H.; Wu, S.-B.; Cui, X.-P.; Zhou, Z.; Zhu, M.-M.; Wang, J.; Xue, C.-J.; Li, X.-F.; Wang, L.; Li, Z.-J.; Wang, K.; Niu, C.-C.; Yang, Q.-J.; Tang, X.-J.; Zhang, Y.; Liu, X.-M.; Li, J.-J.; Zhang, D.-C.; Zhang, F.; Liu, P.; Yuan, J.; Li, Q.; Hu, J.-L.; Chen, J.; Huang, A.-L., Antibody responses to SARS-CoV-2 in patients with COVID-19. *Nature Medicine* **2020**. <https://doi.org/10.1038/s41591-020-0897-1>
417. Long, Q.-X.; Tang, X.-J.; Shi, Q.-L.; Li, Q.; Deng, H.-J.; Yuan, J.; Hu, J.-L.; Xu, W.; Zhang, Y.; Lv, F.-J.; Su, K.; Zhang, F.; Gong, J.; Wu, B.; Liu, X.-M.; Li, J.-J.; Qiu, J.-F.; Chen, J.; Huang, A.-L., Clinical and immunological assessment of asymptomatic SARS-CoV-2 infections. *Nature Medicine* **2020**. <https://doi.org/10.1038/s41591-020-0965-6>
418. Long, S. W.; Olsen, R. J.; Christensen, P. A.; Bernard, D. W.; Davis, J. J.; Shukla, M.; Nguyen, M.; Saavedra, M. O.; Yerramilli, P.; Pruitt, L.; Subedi, S.; Kuo, H.-C.; Hendrickson, H.; Eskandari, G.; Nguyen, H. A. T.; Long, J. H.; Kumaraswami, M.; Goike, J.; Boutz, D.; Gollihar, J.; McLellan, J. S.; Chou, C.-W.; Javanmardi, K.; Finkelstein, I. J.; Musser, J., Molecular Architecture of Early Dissemination and Massive Second Wave of the SARS-CoV-2 Virus in a Major Metropolitan Area. *medRxiv* **2020**, 2020.09.22.20199125. <http://medrxiv.org/content/early/2020/09/25/2020.09.22.20199125.abstract>
419. Lu, J.; Plessis, L. d.; Liu, Z.; Hill, V.; Kang, M.; Lin, H.; Sun, J.; Francois, S.; Kraemer, M. U. G.; Faria, N. R.; McCrone, J. T.; Peng, J.; Xiong, Q.; Yuan, R.; Zeng, L.; Zhou, P.; Liang, C.; Yi, L.; Liu, J.; Xiao, J.; Hu, J.; Liu, T.; Ma, W.; Li, W.; Su, J.; Zheng, H.; Peng, B.; Fang, S.; Su, W.; Li, K.; Sun, R.; Bai, R.; Tang, X.; Liang, M.; Quick, J.; Song, T.; Rambaut, A.; Loman, N.; Raghwani, J.; Pybus, O.; Ke, C., Genomic epidemiology of

SARS-CoV-2 in Guangdong Province, China. *medRxiv* **2020**, 2020.04.01.20047076.

<https://www.medrxiv.org/content/medrxiv/early/2020/04/04/2020.04.01.20047076.full.pdf>

420. Lu, R.; Zhao, X.; Li, J.; Niu, P.; Yang, B.; Wu, H.; Wang, W.; Song, H.; Huang, B.; Zhu, N.; Bi, Y.; Ma, X.; Zhan, F.; Wang, L.; Hu, T.; Zhou, H.; Hu, Z.; Zhou, W.; Zhao, L.; Chen, J.; Meng, Y.; Wang, J.; Lin, Y.; Yuan, J.; Xie, Z.; Ma, J.; Liu, W. J.; Wang, D.; Xu, W.; Holmes, E. C.; Gao, G. F.; Wu, G.; Chen, W.; Shi, W.; Tan, W., Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *The Lancet* **2020**. [https://doi.org/10.1016/S0140-6736\(20\)30251-8](https://doi.org/10.1016/S0140-6736(20)30251-8)

421. Lu, S.; Zhao, Y.; Yu, W.; Yang, Y.; Gao, J.; Wang, J.; Kuang, D.; Yang, M.; Yang, J.; Ma, C.; Xu, J.; Qian, X.; Li, H.; Zhao, S.; Li, J.; Wang, H.; Long, H.; Zhou, J.; Luo, F.; Ding, K.; Wu, D.; Zhang, Y.; Dong, Y.; Liu, Y.; Zheng, Y.; Lin, X.; Jiao, L.; Zheng, H.; Dai, Q.; Sun, Q.; Hu, Y.; Ke, C.; Liu, H.; Peng, X., Comparison of nonhuman primates identified the suitable model for COVID-19. *Signal Transduction and Targeted Therapy* **2020**, 5 (1), 157. <https://doi.org/10.1038/s41392-020-00269-6>

422. Lu, S.; Zhao, Y.; Yu, W.; Yang, Y.; Gao, J.; Wang, J.; Kuang, D.; Yang, M.; Yang, J.; Ma, C.; Xu, J.; Qian, X.; Li, H.; Zhao, S.; Li, J.; Wang, H.; Long, H.; Zhou, J.; Luo, F.; Ding, K.; Wu, D.; Zhang, Y.; Dong, Y.; Liu, Y.; Zheng, Y.; Lin, X.; Jiao, L.; Zheng, H.; Dai, Q.; Sun, Q.; Hu, Y.; Ke, C.; Liu, H.; Peng, X., Comparison of SARS-CoV-2 infections among 3 species of non-human primates. *bioRxiv* **2020**, 2020.04.08.031807.

<https://www.biorxiv.org/content/biorxiv/early/2020/04/12/2020.04.08.031807.full.pdf>

423. Lu, X.; Zhang, L.; Du, H.; Zhang, J.; Li, Y. Y.; Qu, J.; Zhang, W.; Wang, Y.; Bao, S.; Li, Y.; Wu, C.; Liu, H.; Liu, D.; Shao, J.; Peng, X.; Yang, Y.; Liu, Z.; Xiang, Y.; Zhang, F.; Silva, R. M.; Pinkerton, K. E.; Shen, K.; Xiao, H.; Xu, S.; Wong, G. W. K., SARS-CoV-2 Infection in Children. *New England Journal of Medicine* **2020**.

<https://www.nejm.org/doi/full/10.1056/NEJMc2005073>

424. Lu, Y.-f.; Pan, L.-y.; Zhang, W.-W.; Cheng, F.; Hu, S.-S.; Zhang, X.; Jiang, H.-y., A meta-analysis of the incidence of venous thromboembolic events and impact of anticoagulation on mortality in patients with COVID-19. *International Journal of Infectious Diseases* **2020**. <https://doi.org/10.1016/j.ijid.2020.08.023>

425. Lu, Y.; Li, Y.; Deng, W.; Liu, M.; He, Y.; Huang, L.; Lv, M.; Li, J.; Du, H., Symptomatic Infection is Associated with Prolonged Duration of Viral Shedding in Mild Coronavirus Disease 2019: A Retrospective Study of 110 Children in Wuhan. *Pediatr Infect Dis J* **2020**.

426. Lumley, S. F.; O'Donnell, D.; Stoesser, N. E.; Matthews, P. C.; Howarth, A.; Hatch, S. B.; Marsden, B. D.; Cox, S.; James, T.; Warren, F.; Peck, L. J.; Ritter, T. G.; de Toledo, Z.; Warren, L.; Axten, D.; Cornall, R. J.; Jones, E. Y.; Stuart, D. I.; Sreaton, G.; Ebner, D.; Hoosdally, S.; Chand, M.; Crook, D. W.; O'Donnell, A.-M.; Conlon, C. P.; Pouwels, K. B.; Walker, A. S.; Peto, T. E.; Hopkins, S.; Walker, T. M.; Jeffery, K.; Eyre, D. W., Antibodies to SARS-CoV-2 are associated with protection against reinfection. *medRxiv* **2020**, 2020.11.18.20234369.

<https://www.medrxiv.org/content/medrxiv/early/2020/11/19/2020.11.18.20234369.full.pdf>

427. Luo, K.; Lei, Z.; Hai, Z.; Xiao, S.; Rui, J.; Yang, H.; Jing, X.; Wang, H.; Xie, Z.; Luo, P.; Li, W.; Li, Q.; Tan, H.; Xu, Z.; Yang, Y.; Hu, S.; Chen, T., Transmission of SARS-CoV-2 in Public Transportation Vehicles: A Case Study in Hunan Province, China. *Open Forum Infectious Diseases* **2020**, 7 (10).

<https://doi.org/10.1093/ofid/ofaa430>

428. Luo, Y.; Trevathan, E.; Qian, Z.; Li, Y.; Li, J.; Xiao, W.; Tu, N.; Zeng, Z.; Mo, P.; Xiong, Y.; Ye, G., Asymptomatic SARS-CoV-2 Infection in Household Contacts of a Healthcare Provider, Wuhan, China. *Emerging Infectious Disease journal* **2020**, 26 (8). https://wwwnc.cdc.gov/eid/article/26/8/20-1016_article

429. Ma, J.; Qi, X.; Chen, H.; Li, X.; Zhang, Z.; Wang, H.; Sun, L.; Zhang, L.; Guo, J.; Morawska, L.; Grinshpun, S. A.; Biswas, P.; Flagan, R. C.; Yao, M., COVID-19 patients in earlier stages exhaled millions of SARS-CoV-2 per hour. *Clinical Infectious Diseases* **2020**. <https://doi.org/10.1093/cid/ciaa1283>

430. Madewell, Z. J.; Yang, Y.; Longini, I. M., Jr; Halloran, M. E.; Dean, N. E., Household Transmission of SARS-CoV-2: A Systematic Review and Meta-analysis. *JAMA Network Open* **2020**, 3 (12), e2031756-e2031756. <https://doi.org/10.1001/jamanetworkopen.2020.31756>

431. Magleby, R.; Westblade, L. F.; Trzebucki, A.; Simon, M. S.; Rajan, M.; Park, J.; Goyal, P.; Safford, M. M.; Satlin, M. J., Impact of SARS-CoV-2 Viral Load on Risk of Intubation and Mortality Among Hospitalized Patients with Coronavirus Disease 2019. *Clinical Infectious Diseases* **2020**.
<https://doi.org/10.1093/cid/ciaa851>
432. Maier, B. F.; Brockmann, D., Effective containment explains subexponential growth in recent confirmed COVID-19 cases in China. *Science* **2020**, *368* (6492), 742-746.
<https://science.sciencemag.org/content/sci/368/6492/742.full.pdf>
433. Majumder, M.; Mandl, K., Early transmissibility assessment of a novel coronavirus in Wuhan, China. *SSRN* **2020**. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3524675
434. Malgouyres, J.; Schoones, J. W.; Pijls, B. G., Decreased mortality in COVID-19 patients treated with Tocilizumab: a rapid systematic review and meta-analysis of observational studies. *Clin Infect Dis* **2020**.
435. Mallapaty, S., Coronavirus can infect cats — dogs, not so much. *Nature* **2020**.
<https://www.nature.com/articles/d41586-020-00984-8>
436. Mallett, S.; Allen, A. J.; Graziadio, S.; Taylor, S. A.; Sakai, N. S.; Green, K.; Suklan, J.; Hyde, C.; Shinkins, B.; Zhelev, Z.; Peters, J.; Turner, P. J.; Roberts, N. W.; di Ruffano, L. F.; Wolff, R.; Whiting, P.; Winter, A.; Bhatnagar, G.; Nicholson, B. D.; Halligan, S., At what times during infection is SARS-CoV-2 detectable and no longer detectable using RT-PCR-based tests? A systematic review of individual participant data. *BMC Med* **2020**, *18* (1), 346.
437. Mandavilli, A., The Coronavirus Is Mutating. What Does That Mean for Us? *New York Times* **2020**.
<https://www.nytimes.com/2020/12/20/health/coronavirus-britain-variant.html?action=click&module=Top%20Stories&pgtype=Homepage>
438. Maor, Y.; Cohen, D.; Paran, N.; Israely, T.; Ezra, V.; Axelrod, O.; Shinar, E.; Izak, M.; Rahav, G.; Rahimi-Levene, N.; Bazofin, B. M.; Gelman, R.; Dicker, D.; Brosh-Nissimov, T.; Megged, O.; Dahan, D.; Benov, A.; Paz, A.; Edward, K.; Moran, A.; Rogowski, O.; Sorkine, P.; Mayo, A.; Zimhony, O.; Chen, J., Compassionate use of convalescent plasma for treatment of moderate and severe pneumonia in COVID-19 patients and association with IgG antibody levels in donated plasma. *EclinicalMedicine* **2020**, 100525.
439. Masana, L.; Correig, E.; Rodríguez-Borjabad, C.; Anoro, E.; Arroyo, J. A.; Jericó, C.; Pedragosa, A.; Miret, M.; Näf, S.; Pardo, A.; Perea, V.; Pérez-Bernalte, R.; Plana, N.; Ramírez-Montesinos, R.; Royuela, M.; Soler, C.; Urquiza-Padilla, M.; Zamora, A.; Pedro-Botet, J.; Group, O., EFFECT OF STATIN THERAPY ON SARS-CoV-2 INFECTION-RELATED. *Eur Heart J Cardiovasc Pharmacother* **2020**.
440. Mateus, J.; Grifoni, A.; Tarke, A.; Sidney, J.; Ramirez, S. I.; Dan, J. M.; Burger, Z. C.; Rawlings, S. A.; Smith, D. M.; Phillips, E.; Mallal, S.; Lammers, M.; Rubiro, P.; Quiambao, L.; Sutherland, A.; Yu, E. D.; da Silva Antunes, R.; Greenbaum, J.; Frazier, A.; Markmann, A. J.; Premkumar, L.; de Silva, A.; Peters, B.; Crotty, S.; Sette, A.; Weiskopf, D., Selective and cross-reactive SARS-CoV-2 T cell epitopes in unexposed humans. *Science* **2020**, eabd3871.
<https://science.sciencemag.org/content/sci/early/2020/08/04/science.abd3871.full.pdf>
441. Mbaeyi, S., Use of Pfizer-BioNTech COVID-19 Vaccine: Clinical Considerations. <https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2020-12/slides-12-12/COVID-03-Mbaeyi.pdf>.
442. McCoy, J.; Cadejani, F. A.; Wambier, C. G.; Herrera, S.; Vaño-Galván, S.; Mesinkovska, N. A.; Ramos, P. M.; Shapiro, J.; Sinclair, R.; Tosti, A.; Goren, A., 5-Alpha-Reductase Inhibitors are Associated with Reduced Frequency of COVID-19 Symptoms in Males with Androgenetic Alopecia. *J Eur Acad Dermatol Venereol* **2020**.
443. McElvaney, O. J.; Hobbs, B. D.; Qiao, D.; McElvaney, O. F.; Moll, M.; McEvoy, N. L.; Clarke, J.; O'Connor, E.; Walsh, S.; Cho, M. H.; Curley, G. F.; McElvaney, N. G., A linear prognostic score based on the ratio of interleukin-6 to interleukin-10 predicts outcomes in COVID-19. *EBioMedicine* **2020**, *61*, 103026. <http://www.sciencedirect.com/science/article/pii/S2352396420304023>

444. Mehta, N. S.; Mytton, O. T.; Mullins, E. W. S.; Fowler, T. A.; Falconer, C. L.; Murphy, O. B.; Langenberg, C.; Jayatunga, W. J. P.; Eddy, D. H.; Nguyen-Van-Tam, J. S., SARS-CoV-2 (COVID-19): What Do We Know About Children? A Systematic Review. *Clinical Infectious Diseases* **2020**, *71* (9), 2469-2479. <https://doi.org/10.1093/cid/ciaa556>
445. Menachery, V. D.; Dinno, K. H.; Yount, B. L.; McAnarney, E. T.; Gralinski, L. E.; Hale, A.; Graham, R. L.; Scobey, T.; Anthony, S. J.; Wang, L.; Graham, B.; Randell, S. H.; Lipkin, W. I.; Baric, R. S., Trypsin Treatment Unlocks Barrier for Zoonotic Bat Coronavirus Infection. *Journal of Virology* **2020**, *94* (5), e01774-19. <https://jvi.asm.org/content/jvi/94/5/e01774-19.full.pdf>
446. Merkle, A. E.; Parikh, N. S.; Mir, S.; Gupta, A.; Kamel, H.; Lin, E.; Lantos, J.; Schenck, E. J.; Goyal, P.; Bruce, S. S.; Kahan, J.; Lansdale, K. N.; LeMoss, N. M.; Murthy, S. B.; Stieg, P. E.; Fink, M. E.; Iadecola, C.; Segal, A. Z.; Cusick, M.; Champion, T. R., Jr; Diaz, I.; Zhang, C.; Navi, B. B., Risk of Ischemic Stroke in Patients With Coronavirus Disease 2019 (COVID-19) vs Patients With Influenza. *JAMA Neurology* **2020**. <https://doi.org/10.1001/jamaneurol.2020.2730>
447. Meyerowitz, E. A.; Richterman, A.; Bogoch, I. I.; Low, N.; Cevik, M., Towards an accurate and systematic characterisation of persistently asymptomatic infection with SARS-CoV-2. *The Lancet Infectious Diseases* **2020**. <http://www.sciencedirect.com/science/article/pii/S1473309920308379>
448. Millett, G. A.; Jones, A. T.; Benkeser, D.; Baral, S.; Mercer, L.; Beyrer, C.; Honermann, B.; Lankiewicz, E.; Mena, L.; Crowley, J. S.; Sherwood, J.; Sullivan, P., Assessing Differential Impacts of COVID-19 on Black Communities. *Annals of Epidemiology* **2020**. <http://www.sciencedirect.com/science/article/pii/S1047279720301769>
449. Mina, M. J.; Parker, R.; Larremore, D. B., Rethinking Covid-19 Test Sensitivity — A Strategy for Containment. *New England Journal of Medicine* **2020**. <https://www.nejm.org/doi/full/10.1056/NEJMp2025631>
450. MIT, DELPHI Epidemiological Case Predictions. <https://www.covidanalytics.io/projections>.
451. Mitchell, S. L.; Ventura, S. E., Evaluation and Comparison of the Hologic Aptima SARS-CoV-2 and the CDC 2019 nCoV real-time RT-PCR Diagnostic Panel using a Four-Sample Pooling Approach. *Journal of Clinical Microbiology* **2020**, JCM.02241-20. <https://jcm.asm.org/content/jcm/early/2020/09/17/JCM.02241-20.full.pdf>
452. Mitja, O.; Ubals, M.; Corbacho, M.; Alemany, A.; Suner, C.; Tebe, C.; Tobias, A.; Penafiel, J.; Ballana, E.; Perez, C. A.; Admella, P.; Riera-Marti, N.; Laporte, P.; Mitja, J.; Clua, M.; Bertran, L.; Gavilan, S.; Ara, J.; Sarquella, M.; Argimon, J. M.; Cuatrecasas, G.; Canadas, P.; Elizalde-Torrent, A.; Fabregat, R.; Farre, M.; Forcada, A.; Flores-Mateo, G.; Lopez, C.; Muntada, E.; Nadal, N.; Narejos, S.; Gil-Ortega, A. N.; Prat, N.; Puig, J.; Quinones, C.; Ramirez-Viaplana, F.; Reyes-Uruena, J.; Riveira-Munoz, E.; Ruiz, L.; Sanz, S.; Sentis, A.; Sierra, A.; Velasco, C.; Vivanco-Hidalgo, R. M.; Zamora, J.; Casabona, J.; Vall-Mayans, M.; G-Beiras, C.; Clotet, B., A Cluster-Randomized Trial of Hydroxychloroquine as Prevention of Covid-19 Transmission and Disease. *medRxiv* **2020**, 2020.07.20.20157651. <http://medrxiv.org/content/early/2020/07/26/2020.07.20.20157651.abstract>
453. MITRE, COVID-19 Dashboard and Tools. <https://dashboards.c19hcc.org/>.
454. Mizumoto, K.; Kagaya, K.; Zarebski, A.; Chowell, G., Estimating the asymptomatic proportion of coronavirus disease 2019 (COVID-19) cases on board the Diamond Princess cruise ship, Yokohama, Japan, 2020. *Eurosurveillance* **2020**, *25* (10), 2000180. <https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.10.2000180>
455. Moderna, Moderna Announces Longer Shelf Life for its COVID-19 Vaccine Candidate at Refrigerated Temperatures. <https://investors.modernatx.com/news-releases/news-release-details/moderna-announces-longer-shelf-life-its-covid-19-vaccine>.
456. Moderna, Moderna Announces Primary Efficacy Analysis in Phase 3 COVE Study for Its COVID-19 Vaccine Candidate and Filing Today with U.S. FDA for Emergency Use Authorization.

<https://investors.modernatx.com/news-releases/news-release-details/moderna-announces-primary-efficacy-analysis-phase-3-cove-study>.

457. Moghadam, S. A.; Dini, P.; Nassiri, S.; Motavaselian, M.; Hajibaba, M.; Sohrabi, M., Clinical features of pregnant women in Iran who died due to COVID-19. *International Journal of Gynecology & Obstetrics* **2020**, n/a (n/a). <https://obgyn.onlinelibrary.wiley.com/doi/abs/10.1002/ijgo.13461>

458. Moiseev, S.; Avdeev, S.; Tao, E.; Brovko, M.; Bulanov, N.; Zykova, A.; Akulkina, L.; Smirnova, I.; Fomin, V., Neither earlier nor late tocilizumab improved outcomes in the intensive care unit patients with COVID-19 in a retrospective cohort study. *Annals of the Rheumatic Diseases* **2020**, annrheumdis-2020-219265. <http://ard.bmj.com/content/early/2020/10/30/annrheumdis-2020-219265.abstract>

459. Monchatre-Leroy, E.; Lesellier, S.; Wasniewski, M.; Picard-Meyer, E.; Richomme, C.; Boué, F.; Lacôte, S.; Murri, S.; Pulido, C.; Vulin, J.; Salguero, F. J.; Gouilh, M. A.; Servat, A.; Marianneau, P., Hamster and ferret experimental infection with intranasal low dose of a single strain of SARS-CoV-2. *bioRxiv* **2020**, 2020.09.24.311977.

<http://biorxiv.org/content/early/2020/09/24/2020.09.24.311977.abstract>

460. Monk, P. D.; Marsden, R. J.; Tear, V. J.; Brookes, J.; Batten, T. N.; Mankowski, M.; Gabbay, F. J.; Davies, D. E.; Holgate, S. T.; Ho, L. P.; Clark, T.; Djukanovic, R.; Wilkinson, T. M. A., Safety and efficacy of inhaled nebulised interferon beta-1a (SNG001) for treatment of SARS-CoV-2 infection: a randomised, double-blind, placebo-controlled, phase 2 trial. *Lancet Respir Med* **2020**.

461. Monreal, E.; Sainz de la Maza, S.; Natera-Villalba, E.; Beltrán-Corbellini, Á.; Rodríguez-Jorge, F.; Fernández-Velasco, J. I.; Walo-Delgado, P.; Muriel, A.; Zamora, J.; Alonso-Canovas, A.; Fortún, J.; Manzano, L.; Montero-Errasquín, B.; Costa-Frossard, L.; Masjuan, J.; Villar, L. M., High versus standard doses of corticosteroids in severe COVID-19: a retrospective cohort study. *Eur J Clin Microbiol Infect Dis* **2020**, 1-9.

462. Montopoli, M.; Zumerle, S.; Vettor, R.; Ruge, M.; Zorzi, M.; Catapano, C. V.; Carbone, G.; Cavalli, A.; Pagano, F.; Ragazzi, E., Androgen-deprivation therapies for prostate cancer and risk of infection by SARS-CoV-2: a population-based study (n= 4532). *Annals of Oncology* **2020**.

463. Moore, J. T.; Ricaldi, J. N.; Rose, C. E.; al., e., Disparities in Incidence of COVID-19 Among Underrepresented Racial/Ethnic Groups in Counties Identified as Hotspots During June 5–18, 2020 — 22 States, February–June 2020. *Morbidity and Mortality Weekly Report* **2020**, ePub: 14 August 2020.

464. Morawska, L.; Milton, D. K., It is Time to Address Airborne Transmission of COVID-19. *Clinical Infectious Diseases* **2020**. <https://doi.org/10.1093/cid/ciaa939>

465. Moriarty, L. F.; Plucinski, M. M.; Marston, B. J. e. a., Public Health Responses fo COVID-19 Outbreaks on Cruise Ships - Worldwide, February - March 2020. *MMWR* **2020**, (ePub: 23 March 2020). <https://www.cdc.gov/mmwr/volumes/69/wr/mm6912e3.htm>

466. Morley, C. P.; Anderson, K. B.; Shaw, J.; Stewart, T.; Thomas, S. J.; Wang, D., Social Distancing Metrics and Estimates of SARS-CoV-2 Transmission Rates: Associations Between Mobile Telephone Data Tracking and R. *Journal of Public Health Management and Practice* **9000**, Publish Ahead of Print. https://journals.lww.com/jphmp/Fulltext/9000/Social_Distancing_Metrics_and_Estimates_of.99258.aspx

467. Morris, S. B.; Schwartz, N. G.; Patel, P.; al., e., Case Series of Multisystem Inflammatory Syndrome in Adults Associated with SARS-CoV-2 Infection — United Kingdom and United States, March–August 2020. *Morbidity and Mortality Weekly Report* **2020**, 2 October 2020. <https://www.cdc.gov/mmwr/volumes/69/wr/mm6940e1.htm>

468. Mudd, P. A.; Crawford, J. C.; Turner, J. S.; Souquette, A.; Reynolds, D.; Bender, D.; Bosanquet, J. P.; Anand, N. J.; Striker, D. A.; Martin, R. S.; Boon, A. C. M.; House, S. L.; Remy, K. E.; Hotchkiss, R. S.; Presti, R. M.; O'Halloran, J. A.; Powderly, W. G.; Thomas, P. G.; Ellebedy, A. H., Distinct inflammatory profiles distinguish COVID-19 from influenza with limited contributions from cytokine storm. *Science Advances*

2020, eabe3024.

<https://advances.sciencemag.org/content/advances/early/2020/11/13/sciadv.abe3024.full.pdf>

469. Munster, V. J.; Feldmann, F.; Williamson, B. N.; van Doremalen, N.; Pérez-Pérez, L.; Schulz, J.; Meade-White, K.; Okumura, A.; Callison, J.; Brumbaugh, B.; Avanzato, V. A.; Rosenke, R.; Hanley, P. W.; Saturday, G.; Scott, D.; Fischer, E. R.; de Wit, E., Respiratory disease and virus shedding in rhesus macaques inoculated with SARS-CoV-2. *bioRxiv* **2020**, 2020.03.21.001628.

<https://www.biorxiv.org/content/biorxiv/early/2020/03/21/2020.03.21.001628.full.pdf>

470. Murat, S.; Dogruoz Karatekin, B.; Icgasioglu, A.; Ulasoglu, C.; İçten, S.; Incealtin, O., Clinical presentations of pain in patients with COVID-19 infection. *Ir J Med Sci* **2020**.

471. Murphy, N.; Boland, M.; Bambury, N.; Fitzgerald, M.; Comerford, L.; Dever, N.; O'Sullivan, M. B.; Petty-Saphon, N.; Kiernan, R.; Jensen, M.; O'Connor, L., A large national outbreak of COVID-19 linked to air travel, Ireland, summer 2020. *Eurosurveillance* **2020**, 25 (42), 2001624.

<https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.42.2001624>

472. Mutambudzi, M.; Niedwiedz, C.; Macdonald, E. B.; Leyland, A.; Mair, F.; Anderson, J.; Celis-Morales, C.; Cleland, J.; Forbes, J.; Gill, J.; Hastie, C.; Ho, F.; Jani, B.; Mackay, D. F.; Nicholl, B.; O'Donnell, C.; Sattar, N.; Welsh, P.; Pell, J. P.; Katikireddi, S. V.; Demou, E., Occupation and risk of severe COVID-19: prospective cohort study of 120 075 UK Biobank participants. *Occupational and Environmental Medicine* **2020**, oemed-2020-106731.

<https://oem.bmj.com/content/oemed/early/2020/12/01/oemed-2020-106731.full.pdf>

473. Mykytyn, A. Z.; Lamers, M. M.; Okba, N. M. A.; Breugem, T. I.; Schipper, D.; van den Doel, P. B.; van Run, P.; van Amerongen, G.; de Waal, L.; Koopmans, M.; Stittelaar, K. J.; van den Brand, J.; Haagmans, B. L., Susceptibility of rabbits to SARS-CoV-2. *bioRxiv* **2020**, 2020.08.27.263988.

<http://biorxiv.org/content/early/2020/08/27/2020.08.27.263988.abstract>

474. NACCHO, U.S. COVID-19 Dashboard.

<https://naccho.maps.arcgis.com/apps/opsdashboard/index.html#/745860ceff004059aad1b6f82f196fb5>

475. Naderi-Azad, S.; Vender, R., Lessons From the First Wave of the Pandemic: Skin Features of COVID-19 can be Divided Into Inflammatory and Vascular Patterns. *Journal of Cutaneous Medicine and Surgery* **2020**, 1203475420972343. <https://doi.org/10.1177/1203475420972343>

476. Nadkarni, G. N.; Lala, A.; Bagiella, E.; Chang, H. L.; Moreno, P.; Pujadas, E.; Arvind, V.; Bose, S.; Charney, A. W.; Chen, M. D.; Cordon-Cardo, C.; Dunn, A. S.; Farkouh, M. E.; Glicksberg, B.; Kia, A.; Kohli-Seth, R.; Levin, M. A.; Timsina, P.; Zhao, S.; Fayad, Z. A.; Fuster, V., Anticoagulation, Mortality, Bleeding and Pathology Among Patients Hospitalized with COVID-19: A Single Health System Study. *Journal of the American College of Cardiology* **2020**, 27631.

<https://www.onlinejacc.org/content/accj/early/2020/08/24/j.jacc.2020.08.041.full.pdf>

477. Nasa, P.; Singh, A.; Upadhyay, S.; Bagadia, S.; Polumuru, S.; Shrivastava, P. K.; Sankar, R.; Vijayan, L.; Soliman, M. A.; Ali, A.; Patidar, S., Tocilizumab Use in COVID-19 Cytokine-release Syndrome: Retrospective Study of Two Centers. *Indian J Crit Care Med* **2020**, 24 (9), 771-776.

478. NASEM, *Airborne transmission of SARS-CoV-2; Proceedings of a Workshop - in Brief*; National Academies of Sciences, Engineering, and Medicine: 2020. <https://www.nap.edu/read/25958/chapter/1>

479. National Institutes of Health, NIH observational study of coronavirus infection and multisystem inflammatory syndrome in children begins. <https://www.nih.gov/news-events/news-releases/nih-observational-study-coronavirus-infection-multisystem-inflammatory-syndrome-children-begins> (accessed 16 Dec 2020).

480. Ndieugnou Djangang, N.; Peluso, L.; Talamonti, M.; Izzi, A.; Gevenois, P. A.; Garufi, A.; Goffard, J.-C.; Henrard, S.; Severgnini, P.; Vincent, J.-L.; Creteur, J.; Taccone, F. S., Eosinopenia in COVID-19 Patients: A Retrospective Analysis. *Microorganisms* **2020**, 8 (12), 1929. <https://www.mdpi.com/2076-2607/8/12/1929>

481. Ng, K. W.; Faulkner, N.; Cornish, G. H.; Rosa, A.; Harvey, R.; Hussain, S.; Ulferts, R.; Earl, C.; Wrobel, A. G.; Benton, D. J.; Roustan, C.; Bolland, W.; Thompson, R.; Agua-Doce, A.; Hobson, P.; Heaney, J.; Rickman, H.; Paraskevopoulou, S.; Houlihan, C. F.; Thomson, K.; Sanchez, E.; Shin, G. Y.; Spyer, M. J.; Joshi, D.; O'Reilly, N.; Walker, P. A.; Kjaer, S.; Riddell, A.; Moore, C.; Jebson, B. R.; Wilkinson, M.; Marshall, L. R.; Rosser, E. C.; Radziszewska, A.; Peckham, H.; Ciurtin, C.; Wedderburn, L. R.; Beale, R.; Swanton, C.; Gandhi, S.; Stockinger, B.; McCauley, J.; Gamblin, S. J.; McCoy, L. E.; Cherepanov, P.; Nastouli, E.; Kassiotis, G., Preexisting and de novo humoral immunity to SARS-CoV-2 in humans. *Science* **2020**, eabe1107.
<https://science.sciencemag.org/content/sci/early/2020/11/05/science.abe1107.full.pdf>
482. Ng, O. T.; Marimuthu, K.; Koh, V.; Pang, J.; Linn, K. Z.; Sun, J.; De Wang, L.; Chia, W. N.; Tiu, C.; Chan, M.; Ling, L. M.; Vasoo, S.; Abdad, M. Y.; Chia, P. Y.; Lee, T. H.; Lin, R. J.; Sadarangani, S. P.; Chen, M. I. C.; Said, Z.; Kurupatham, L.; Pung, R.; Wang, L.-F.; Cook, A. R.; Leo, Y.-S.; Lee, V. J. M., SARS-CoV-2 seroprevalence and transmission risk factors among high-risk close contacts: a retrospective cohort study. *The Lancet Infectious Diseases*. [https://doi.org/10.1016/S1473-3099\(20\)30833-1](https://doi.org/10.1016/S1473-3099(20)30833-1)
483. Ngonghala, C. N.; Iboi, E.; Eikenberry, S.; Scotch, M.; MacIntyre, C. R.; Bonds, M. H.; Gumel, A. B., Mathematical assessment of the impact of non-pharmaceutical interventions on curtailing the 2019 novel Coronavirus. *Mathematical Biosciences* **2020**, 325, 108364.
<http://www.sciencedirect.com/science/article/pii/S0025556420300560>
484. Nguyen-Contant, P.; Embong, A. K.; Kanagaiah, P.; Chaves, F. A.; Yang, H.; Branche, A. R.; Topham, D. J.; Sangster, M. Y., S Protein-Reactive IgG and Memory B Cell Production after Human SARS-CoV-2 Infection Includes Broad Reactivity to the S2 Subunit. *mBio* **2020**, 11 (5), e01991-20.
<https://mbio.asm.org/content/mbio/11/5/e01991-20.full.pdf>
485. Nguyen, L. H.; Drew, D. A.; Graham, M. S.; Joshi, A. D.; Guo, C.-G.; Ma, W.; Mehta, R. S.; Warner, E. T.; Sikavi, D. R.; Lo, C.-H.; Kwon, S.; Song, M.; Mucci, L. A.; Stampfer, M. J.; Willett, W. C.; Eliassen, A. H.; Hart, J. E.; Chavarro, J. E.; Rich-Edwards, J. W.; Davies, R.; Capdevila, J.; Lee, K. A.; Lochlainn, M. N.; Varsavsky, T.; Sudre, C. H.; Cardoso, M. J.; Wolf, J.; Spector, T. D.; Ourselin, S.; Steves, C. J.; Chan, A. T., Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. *Lancet Public Health* **2020**. <http://www.thelancet-press.com/embargo/hcwcovid.pdf>
486. NIH, *Fact Sheet for Patients And Parent/Caregivers - Emergency Use Authorization (EUA) Of Remdesivir For Coronavirus Disease 2019 (COVID-19)*; National Institutes of Health: 2020.
<https://www.fda.gov/media/137565/download>
487. Nishiura, H.; Kobayashi, T.; Miyama, T.; Suzuki, A.; Jung, S.-m.; Hayashi, K.; Kinoshita, R.; Yang, Y.; Yuan, B.; Akhmetzhanov, A. R.; Linton, N. M., Estimation of the asymptomatic ratio of novel coronavirus infections (COVID-19). *International Journal of Infectious Diseases* **2020**, 94, 154-155.
<http://www.sciencedirect.com/science/article/pii/S1201971220301399>
488. Niu, A.; Ning, B.; Socola, F.; Safah, H.; Reynolds, T.; Ibrahim, M.; Safa, F.; Alfonso, T.; Luk, A.; Mushatt, D. M.; Hu, T.; Saba, N. S., 313 COVID-19 in Patients with hematological Malignancies: High False Negative Rate with High Mortality. In *62nd ASH Annual Meeting and Exposition*, 2020.
<https://ash.confex.com/ash/2020/webprogram/Paper138611.html>
489. Northeastern, Modeling of COVID-19 epidemic in the United States.
<https://covid19.gleamproject.org/#icubedproj>.
490. Novavax, Novavax Initiates Phase 3 Efficacy Trial of COVID-19 Vaccine in the United Kingdom.
<https://ir.novavax.com/news-releases/news-release-details/novavax-initiates-phase-3-efficacy-trial-covid-19-vaccine-united>.
491. Novelli, L.; Raimondi, F.; Ghirardi, A.; Pellegrini, D.; Capodanno, D.; Sotgiu, G.; Guagliumi, G.; Senni, M.; Russo, F. M.; Lorini, F. L.; Rizzi, M.; Barbui, T.; Rambaldi, A.; Cosentini, R.; Grazioli, L. S.; Marchesi, G.; Sferrazza Papa, G. F.; Cesa, S.; Colledan, M.; Civiletti, R.; Conti, C.; Casati, M.; Ferri, F.; Camagni, S.; Sessa, M.; Masciulli, A.; Gavazzi, A.; Falanga, A.; Da Pozzo, L. F.; Buoro, S.; Remuzzi, G.; Ruggenti, P.;

- Callegaro, A.; D'Antiga, L.; Pasulo, L.; Pezzoli, F.; Gianatti, A.; Parigi, P.; Farina, C.; Bellasi, A.; Solidoro, P.; Sironi, S.; Di Marco, F.; Faggioli, S., At the peak of Covid-19 age and disease severity but not comorbidities are predictors of mortality. Covid-19 burden in Bergamo, Italy. *Panminerva Med* **2020**. 492. Now, C. A., America's COVID warning system. <https://covidactnow.org/?s=38532>.
493. O'Hearn, K.; Gertsman, S.; Webster, R.; Tsampalieros, A.; Ng, R.; Gibson, J.; Sampson, M.; Sikora, L.; McNally, J. D., Efficacy and Safety of Disinfectants for Decontamination of N95 and SN95 Filtering Facepiece Respirators: A Systematic Review. *Journal of Hospital Infection*. <https://doi.org/10.1016/j.jhin.2020.08.005>
494. Observatory, U., *COVID-19 Trends for U.S. Counties*; ESRI: 2020. <https://urbanobservatory.maps.arcgis.com/apps/MapSeries/index.html?appid=ad46e587a9134fadb43ff54c16f8c39b>
495. Oetjens, M. T.; Luo, J. Z.; Chang, A.; Leader, J. B.; Hartzel, D. N.; Moore, B. S.; Strande, N. T.; Kirchner, H. L.; Ledbetter, D. H.; Justice, A. E.; Carey, D. J.; Mirshahi, T., Electronic health record analysis identifies kidney disease as the leading risk factor for hospitalization in confirmed COVID-19 patients. *PLoS One* **2020**, *15* (11), e0242182.
496. Offeddu, V.; Yung, C. F.; Low, M. S. F.; Tam, C. C., Effectiveness of Masks and Respirators Against Respiratory Infections in Healthcare Workers: A Systematic Review and Meta-Analysis. *Clin Infect Dis* **2017**, *65* (11), 1934-1942. <https://www.ncbi.nlm.nih.gov/pubmed/29140516>
497. Ogega, C. O.; Skinner, N. E.; Blair, P. W.; Park, H.-S.; Littlefield, K.; Ganesan, A.; Ladiwala, P.; Antar, A. A.; Ray, S. C.; Betenbaugh, M. J.; Pekosz, A.; Klein, S.; Manabe, Y. C.; Cox, A. L.; Bailey, J. R., Durable SARS-CoV-2 B cell immunity after mild or severe disease. *medRxiv* **2020**, 2020.10.28.20220996. <https://www.medrxiv.org/content/medrxiv/early/2020/10/30/2020.10.28.20220996.full.pdf>
498. Olson, D. R.; Huynh, M.; Fine, A.; Baumgartner, J.; Castro, A.; Chan, H. T.; Daskalakis, D.; Devinney, K.; Guerra, K.; Harper, S.; Kennedy, J.; Konty, K.; Li, W.; McGibbon, E.; Shaff, J.; Thompson, C.; Vora, N. M.; Van Wye, G., Preliminary Estimate of Excess Mortality During the COVID-19 Outbreak — New York City, March 11–May 2, 2020. *Morbidity and Mortality Weekly Report* **2020**, (ePub: 11 May 2020). https://www.cdc.gov/mmwr/volumes/69/wr/mm6919e5.htm?s_cid=mm6919e5_w
499. Omrani, A. S.; Pathan, S. A.; Thomas, S. A.; Harris, T. R. E.; Coyle, P. V.; Thomas, C. E.; Qureshi, I.; Bhutta, Z. A.; Mawlawi, N. A.; Kahlout, R. A.; Elmalik, A.; Azad, A. M.; Daghfal, J.; Mustafa, M.; Jeremijenko, A.; Soub, H. A.; Khattab, M. A.; Maslamani, M. A.; Thomas, S. H., Randomized double-blinded placebo-controlled trial of hydroxychloroquine with or without azithromycin for virologic cure of non-severe Covid-19. *EClinicalMedicine* **2020**, *29*, 100645.
500. Onder, G.; Rezza, G.; Brusaferro, S., Case-Fatality Rate and Characteristics of Patients Dying in Relation to COVID-19 in Italy. *JAMA* **2020**. <https://doi.org/10.1001/jama.2020.4683>
501. Ong, S. W. X.; Tan, Y. K.; Chia, P. Y.; Lee, T. H.; Ng, O. T.; Wong, M. S. Y.; Marimuthu, K., Air, Surface Environmental, and Personal Protective Equipment Contamination by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) From a Symptomatic Patient. *Jama* **2020**. https://jamanetwork.com/journals/jama/articlepdf/2762692/jama_ong_2020_id_200016.pdf
502. Oran, D. P.; Topol, E. J., Prevalence of Asymptomatic SARS-CoV-2 Infection. *Annals of Internal Medicine* **2020**, *0* (0), null. <https://www.acpjournals.org/doi/abs/10.7326/M20-3012>
503. Ortolan, A.; Lorenzin, M.; Felicetti, M.; Doria, A.; Ramonda, R., Does gender influence clinical expression and disease outcomes in COVID-19? A systematic review and meta-analysis. *International Journal of Infectious Diseases* **2020**. <https://doi.org/10.1016/j.ijid.2020.07.076>
504. Oster, A. M.; Caruso, E.; DeVies, J.; Hartnett, K. P.; Boehmer, T. K., Transmission Dynamics by Age Group in COVID-19 Hotspot Counties — United States, April–September 2020. *Morbidity and Mortality Weekly Report* **2020**, ePub (9 October 2020). <https://www.cdc.gov/mmwr/volumes/69/wr/mm6941e1.htm>

505. Oude Munnink, B. B.; Sikkema, R. S.; Nieuwenhuijse, D. F.; Molenaar, R. J.; Munger, E.; Molenkamp, R.; van der Spek, A.; Tolsma, P.; Rietveld, A.; Brouwer, M.; Bouwmeester-Vincken, N.; Harders, F.; Hakze-van der Honing, R.; Wegdam-Blans, M. C. A.; Bouwstra, R. J.; GeurtsvanKessel, C.; van der Eijk, A. A.; Velkers, F. C.; Smit, L. A. M.; Stegeman, A.; van der Poel, W. H. M.; Koopmans, M. P. G., Transmission of SARS-CoV-2 on mink farms between humans and mink and back to humans. *Science* **2020**, eabe5901. <http://science.sciencemag.org/content/early/2020/11/09/science.abe5901.abstract>
506. Owusu, D.; Kim, L.; O'Halloran, A.; Whitaker, M.; Piasecki, A. M.; Reingold, A.; Alden, N. B.; Maslar, A.; Anderson, E. J.; Ryan, P. A.; Kim, S.; Como-Sabetti, K.; Hancock, E. B.; Muse, A.; Bennett, N. M.; Billing, L. M.; Sutton, M.; Talbot, K.; Ortega, J.; Brammer, L.; Fry, A. M.; Hall, A. J.; Garg, S.; Team, C.-N. S., Characteristics of Adults aged 18–49 Years without Underlying Conditions Hospitalized with Laboratory-Confirmed COVID-19 in the United States, COVID-NET — March–August 2020. *Clinical Infectious Diseases* **2020**. <https://doi.org/10.1093/cid/ciaa1806>
507. Pairo-Castineira, E.; Clohisey, S.; Klaric, L.; Bretherick, A.; Rawlik, K.; Parkinson, N.; Pasko, D.; Walker, S.; Richmond, A.; Head Fourman, M.; Law, A.; Furniss, J.; Gountouna, E.; Wrobel, N.; Russell, C. D.; Moutsianas, L.; Wang, B.; Meynert, A.; Yang, Z.; Zhai, R.; Zheng, C.; Griffith, F.; Oosthuyzen, W.; Shih, B.; Keating, S.; Zechner, M.; Haley, C.; Porteous, D. J.; Hayward, C.; Knight, J.; Summers, C.; Shankar-Hari, M.; Turtle, L.; Ho, A.; Hinds, C.; Horby, P.; Nichol, A.; Maslove, D.; Ling, L.; Klenerman, P.; McAuley, D.; Montgomery, H.; Walsh, T.; Shen, X.; Rowan, K.; Fawkes, A.; Murphy, L.; Ponting, C. P.; Tenesa, A.; Caulfield, M.; Scott, R.; Openshaw, P. J. M.; Semple, M. G.; Vitart, V.; Wilson, J. F.; Baillie, J. K., Genetic mechanisms of critical illness in Covid-19. *medRxiv* **2020**, 2020.09.24.20200048. <http://medrxiv.org/content/early/2020/09/25/2020.09.24.20200048.1.abstract>
508. Pairo-Castineira, E.; Clohisey, S.; Klaric, L.; Bretherick, A. D.; Rawlik, K.; Pasko, D.; Walker, S.; Parkinson, N.; Fourman, M. H.; Russell, C. D.; Furniss, J.; Richmond, A.; Gountouna, E.; Wrobel, N.; Harrison, D.; Wang, B.; Wu, Y.; Meynert, A.; Griffiths, F.; Oosthuyzen, W.; Kousathanas, A.; Moutsianas, L.; Yang, Z.; Zhai, R.; Zheng, C.; Grimes, G.; Beale, R.; Millar, J.; Shih, B.; Keating, S.; Zechner, M.; Haley, C.; Porteous, D. J.; Hayward, C.; Yang, J.; Knight, J.; Summers, C.; Shankar-Hari, M.; Klenerman, P.; Turtle, L.; Ho, A.; Moore, S. C.; Hinds, C.; Horby, P.; Nichol, A.; Maslove, D.; Ling, L.; McAuley, D.; Montgomery, H.; Walsh, T.; Pereira, A.; Renieri, A.; Millar, J.; Nichol, A.; Walsh, T.; Openshaw, P. J. M.; Shankar-Hari, M.; Ponting, C.; Meikle, J.; Finernan, P.; McMaster, E.; Law, A.; Baillie, J. K.; Paterson, T.; Wackett, T.; Armstrong, R.; Clark, R.; Coutts, A.; Donnelly, L.; Gilchrist, T.; Hafezi, K.; Macgillivray, L.; Maclean, A.; McCafferty, S.; Morrice, K.; Weaver, J.; Boz, C.; Golightly, A.; Ward, M.; Mal, H.; Szoor-McElhinney, H.; Brown, A.; Hendry, R.; Stenhouse, A.; Cullum, L.; Law, D.; Law, S.; Law, R.; Swets, M.; Day, N.; Taneski, F.; Duncan, E.; Parkinson, N.; Collier, D.; Wood, S.; Zak, A.; Borra, C.; Matharu, M.; May, P.; Alldis, Z.; Mitchelmore, O.; Bowles, R.; Easthorpe, A.; Bibi, F.; Lancoma-Malcolm, I.; Gurasashvili, J.; Pheby, J.; Shiel, J.; Bolton, M.; Patel, M.; Taylor, M.; Zongo, O.; Ebano, P.; Harding, P.; Astin-Chamberlain, R.; Choudhury, Y.; Cox, A.; Kallon, D.; Burton, M.; Hall, R.; Blowes, S.; Prime, Z.; Biddle, J.; Prysyazhna, O.; Newman, T.; Tierney, C.; Kassam, J.; Shankar-Hari, M.; Ostermann, M.; Campos, S.; Bociek, A.; Lim, R.; Grau, N.; Jones, T. O.; Whitton, C.; Marotti, M.; Arbane, G.; Bonner, S.; Hugill, K.; Reid, J.; Welters, I.; Waugh, V.; Williams, K.; Shaw, D.; Roman, J. F.; Martinez, M. L.; Johnson, E.; Waite, A.; Johnson, B.; Hamilton, O.; Mulla, S.; McPhail, M.; Smith, J.; Baillie, J. K.; Barclay, L.; Hope, D.; McCulloch, C.; McQuillan, L.; Clark, S.; Singleton, J.; Priestley, K.; Rea, N.; Callaghan, M.; Campbell, R.; Andrew, G.; Marshall, L.; McKechnie, S.; Hutton, P.; Bashyal, A.; Davidson, N.; Summers, C.; Polgarova, P.; Stroud, K.; Pathan, N.; Elston, K.; Agrawal, S.; Battle, C.; Newey, L.; Rees, T.; Harford, R.; Brinkworth, E.; Williams, M.; Murphy, C.; White, I.; Croft, M.; Bandla, N.; Gellamucho, M.; Tomlinson, J.; Turner, H.; Davies, M.; Quinn, A.; Hussain, I.; Thompson, C.; Parker, H.; Bradley, R.; Griffiths, R.; Scriven, J.; Gill, J.; Puxty, A.; Cathcart, S.; Salutous, D.; Turner, L.; Duffy, K.; Puxty, K.; Joseph, A.; Herdman-Grant, R.; Simms, R.; Swain, A.; Naranjo, A.; Crowe, R.; Sollesta, K.; Loveridge, A.; Baptista, D.; Morino, E.; Davey, M.; Golden, D.; Jones, J.; Cuesta, J. M.; Haldeos, A.; Bakthavatsalam, D.; Vincent, R.; Elhassan, M.; Xavier, K.;

- Ganesan, A.; Abdelrazik, D. P. M.; Morgan, J.; Akeroyd, L.; Bano, S.; Warren, D.; Bromley, M.; Sellick, K.; Gurr, L.; Wilkinson, B.; Nagarajan, V.; Szedlak, P.; Cupitt, J.; Stoddard, E.; Benham, L.; Preston, S.; Slawson, N.; Bradshaw, Z.; Brown, J.; Caswell, M.; Melling, S.; Bamford, P.; Faulkner, M.; Cawley, K.; Jeffrey, H.; London, E.; Sainsbury, H.; Nagra, I.; Nasir, F.; Dunmore, C.; Jones, R.; Abraheem, A.; Al-Moasseb, M.; Girach, R.; Brantwood, C.; Alexander, P.; Bradley-Potts, J.; Allen, S.; Felton, T.; Manna, S.; Farnell-Ward, S.; Leaver, S.; Queiroz, J.; Maccacari, E.; Dawson, D.; Delgado, C. C.; Saluzzio, R. P.; Ezeobu, O.; Ding, L.; Sicut, C.; Kanu, R.; The Gen, O. I.; Gen, O. C.; Gen, O. C.-i.; Central, m.; laboratory, t.; Data analysis, t.; Barts Health Nhs Trust, L. U. K.; Guys; St Thomas' Hospital, L. U. K.; James Cook University Hospital, M. U. K.; The Royal Liverpool University Hospital, L. U. K.; King's College Hospital, L. U. K.; Royal Infirmary of Edinburgh, E. U. K.; John Radcliffe Hospital, O. U. K.; Addenbrooke's Hospital, C. U. K.; Morrision Hospital, S. U. K.; Ashford; St Peter's Hospital, S. U. K.; Royal Stoke University Hospital, S. U. K.; Queen Elizabeth Hospital, B. U. K.; Glasgow Royal Infirmary, G. U. K.; Kingston Hospital, S. U. K.; The Tunbridge Wells, H.; Maidstone Hospital, K. U. K.; North Middlesex University Hospital Nhs Trust, L. U. K.; Bradford Royal Infirmary, B. U. K.; Blackpool Victoria Hospital, B. U. K.; Countess of Chester Hospital, C. U. K.; Wythenshawe Hospital, M. U. K.; St George's Hospital, L. U. K., Genetic mechanisms of critical illness in Covid-19. *Nature* **2020**. <https://doi.org/10.1038/s41586-020-03065-y>
509. Pan, D.; Sze, S.; Minhas, J. S.; Bangash, M. N.; Pareek, N.; Divall, P.; Williams, C. M. L.; Oggioni, M. R.; Squire, I. B.; Nellums, L. B.; Hanif, W.; Khunti, K.; Pareek, M., The impact of ethnicity on clinical outcomes in COVID-19: A systematic review. *EClinicalMedicine*. <https://doi.org/10.1016/j.eclinm.2020.100404>
510. Pan, F.; Ye, T.; Sun, P.; Gui, S.; Liang, B.; Li, L.; Zheng, D.; Wang, J.; Hesketh, R. L.; Yang, L.; Zheng, C., Time Course of Lung Changes On Chest CT During Recovery From 2019 Novel Coronavirus (COVID-19) Pneumonia. *Radiology* *0* (0), 200370. <https://pubs.rsna.org/doi/abs/10.1148/radiol.2020200370>
511. Pan, H.; Peto, R.; Henao-Restrepo, A. M.; Preziosi, M. P.; Sathiyamoorthy, V.; Abdool Karim, Q.; Alejandria, M. M.; Hernández García, C.; Kieny, M. P.; Malekzadeh, R.; Murthy, S.; Reddy, K. S.; Roses Periago, M.; Abi Hanna, P.; Ader, F.; Al-Bader, A. M.; Alhasawi, A.; Allum, E.; Alotaibi, A.; Alvarez-Moreno, C. A.; Appadoo, S.; Asiri, A.; Aukrust, P.; Barratt-Due, A.; Bellani, S.; Branca, M.; Cappel-Porter, H. B. C.; Cerrato, N.; Chow, T. S.; Como, N.; Eustace, J.; García, P. J.; Godbole, S.; Gotuzzo, E.; Giskevicius, L.; Hamra, R.; Hassan, M.; Hassany, M.; Hutton, D.; Irmansyah, I.; Jancoriene, L.; Kirwan, J.; Kumar, S.; Lennon, P.; Lopardo, G.; Lydon, P.; Magrini, N.; Maguire, T.; Manevska, S.; Manuel, O.; McGinty, S.; Medina, M. T.; Mesa Rubio, M. L.; Miranda-Montoya, M. C.; Nel, J.; Nunes, E. P.; Perola, M.; Portolés, A.; Rasmin, M. R.; Raza, A.; Rees, H.; Reges, P. P. S.; Rogers, C. A.; Salami, K.; Salvadori, M. I.; Sinani, N.; Sterne, J. A. C.; Stevanovikj, M.; Tacconelli, E.; Tikkinen, K. A. O.; Trelle, S.; Zaid, H.; Røttingen, J. A.; Swaminathan, S., Repurposed Antiviral Drugs for Covid-19 - Interim WHO Solidarity Trial Results. *N Engl J Med* **2020**.
512. Papamanoli, A.; Yoo, J.; Grewal, P.; Predun, W.; Hotelling, J.; Jacob, R.; Mojahedi, A.; Skopicki, H. A.; Mansour, M.; Marcos, L. A.; Kalogeropoulos, A. P., High-Dose Methylprednisolone in Nonintubated Patients with Severe COVID-19 Pneumonia. *Eur J Clin Invest* **2020**, e13458.
513. Paranjpe, I.; Fuster, V.; Lala, A.; Russak, A.; Glicksberg, B. S.; Levin, M. A.; Charney, A. W.; Narula, J.; Fayad, Z. A.; Bagiella, E.; Zhao, S.; Nadkarni, G. N., Association of Treatment Dose Anticoagulation with In-Hospital Survival Among Hospitalized Patients with COVID-19. *Journal of the American College of Cardiology* **2020**, 27327. <http://www.onlinejacc.org/content/accj/early/2020/05/05/j.jacc.2020.05.001.full.pdf>
514. Park, S. W.; Champredon, D.; Earn, D. J. D.; Li, M.; Weitz, J. S.; Grenfell, B. T.; Dushoff, J., Reconciling early-outbreak preliminary estimates of the basic reproductive number and its uncertainty: a new framework and applications to the novel coronavirus (2019-nCoV) outbreak. **2020**, 1-13.
515. Park, S. Y.; Kim, Y.-M.; Yi, S.; Lee, S.; Na, B.-J.; Kim, C. B.; Kim, J.-i.; Kim, H. S.; Kim, Y. B.; Park, Y.; Huh, I. S.; Kim, H. K.; Yoon, H. J.; Jang, H.; Kim, K.; Chang, Y.; Kim, I.; Lee, H.; Gwack, J.; Kim, S. S.; Kim, M.;

- Kweon, S.; Choe, Y. J.; Park, O.; Park, Y. J.; Jeong, E. K., Coronavirus Disease Outbreak in Call Center, South Korea. *Emerging Infectious Disease journal* **2020**, *26* (8), 1666.
https://wwwnc.cdc.gov/eid/article/26/8/20-1274_article
516. Park, Y. J.; Choe, Y. J.; Park, O.; Park, S. Y.; Kim, Y.-M.; Kim, J.; Kweon, S.; Woo, Y.; Gwack, J.; Kim, S. S.; Lee, J.; Hyun, J.; Ryu, B.; Jang, Y. S.; Kim, H.; Shin, S. H.; Yi, S.; Lee, S.; Kim, H. K.; Lee, H.; Jin, Y.; Park, E.; Choi, S. W.; Kim, M.; Song, J.; Choi, S. W.; Kim, D.; Jeon, B.-H.; Yoo, H.; Jeong, E. K., Contact Tracing during Coronavirus Disease Outbreak, South Korea, 2020. *Emerging Infectious Disease journal* **2020**, *26* (10). https://wwwnc.cdc.gov/eid/article/26/10/20-1315_article
517. Parker, C. W.; Singh, N.; Tighe, S.; Blachowicz, A.; Wood, J. M.; Seuylemezian, A.; Vaishampayan, P.; Urbaniak, C.; Hendrickson, R.; Laaguiby, P.; Clark, K.; Clement, B. G.; O'Hara, N. B.; Couto-Rodriguez, M.; Bezdán, D.; Mason, C. E.; Venkateswaran, K., End-to-End Protocol for the Detection of SARS-CoV-2 from Built Environments. *mSystems* **2020**, *5* (5), e00771-20.
<https://msystems.asm.org/content/msys/5/5/e00771-20.full.pdf>
518. Parri, N.; Lenge, M.; Buonsenso, D., Children with Covid-19 in Pediatric Emergency Departments in Italy. *New England Journal of Medicine* **2020**. <https://www.nejm.org/doi/full/10.1056/NEJMc2007617>
519. Parshley, L., Kids catch and spread coronavirus half as much as adults, Iceland study confirms. *National Geographic* December 10, 2020, 2020.
<https://www.nationalgeographic.com/science/2020/12/we-now-know-how-much-children-spread-coronavirus/#close>
520. Pastor-Barriuso, R.; Pérez-Gómez, B.; Hernán, M. A.; Pérez-Olmeda, M.; Yotti, R.; Oteo-Iglesias, J.; Sanmartín, J. L.; León-Gómez, I.; Fernández-García, A.; Fernández-Navarro, P.; Cruz, I.; Martín, M.; Delgado-Sanz, C.; Fernández de Larrea, N.; León Paniagua, J.; Muñoz-Montalvo, J. F.; Blanco, F.; Larrauri, A.; Pollán, M., Infection fatality risk for SARS-CoV-2 in community dwelling population of Spain: nationwide seroepidemiological study. *BMJ* **2020**, *371*, m4509.
<https://www.bmj.com/content/bmj/371/bmj.m4509.full.pdf>
521. Patolia, H.; Pan, J.; Harb, C.; Marr, L. C.; Baffoe-Bonnie, A., Filtration evaluation and clinical use of expired elastomeric P-100 filter cartridges during the COVID-19 pandemic. *Infection Control & Hospital Epidemiology* **2020**, 1-6. <https://www.cambridge.org/core/article/filtration-evaluation-and-clinical-use-of-expired-elastomeric-p100-filter-cartridges-during-the-covid19-pandemic/D5EFCC5EEF65FEA210E1070149CB9DEF>
522. Patterson, E. I.; Elia, G.; Grassi, A.; Giordano, A.; Desario, C.; Medardo, M.; Smith, S. L.; Anderson, E. R.; Prince, T.; Patterson, G. T.; Lorusso, E.; Lucente, M. S.; Lanave, G.; Lauzi, S.; Bonfanti, U.; Stranieri, A.; Martella, V.; Solari Basano, F.; Barrs, V. R.; Radford, A. D.; Agrimi, U.; Hughes, G. L.; Paltrinieri, S.; Decaro, N., Evidence of exposure to SARS-CoV-2 in cats and dogs from households in Italy. *Nature Communications* **2020**, *11* (1), 6231. <https://doi.org/10.1038/s41467-020-20097-0>
523. Pau, A. K.; Aberg, J.; Baker, J.; Belperio, P. S.; Coopersmith, C. M.; Crew, P.; Glidden, D. V.; Grund, B.; Gulick, R. M.; Harrison, C.; Kim, A.; Lane, H. C.; Masur, H.; Sheikh, V.; Singh, K.; Yazdany, J.; Tebas, P., Convalescent Plasma for the Treatment of COVID-19: Perspectives of the National Institutes of Health COVID-19 Treatment Guidelines Panel. *Annals of Internal Medicine* **2020**, *0* (0), null.
<https://www.acpjournals.org/doi/abs/10.7326/M20-6448>
524. Payne, D. C., SARS-CoV-2 Infections and Serologic Responses from a Sample of US Navy Service Members—USS Theodore Roosevelt, April 2020. *MMWR. Morbidity and Mortality Weekly Report* **2020**, *69*.
525. Peccia, J.; Zulli, A.; Brackney, D. E.; Grubaugh, N. D.; Kaplan, E. H.; Casanovas-Massana, A.; Ko, A. I.; Malik, A. A.; Wang, D.; Wang, M.; Warren, J. L.; Weinberger, D. M.; Arnold, W.; Omer, S. B., Measurement of SARS-CoV-2 RNA in wastewater tracks community infection dynamics. *Nature Biotechnology* **2020**. <https://doi.org/10.1038/s41587-020-0684-z>

526. Peckham, H.; de Grijter, N. M.; Raine, C.; Radziszewska, A.; Ciurtin, C.; Wedderburn, L. R.; Rosser, E. C.; Webb, K.; Deakin, C. T., Male sex identified by global COVID-19 meta-analysis as a risk factor for death and ITU admission. *Nature Communications* **2020**, *11* (1), 6317. <https://doi.org/10.1038/s41467-020-19741-6>
527. Peltier, R. E.; Wang, J.; Hollenbeck, B. L.; Lanza, J.; Furtado, R. M.; Cyr, J.; Ellison, R.; Kobayashi, K. J., Addressing Decontaminated Respirators: Some Methods Appear to Damage Mask Integrity and Protective Function. *Infection Control & Hospital Epidemiology* **2020**, 1-9.
528. Perchetti, G. A.; Huang, M.-L.; Peddu, V.; Jerome, K. R.; Greninger, A. L., Stability of SARS-CoV-2 in PBS for Molecular Detection. *Journal of Clinical Microbiology* **2020**.
529. Perkins, A.; Espana, G., NotreDame-FRED COVID-19 forecasts. https://github.com/confunguido/covid19_ND_forecasting/blob/master/README.md.
530. Perry, R. J.; Smith, C. J.; Roffe, C.; Simister, R. J.; Narayanamoorthi, S.; Marigold, R.; Willmot, M.; Dixit, A.; Hassan, A.; Quinn, T.; Ankolekar, S.; Zhang, L.; Banerjee, S.; Ahmed, U.; Padmanabhan, N.; Ferdinand, P.; McGrane, F.; Banaras, A.; Marks, I. H.; Werring, D. J., Characteristics and outcomes of COVID-19-associated stroke: a UK multicentre case-control study. *Journal of Neurology, Neurosurgery & Psychiatry* **2020**, jnnp-2020-324927. <https://jnnp.bmj.com/content/jnnp/early/2020/11/03/jnnp-2020-324927.full.pdf>
531. Peto, L.; Rodger, G.; Carter, D. P.; Osman, K. L.; Yavuz, M.; Johnson, K.; Raza, M.; Parker, M. D.; Wyles, M. D.; Andersson, M.; Justice, A.; Vaughan, A.; Hoosdally, S.; Stoesser, N.; Matthews, P. C.; Eyre, D. W.; Peto, T. E.; Carroll, M. W.; de Silva, T. I.; Crook, D. W.; Evans, C. M.; Pullan, S. T., Diagnosis of SARS-CoV-2 infection with LamPORE, a high-throughput platform combining loop-mediated isothermal amplification and nanopore sequencing. *medRxiv* **2020**, 2020.09.18.20195370. <https://www.medrxiv.org/content/medrxiv/early/2020/09/25/2020.09.18.20195370.full.pdf>
532. Petrakis, D.; Margină, D.; Tsarouhas, K.; Tekos, F.; Stan, M.; Nikitovic, D.; Kouretas, D.; Spandidos, D. A.; Tsatsakis, A., Obesity - a risk factor for increased COVID-19 prevalence, severity and lethality (Review). *Mol Med Rep* **2020**, *22* (1), 9-19. <https://doi.org/10.3892/mmr.2020.11127>
533. Pfizer, PFIZER AND BIONTECH ANNOUNCE VACCINE CANDIDATE AGAINST COVID-19 ACHIEVED SUCCESS IN FIRST INTERIM ANALYSIS FROM PHASE 3 STUDY. <https://www.pfizer.com/news/press-release/press-release-detail/pfizer-and-biontech-announce-vaccine-candidate-against>.
534. Pfizer, PFIZER AND BIONTECH CONCLUDE PHASE 3 STUDY OF COVID-19 VACCINE CANDIDATE, MEETING ALL PRIMARY EFFICACY ENDPOINTS. <https://www.pfizer.com/news/press-release/press-release-detail/pfizer-and-biontech-conclude-phase-3-study-covid-19-vaccine>.
535. Pfizer, PFIZER AND BIONTECH TO SUBMIT EMERGENCY USE AUTHORIZATION REQUEST TODAY TO THE U.S. FDA FOR COVID-19 VACCINE. <https://www.pfizer.com/news/press-release/press-release-detail/pfizer-and-biontech-submit-emergency-use-authorization>.
536. Pickering, B.; Smith, G.; Pinette, M.; Embury-Hyatt, C.; Moffat, E.; Marszal, P.; Lewis, C. E., Susceptibility of domestic swine to experimental infection with SARS-CoV-2. *bioRxiv* **2020**, 2020.09.10.288548. <http://biorxiv.org/content/early/2020/09/10/2020.09.10.288548.abstract>
537. Pigoga, J. L.; Friedman, A.; Broccoli, M.; Hirner, S.; Naidoo, A. V.; Singh, S.; Werner, K.; Wallis, L. A., Clinical and historical features associated with severe COVID-19 infection: a systematic review. *medRxiv* **2020**, 2020.04.23.20076653. <https://www.medrxiv.org/content/medrxiv/early/2020/04/27/2020.04.23.20076653.full.pdf>
538. Piroth, L.; Cottenet, J.; Mariet, A.-S.; Bonniaud, P.; Blot, M.; Tubert-Bitter, P.; Quantin, C., Comparison of the characteristics, morbidity, and mortality of COVID-19 and seasonal influenza: a nationwide, population-based retrospective cohort study. *The Lancet Respiratory Medicine* **2020**. [https://doi.org/10.1016/S2213-2600\(20\)30527-0](https://doi.org/10.1016/S2213-2600(20)30527-0)

539. Pitman-Hunt, C.; Leja, J.; Jiwani, Z. M.; Rondot, D.; Ang, J.; Kannikeswaran, N., SARS-CoV-2 Transmission in an Urban Community: The Role of Children and Household Contacts. *Journal of the Pediatric Infectious Diseases Society* **2020**. <https://doi.org/10.1093/jpids/piaa158>
540. Plante, J. A.; Liu, Y.; Liu, J.; Xia, H.; Johnson, B. A.; Lokugamage, K. G.; Zhang, X.; Muruato, A. E.; Zou, J.; Fontes-Garfias, C. R.; Mirchandani, D.; Scharton, D.; Bilello, J. P.; Ku, Z.; An, Z.; Kalveram, B.; Freiberg, A. N.; Menachery, V. D.; Xie, X.; Plante, K. S.; Weaver, S. C.; Shi, P.-Y., Spike mutation D614G alters SARS-CoV-2 fitness and neutralization susceptibility. *bioRxiv* **2020**, 2020.09.01.278689. <http://biorxiv.org/content/early/2020/09/02/2020.09.01.278689.abstract>
541. Plante, J. A.; Liu, Y.; Liu, J.; Xia, H.; Johnson, B. A.; Lokugamage, K. G.; Zhang, X.; Muruato, A. E.; Zou, J.; Fontes-Garfias, C. R.; Mirchandani, D.; Scharton, D.; Bilello, J. P.; Ku, Z.; An, Z.; Kalveram, B.; Freiberg, A. N.; Menachery, V. D.; Xie, X.; Plante, K. S.; Weaver, S. C.; Shi, P. Y., Spike mutation D614G alters SARS-CoV-2 fitness. *Nature* **2020**.
542. Pollán, M.; Pérez-Gómez, B.; Pastor-Barriuso, R.; al., e., Prevalence of SARS-CoV-2 in Spain (ENE-COVID): a nationwide, population-based seroepidemiological study. *The Lancet* **2020**. [https://doi.org/10.1016/S0140-6736\(20\)31483-5](https://doi.org/10.1016/S0140-6736(20)31483-5)
543. Popa, A.; Genger, J.-W.; Nicholson, M. D.; Penz, T.; Schmid, D.; Aberle, S. W.; Agerer, B.; Lercher, A.; Endler, L.; Colaço, H.; Smyth, M.; Schuster, M.; Grau, M. L.; Martínez-Jiménez, F.; Pich, O.; Borena, W.; Pawelka, E.; Keszei, Z.; Senekowitsch, M.; Laine, J.; Aberle, J. H.; Redlberger-Fritz, M.; Karolyi, M.; Zoufaly, A.; Maritschnik, S.; Borkovec, M.; Hufnagl, P.; Nairz, M.; Weiss, G.; Wolfinger, M. T.; von Laer, D.; Superti-Furga, G.; Lopez-Bigas, N.; Puchhammer-Stöckl, E.; Allerberger, F.; Michor, F.; Bock, C.; Bergthaler, A., Genomic epidemiology of superspreading events in Austria reveals mutational dynamics and transmission properties of SARS-CoV-2. *Science Translational Medicine* **2020**, eabe2555. <https://stm.sciencemag.org/content/scitransmed/early/2020/11/20/scitranslmed.abe2555.full.pdf>
544. Poston, D.; Weisblum, Y.; Wise, H.; Templeton, K.; Jenks, S.; Hatzioannou, T.; Bieniasz, P. D., Absence of SARS-CoV-2 neutralizing activity in pre-pandemic sera from individuals with recent seasonal coronavirus infection. *medRxiv* **2020**, 2020.10.08.20209650. <https://www.medrxiv.org/content/medrxiv/early/2020/10/11/2020.10.08.20209650.full.pdf>
545. Potter, D.; Riffon, M.; Kakamada, S.; Miller, R. S.; Komatsoulis, G. A., Disproportionate impact of COVID-19 disease among racial and ethnic minorities in the U.S. cancer population as seen in CancerLinQ Discovery data. *Journal of Clinical Oncology* **2020**, *38* (29_suppl), 84-84. https://ascopubs.org/doi/abs/10.1200/JCO.2020.38.29_suppl.84
546. Prentiss, M.; Chu, A.; Berggren, K. K., Superspreading Events Without Superspreaders: Using High Attack Rate Events to Estimate N_{eff} for Airborne Transmission of COVID-19. *medRxiv* **2020**, 2020.10.21.20216895. <https://www.medrxiv.org/content/medrxiv/early/2020/10/23/2020.10.21.20216895.full.pdf>
547. Press, A., Finland deploys coronavirus-sniffing dogs at main airport. <https://www.msn.com/en-us/news/world/finland-deploys-coronavirus-sniffing-dogs-at-main-airport/ar-BB19li6Z?li=BBnbcA1> (accessed 23 SEP 2020).
548. Price-Haywood, E. G.; Burton, J.; Fort, D.; Seoane, L., Hospitalization and Mortality among Black Patients and White Patients with Covid-19. *New England Journal of Medicine* **2020**. <https://www.nejm.org/doi/full/10.1056/NEJMsa2011686>
549. Qin, J.; You, C.; Lin, Q.; Hu, T.; Yu, S.; Zhou, X., Estimation of incubation period distribution of COVID-19 using disease onset forward time: a novel cross-sectional and forward follow-up study. *Science Advances* **2020**, *07 Aug 2020*. <https://advances.sciencemag.org/content/early/2020/08/07/sciadv.abc1202>
550. Qiu, H.; Wu, J.; Hong, L.; Luo, Y.; Song, Q.; Chen, D., Clinical and epidemiological features of 36 children with coronavirus disease 2019 (COVID-19) in Zhejiang, China: an observational cohort study. *The Lancet Infectious Diseases*. [https://doi.org/10.1016/S1473-3099\(20\)30198-5](https://doi.org/10.1016/S1473-3099(20)30198-5)

551. Rai, B.; Shukla, A.; Dwivedi, L. K., Estimates of serial interval for COVID-19: A systematic review and meta-analysis. *Clinical Epidemiology and Global Health* **2020**.
<http://www.sciencedirect.com/science/article/pii/S2213398420301895>
552. Rajasingham, R.; Bangdiwala, A. S.; Nicol, M. R.; Skipper, C. P.; Pastick, K. A.; Axelrod, M. L.; Pullen, M. F.; Nascene, A. A.; Williams, D. A.; Engen, N. W.; Okafor, E. C.; Rini, B. I.; Mayer, I. A.; McDonald, E. G.; Lee, T. C.; Li, P.; MacKenzie, L. J.; Balko, J. M.; Dunlop, S. J.; Hullsiek, K. H.; Boulware, D. R.; Lofgren, S. M.; team, o. b. o. t. C. P., Hydroxychloroquine as pre-exposure prophylaxis for COVID-19 in healthcare workers: a randomized trial. *Clinical Infectious Diseases* **2020**. <https://doi.org/10.1093/cid/ciaa1571>
553. Ramasamy, M. N.; Minassian, A. M.; Ewer, K. J.; al., e., Safety and immunogenicity of ChAdOx1 nCoV-19 vaccine administered in a prime-boost regimen in young and old adults (COV002): a single-blind, randomised, controlled, phase 2/3 trial. *The Lancet* **2020**.
<http://www.sciencedirect.com/science/article/pii/S0140673620324661>
554. Rambaut, A., Phylodynamic analysis of nCoV-2019 genomes - 27-Jan-2020.
<http://virological.org/t/phylodynamic-analysis-of-ncov-2019-genomes-27-jan-2020/353>.
555. Rambaut, A.; Nick Loman²; Oliver Pybus³; Wendy Barclay⁴; Jeff Barrett⁵; Alesandro Carabelli⁶; Tom Connor⁷; Tom Peacock⁴; David L Robertson⁸; Erik Volz⁴; (CoG-UK)⁹, C.-G. C. U., Preliminary genomic characterisation of an emergent SARS-CoV-2 lineage in the UK defined by a novel set of spike mutations. <https://virological.org/t/preliminary-genomic-characterisation-of-an-emergent-sars-cov-2-lineage-in-the-uk-defined-by-a-novel-set-of-spike-mutations/563>.
556. Rapid Expert Consultation, *Rapid Expert Consultation Update on SARS-CoV-2 Surface Stability and Incubation for the COVID-19 Pandemic (March 27, 2020)*. The National Academies Press: Washington, DC, 2020. <https://www.nap.edu/read/25763/chapter/1>
557. Rapkiewicz, A. V.; Mai, X.; Carsons, S. E.; Pittaluga, S.; Kleiner, D. E.; Berger, J. S.; Thomas, S.; Adler, N. M.; Charytan, D. M.; Gasmir, B.; Hochman, J. S.; Reynolds, H. R., Megakaryocytes and platelet-fibrin thrombi characterize multi-organ thrombosis at autopsy in COVID-19: A case series. *EClinicalMedicine* **2020**, 100434. <http://www.sciencedirect.com/science/article/pii/S2589537020301784>
558. Rasheed, A. M.; Fatak, D. F.; Hashim, H. A.; Maulood, M. F.; Kabah, K. K.; Almusawi, Y. A.; Abdulmir, A. S., The therapeutic potential of convalescent plasma therapy on treating critically-ill COVID-19 patients residing in respiratory care units in hospitals in Baghdad, Iraq. *Infez Med* **2020**, 28 (3), 357-366.
559. Ratnesar-Shumate, S.; Williams, G.; Green, B.; Krause, M.; Holland, B.; Wood, S.; Bohannon, J.; Boydston, J.; Freeburger, D.; Hooper, I.; Beck, K.; Yeager, J.; Altamura, L. A.; Biryukov, J.; Yolitz, J.; Schuit, M.; Wahl, V.; Hevey, M.; Dabisch, P., Simulated Sunlight Rapidly Inactivates SARS-CoV-2 on Surfaces. *The Journal of Infectious Diseases* **2020**. <https://doi.org/10.1093/infdis/jiaa274>
560. Ray, J. G.; Schull, M. J.; Vermeulen, M. J.; Park, A. L., Association Between ABO and Rh Blood Groups and SARS-CoV-2 Infection or Severe COVID-19 Illness : A Population-Based Cohort Study. *Ann Intern Med* **2020**. <https://www.acpjournals.org/doi/abs/10.7326/M20-4511>
561. Ray, M., Bharat Biotech's Covid-19 vaccine gets nod for Phase 3 trial. Here's how it came through. <https://www.hindustantimes.com/india-news/bharat-biotech-s-covid-19-vaccine-gets-nod-for-phase-3-trial-here-s-how-it-came-through/story-Hcxt2OVsWr7gPwx6dnnvXKP.html>.
562. Regeneron, REGN-COV2 INDEPENDENT DATA MONITORING COMMITTEE RECOMMENDS HOLDING ENROLLMENT IN HOSPITALIZED PATIENTS WITH HIGH OXYGEN REQUIREMENTS AND CONTINUING ENROLLMENT IN PATIENTS WITH LOW OR NO OXYGEN REQUIREMENTS. Regeneron: 2020.
<https://investor.regeneron.com/news-releases/news-release-details/regn-cov2-independent-data-monitoring-committee-recommends>
563. Regeneron Pharmaceuticals, I., REGENERON'S REGN-COV2 ANTIBODY COCKTAIL REDUCED VIRAL LEVELS AND IMPROVED SYMPTOMS IN NON-HOSPITALIZED COVID-19 PATIENTS. 2020; p 3.

<https://newsroom.regeneron.com/news-releases/news-release-details/regenerons-regn-cov2-antibody-cocktail-reduced-viral-levels-and>

564. Regeneron Pharmaceuticals, I., REGENERON'S CASIRIVIMAB AND IMDEVIMAB ANTIBODY COCKTAIL FOR COVID-19 IS FIRST COMBINATION THERAPY TO RECEIVE FDA EMERGENCY USE AUTHORIZATION.

2020. <https://investor.regeneron.com/news-releases/news-release-details/regenerons-regen-cov2-first-antibody-cocktail-covid-19-receive>

565. Reich, N., Ensemble. <https://reichlab.io/>.

566. Remuzzi, A.; Remuzzi, G., COVID-19 and Italy: what next? *The Lancet* **2020**.

[https://doi.org/10.1016/S0140-6736\(20\)30627-9](https://doi.org/10.1016/S0140-6736(20)30627-9)

567. Ren, L.; Yu, S.; Xu, W.; Overton, J. L.; Chiamvimonvat, N.; Thai, P. N., Lack of association of antihypertensive drugs with the risk and severity of COVID-19: A meta-analysis. *J Cardiol* **2020**.

568. Ren, X.; Li, Y.; Yang, X.; Li, Z.; Cui, J.; Zhu, A.; Zhao, H.; Yu, J.; Nie, T.; Ren, M.; Dong, S.; Cheng, Y.; Chen, Q.; Chang, Z.; Sun, J.; Wang, L.; Feng, L.; Gao, G. F.; Feng, Z.; Li, Z., Evidence for pre-symptomatic transmission of coronavirus disease 2019 (COVID-19) in China. *Influenza and Other Respiratory Viruses* **2020**, n/a (n/a). <https://onlinelibrary.wiley.com/doi/abs/10.1111/irv.12787>

569. Reuters, Frozen food package polluted by living coronavirus could cause infection, China's CDC says. <https://www.reuters.com/article/us-health-coronavirus-china-packaging-idUKKBN2720MD> (accessed 01 Nov 2020).

570. Reuters, WHO looks at mink farm biosecurity globally after Danish coronavirus cases. Farge, E.; Kelland, K., Eds. 2020. <https://in.reuters.com/article/health-coronavirus-who/who-looking-at-biosecurity-in-other-countries-after-danish-covid-19-mink-outbreak-idINKBN27M1F4?il=0>

571. Rice, K.; Wynne, B.; Martin, V.; Ackland, G. J., Effect of school closures on mortality from coronavirus disease 2019: old and new predictions. *BMJ* **2020**, 371, m3588.

<https://www.bmj.com/content/bmj/371/bmj.m3588.full.pdf>

572. Richard, M.; Kok, A.; de Meulder, D.; Bestebroer, T. M.; Lamers, M. M.; Okba, N. M. A.; Fentener van Vlissingen, M.; Rockx, B.; Haagmans, B. L.; Koopmans, M. P. G.; Fouchier, R. A. M.; Herfst, S., SARS-CoV-2 is transmitted via contact and via the air between ferrets. *Nature Communications* **2020**, 11 (1), 3496. <https://doi.org/10.1038/s41467-020-17367-2>

573. Richter, W.; Hofacre, K.; Willenberg, Z., *Final Report for the Bioquell Hydrogen Peroxide Vapor (HPV) Decontamination for Reuse of N95 Respirators*; Battelle Memorial Institute: 2016.

[http://wayback.archive-](http://wayback.archive-it.org/7993/20170113034232/http://www.fda.gov/downloads/EmergencyPreparedness/Counterterrorism/MedicalCountermeasures/MCMRegulatoryScience/UCM516998.pdf)

[it.org/7993/20170113034232/http://www.fda.gov/downloads/EmergencyPreparedness/Counterterrorism/MedicalCountermeasures/MCMRegulatoryScience/UCM516998.pdf](http://www.fda.gov/downloads/EmergencyPreparedness/Counterterrorism/MedicalCountermeasures/MCMRegulatoryScience/UCM516998.pdf)

574. Rickman, H. M.; Rampling, T.; Shaw, K.; Martinez-Garcia, G.; Hail, L.; Coen, P.; Shahmanesh, M.; Shin, G. Y.; Nastouli, E.; Houlihan, C. F., Nosocomial transmission of COVID-19: a retrospective study of 66 hospital-acquired cases in a London teaching hospital. *Clinical Infectious Diseases* **2020**.

<https://doi.org/10.1093/cid/ciaa816>

575. Riddell, S.; Goldie, S.; Hill, A.; Eagles, D.; Drew, T. W., The effect of temperature on persistence of SARS-CoV-2 on common surfaces. *Virology Journal* **2020**, 17 (1), 145. <https://doi.org/10.1186/s12985-020-01418-7>

576. Riou, J.; Althaus, C. L., Pattern of early human-to-human transmission of Wuhan 2019 novel coronavirus (2019-nCoV), December 2019 to January 2020. *Eurosurveillance* **2020**, 25 (4), 2000058.

<https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.4.2000058>

577. Riphagen, S.; Gomez, X.; Gonzalez-Martinez, C.; Wilkinson, N.; Theocharis, P., Hyperinflammatory shock in children during COVID-19 pandemic. *The Lancet*. [https://doi.org/10.1016/S0140-6736\(20\)31094-1](https://doi.org/10.1016/S0140-6736(20)31094-1)

578. Roberts, M., Oxford/AstraZeneca Covid vaccine 'dose error' explained.

<https://www.bbc.com/news/health-55086927>.

579. Robertson, L. J.; Moore, J. S.; Blighe, K.; Ng, K. Y.; Quinn, N.; Jennings, F.; Warnock, G.; Sharpe, P.; Clarke, M.; Maguire, K.; Rainey, S.; Price, R.; Burns, W.; Kowalczyk, A.; Awuah, A.; McNamee, S.; Wallace, G.; Sager, S.; Chao Shern, C.; Nesbit, M. A.; McLaughlin, J.; Moore, T., SARS-CoV-2 antibody testing in a UK population: detectable IgG for up to 20 weeks post infection. *medRxiv* **2020**, 2020.09.29.20201509. <https://www.medrxiv.org/content/medrxiv/early/2020/10/01/2020.09.29.20201509.full.pdf>
580. Rockx, B.; Kuiken, T.; Herfst, S.; Bestebroer, T.; Lamers, M. M.; Oude Munnink, B. B.; de Meulder, D.; van Amerongen, G.; van den Brand, J.; Okba, N. M. A.; Schipper, D.; van Run, P.; Leijten, L.; Sikkema, R.; Verschoor, E.; Verstrepen, B.; Bogers, W.; Langermans, J.; Drosten, C.; Fentener van Vlissingen, M.; Fouchier, R.; de Swart, R.; Koopmans, M.; Haagmans, B. L., Comparative pathogenesis of COVID-19, MERS, and SARS in a nonhuman primate model. *Science* **2020**, eabb7314. <https://science.sciencemag.org/content/sci/early/2020/04/16/science.abb7314.full.pdf>
581. Rodda, L. B.; Netland, J.; Shehata, L.; Pruner, K. B.; Morawski, P. M.; Thouvenel, C.; Takehara, K. K.; Eggenberger, J.; Hemann, E. A.; Waterman, H. R.; Fahning, M. L.; Chen, Y.; Rathe, J.; Stokes, C.; Wrenn, S.; Fiala, B.; Carter, L. P.; Hamerman, J. A.; King, N. P.; Gale, M.; Campbell, D. J.; Rawlings, D.; Pepper, M., Functional SARS-CoV-2-specific immune memory persists after mild COVID-19. *medRxiv* **2020**, 2020.08.11.20171843. <https://www.medrxiv.org/content/medrxiv/early/2020/08/15/2020.08.11.20171843.full.pdf>
582. Rokkas, T., Gastrointestinal involvement in COVID-19: a systematic review and meta-analysis. *Annals of Gastroenterology* **2020**, *33* (4), 355-365. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7315709/>
583. Roschewski, M.; Lionakis, M. S.; Sharman, J. P.; Roswarski, J.; Goy, A.; Monticelli, M. A.; Roshon, M.; Wrzesinski, S. H.; Desai, J. V.; Zarakas, M. A.; Collen, J.; Rose, K.; Hamdy, A.; Izumi, R.; Wright, G. W.; Chung, K. K.; Baselga, J.; Staudt, L. M.; Wilson, W. H., Inhibition of Bruton tyrosine kinase in patients with severe COVID-19. *Science Immunology* **2020**, *5* (48), eabd0110. <http://immunology.sciencemag.org/content/5/48/eabd0110.abstract>
584. Rosenke, K.; Meade-White, K.; Letko, M.; Clancy, C.; Hansen, F.; Liu, Y.; Okumura, A.; Tang-Huau, T.-L.; Li, R.; Saturday, G.; Feldmann, F.; Scott, D.; Wang, Z.; Munster, V.; Jarvis, M. A.; Feldmann, H., Defining the Syrian hamster as a highly susceptible preclinical model for SARS-CoV-2 infection. *Emerging Microbes & Infections* **2020**, 1-36. <https://doi.org/10.1080/22221751.2020.1858177>
585. Ross, C., CDC says people with history of severe allergic reactions can get Covid-19 vaccine. <https://www.statnews.com/2020/12/13/cdc-says-people-with-history-of-severe-allergic-reactions-can-get-covid-19-vaccine/>.
586. Rothe, C.; Schunk, M.; Sothmann, P.; Bretzel, G.; Froeschl, G.; Wallrauch, C.; Zimmer, T.; Thiel, V.; Janke, C.; Guggemos, W.; Seilmaier, M.; Drosten, C.; Vollmar, P.; Zwirgmaier, K.; Zange, S.; Wölfel, R.; Hoelscher, M., Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany. *New England Journal of Medicine* **2020**. <https://www.nejm.org/doi/full/10.1056/NEJMc2001468>
<https://www.nejm.org/doi/10.1056/NEJMc2001468>
587. Ruktanonchai, N. W.; Floyd, J. R.; Lai, S.; Ruktanonchai, C. W.; Sadilek, A.; Rente-Lourenco, P.; Ben, X.; Carioli, A.; Gwinn, J.; Steele, J. E.; Prosper, O.; Schneider, A.; Oplinger, A.; Eastham, P.; Tatem, A. J., Assessing the impact of coordinated COVID-19 exit strategies across Europe. *Science* **2020**, eabc5096. <https://science.sciencemag.org/content/sci/early/2020/07/16/science.abc5096.full.pdf>
588. Rundle, A., Severe COVID-19 Risk Mapping. <https://columbia.maps.arcgis.com/apps/webappviewer/index.html?id=ade6ba85450c4325a12a5b9c09ba796c>.
589. Russell, T. W.; Wu, J. T.; Clifford, S.; Edmunds, W. J.; Kucharski, A. J.; Jit, M., Effect of internationally imported cases on internal spread of COVID-19: a mathematical modelling study. *The Lancet Public Health* **2020**. [https://doi.org/10.1016/S2468-2667\(20\)30263-2](https://doi.org/10.1016/S2468-2667(20)30263-2)

590. RUSSO, R.; Levine, C.; Veilleux, C.; Peixoto, B.; McCormick-Ell, J.; Block, T.; Gresko, A.; Delmas, G.; Chitale, P.; Frees, A.; Ruiz, A.; Alland, D., Decontaminating N95 respirators during the Covid-19 pandemic: simple and practical approaches to increase decontamination capacity, speed, safety and ease of use. *medRxiv* **2020**, 2020.08.17.20177022.
<https://www.medrxiv.org/content/medrxiv/early/2020/08/21/2020.08.17.20177022.full.pdf>
591. Ryan, D. J.; Toomey, S.; Madden, S. F.; Casey, M.; Breathnach, O. S.; Morris, P. G.; Grogan, L.; Branagan, P.; Costello, R. W.; De Barra, E.; Hurley, K.; Gunaratnam, C.; McElvaney, N. G.; O'Brien, M. E.; Sulaiman, I.; Morgan, R. K.; Hennessy, B. T., Use of exhaled breath condensate (EBC) in the diagnosis of SARS-CoV-2 (COVID-19). *Thorax* **2020**, thoraxjnl-2020-215705.
<https://thorax.bmj.com/content/thoraxjnl/early/2020/10/23/thoraxjnl-2020-215705.full.pdf>
592. Ryan, K. A.; Bewley, K. R.; Fotheringham, S. A.; Brown, P.; Hall, Y.; Marriott, A. C.; Tree, J. A.; Allen, L.; Aram, M. J.; Brunt, E.; Buttigieg, K. R.; Cavell, B. E.; Carter, D. P.; Cobb, R.; Coombes, N. S.; Godwin, K. J.; Gooch, K. E.; Gouriet, J.; Halkerston, R.; Harris, D. J.; Humphries, H. E.; Hunter, L.; Ho, C. M. K.; Kennard, C. L.; Leung, S.; Ngabo, D.; Osman, K. L.; Paterson, J.; Penn, E. J.; Pullan, S. T.; Rayner, E.; Slack, G. S.; Steeds, K.; Taylor, I.; Tipton, T.; Thomas, S.; Wand, N. I.; Watson, R. J.; Wiblin, N. R.; Charlton, S.; Hallis, B.; Hiscox, J. A.; Funnell, S.; Dennis, M. J.; Whittaker, C. J.; Catton, M. G.; Druce, J.; Salguero, F. J.; Carroll, M. W., Dose-dependent response to infection with SARS-CoV-2 in the ferret model: evidence of protection to re-challenge. *bioRxiv* **2020**, 2020.05.29.123810.
<https://www.biorxiv.org/content/biorxiv/early/2020/05/29/2020.05.29.123810.full.pdf>
593. Saeed, O.; Castagna, F.; Agalliu, I.; Xue, X.; Patel, S. R.; Rochlani, Y.; Kataria, R.; Vukelic, S.; Sims, D. B.; Alvarez, C.; Rivas-Lasarte, M.; Garcia, M. J.; Jorde, U. P., Statin Use and In-Hospital Mortality in Diabetics with COVID-19. *J Am Heart Assoc* **2020**, e018475.
594. Safewell, SafeSpace. <https://www.safewellsolutions.co.uk/products/safespace/> (accessed 10 Oct 2020).
595. Sakoulas, G.; Geriak, M.; Kullar, R.; Greenwood, K. L.; Habib, M.; Vyas, A.; Ghafourian, M.; Dintyala, V. N. K.; Haddad, F., Intravenous Immunoglobulin Plus Methylprednisolone Mitigate Respiratory Morbidity in Coronavirus Disease 2019. *Crit Care Explor* **2020**, 2 (11), e0280.
596. Salazar, E.; Christensen, P. A.; Graviss, E. A.; Nguyen, D. T.; Castillo, B.; Chen, J.; Lopez, B. V.; Eagar, T. N.; Yi, X.; Zhao, P.; Rogers, J.; Shehabeldin, A.; Joseph, D.; Masud, F.; Leveque, C.; Olsen, R. J.; Bernard, D. W.; Gollihar, J.; Musser, J. M., Significantly decreased mortality in a large cohort of COVID-19 patients transfused early with convalescent plasma containing high titer anti-SARS-CoV-2 spike protein IgG. *The American Journal of Pathology* **2020**.
<http://www.sciencedirect.com/science/article/pii/S0002944020304892>
597. Sanchez, G. V.; Biedron, C.; Fink, L. R.; al., e., Initial and Repeated Point Prevalence Surveys to Inform SARS-CoV-2 Infection Prevention in 26 Skilled Nursing Facilities — Detroit, Michigan, March–May 2020. *Morbidity and Mortality Weekly Report* **2020**, ePub: 1 July 2020.
https://www.cdc.gov/mmwr/volumes/69/wr/mm6927e1.htm?s_cid=mm6927e1_w#suggestedcitation
598. Sandhu, T.; Tieng, A.; Chilimuri, S.; Franchin, G., A Case Control Study to Evaluate the Impact of Colchicine on Patients Admitted to the Hospital with Moderate to Severe COVID-19 Infection. *Can J Infect Dis Med Microbiol* **2020**, 2020, 8865954.
599. Santarpia, J. L.; Rivera, D. N.; Herrera, V.; Morwitzer, M. J.; Creager, H.; Santarpia, G. W.; Crown, K. K.; Brett-Major, D.; Schnaubelt, E.; Broadhurst, M. J.; Lawler, J. V.; Reid, S. P.; Lowe, J. J., Transmission Potential of SARS-CoV-2 in Viral Shedding Observed at the University of Nebraska Medical Center. *medRxiv* **2020**, 2020.03.23.20039446.
<https://www.medrxiv.org/content/medrxiv/early/2020/03/26/2020.03.23.20039446.1.full.pdf>
600. Schlottau, K.; Rissmann, M.; Graaf, A.; Schön, J.; Sehl, J.; Wylezich, C.; Höper, D.; Mettenleiter, T. C.; Balkema-Buschmann, A.; Harder, T.; Grund, C.; Hoffmann, D.; Breithaupt, A.; Beer, M., SARS-CoV-2 in

- fruit bats, ferrets, pigs, and chickens: an experimental transmission study. *The Lancet Microbe* **2020**.
[https://doi.org/10.1016/S2666-5247\(20\)30089-6](https://doi.org/10.1016/S2666-5247(20)30089-6)
601. Schnirring, L., New coronavirus infects health workers, spreads to Korea.
<http://www.cidrap.umn.edu/news-perspective/2020/01/new-coronavirus-infects-health-workers-spreads-korea>.
602. Schuit, M.; Ratnesar-Shumate, S.; Yolitz, J.; Williams, G.; Weaver, W.; Green, B.; Miller, D.; Krause, M.; Beck, K.; Wood, S.; Holland, B.; Bohannon, J.; Freeburger, D.; Hooper, I.; Biryukov, J.; Altamura, L. A.; Wahl, V.; Hevey, M.; Dabisch, P., Airborne SARS-CoV-2 is Rapidly Inactivated by Simulated Sunlight. *The Journal of Infectious Diseases* **2020**. <https://doi.org/10.1093/infdis/jiaa334>
603. Sciences, C. A. o. M., The Efficacy, Safety and Immunogenicity Study of Inactivated SARS-CoV-2 Vaccine for Preventing Against COVID-19. <https://clinicaltrials.gov/ct2/show/NCT04659239>.
604. Self, W. H.; Semler, M. W.; Leither, L. M.; Casey, J. D.; Angus, D. C.; Brower, R. G.; Chang, S. Y.; Collins, S. P.; Eppensteiner, J. C.; Filbin, M. R.; Files, D. C.; Gibbs, K. W.; Ginde, A. A.; Gong, M. N.; Harrell, F. E., Jr; Hayden, D. L.; Hough, C. L.; Johnson, N. J.; Khan, A.; Lindsell, C. J.; Matthay, M. A.; Moss, M.; Park, P. K.; Rice, T. W.; Robinson, B. R. H.; Schoenfeld, D. A.; Shapiro, N. I.; Steingrub, J. S.; Ulysse, C. A.; Weissman, A.; Yealy, D. M.; Thompson, B. T.; Brown, S. M.; National Heart, L.; Network, B. I. P. C. T., Effect of Hydroxychloroquine on Clinical Status at 14 Days in Hospitalized Patients With COVID-19: A Randomized Clinical Trial. *JAMA* **2020**. <https://doi.org/10.1001/jama.2020.22240>
605. Self, W. H.; Tenforde, M. W.; Stubblefield, W. B.; Feldstein, L. R.; Steingrub, J. S.; Shapiro, N. I.; Ginde, A. A.; Prekker, M. E.; Brown, S. M.; Peltan, I. D.; Gong, M. N.; Aboodi, M. S.; Khan, A.; Exline, M. C.; Files, D. C.; Gibbs, K. W.; Lindsell, C. J.; Rice, T. W.; Jones, I. D.; Halasa, N.; Talbot, H. K.; Grijalva, C. G.; Casey, J. D.; Hager, D. N.; Qadir, N.; Henning, D. J.; Coughlin, M. M.; Schiffer, J.; Semenova, V.; Li, H.; Thornburg, N. J.; Patel, M. M., Decline in SARS-CoV-2 Antibodies After Mild Infection Among Frontline Health Care Personnel in a Multistate Hospital Network — 12 States, April–August 2020.
https://www.cdc.gov/mmwr/volumes/69/wr/mm6947a2.htm?s_cid=mm6947a2_w.
606. Seow, J.; Graham, C.; Merrick, B.; Acors, S.; Steel, K. J. A.; Hemmings, O.; O'Bryne, A.; Kouphou, N.; Pickering, S.; Galao, R.; Betancor, G.; Wilson, H. D.; Signell, A. W.; Winstone, H.; Kerridge, C.; Temperton, N.; Snell, L.; Bisnauthsing, K.; Moore, A.; Green, A.; Martinez, L.; Stokes, B.; Honey, J.; Izquierdo-Barras, A.; Arbane, G.; Patel, A.; O'Connell, L.; O'Hara, G.; MacMahon, E.; Douthwaite, S.; Nebbia, G.; Batra, R.; Martinez-Nunez, R.; Edgeworth, J. D.; Neil, S. J. D.; Malim, M. H.; Doores, K., Longitudinal evaluation and decline of antibody responses in SARS-CoV-2 infection. *medRxiv* **2020**, 2020.07.09.20148429.
<https://www.medrxiv.org/content/medrxiv/early/2020/07/11/2020.07.09.20148429.full.pdf>
607. sermet, i.; temmam, s.; huon, c.; behillil, s.; gadjos, v.; bigot, t.; lurier, t.; chretien, d.; backovick, m.; Moisan-Delaunay, A.; donati, f.; albert, m.; foucaud, e.; Mesplees, B.; benoist, g.; fayes, a.; duval-arnould, m.; cretolle, c.; charbit, m.; aubart, m.; Auriou, J.; lorrot, m.; Kariyawasam, D.; fertita, I.; Orliaguet, G.; pigneur, b.; Bader-Meunier, B.; briand, c.; toubiana, j.; Guillemintot, T.; van der werf, s.; leruez-ville, m.; eloit, m., Prior infection by seasonal coronaviruses does not prevent SARS-CoV-2 infection and associated Multisystem Inflammatory Syndrome in children. *medRxiv* **2020**, 2020.06.29.20142596.
<https://www.medrxiv.org/content/medrxiv/early/2020/06/30/2020.06.29.20142596.full.pdf>
608. Services, I. o. M. a. L., REALM Project Releases Results from Latest Tests of Coronavirus on Leather, Summary of Research. <https://www.ims.gov/news/realm-project-releases-results-latest-tests-coronavirus-leather-summary-research>.
609. Shacham, E.; Scroggins, S.; Ellis, M.; Garza, A., Association of County-Wide Mask Ordinances with Reductions in Daily CoVID-19 Incident Case Growth in a Midwestern Region Over 12 Weeks. *medRxiv* **2020**, 2020.10.28.20221705.
<https://www.medrxiv.org/content/medrxiv/early/2020/10/30/2020.10.28.20221705.full.pdf>

610. Shan, B.; Broza, Y. Y.; Li, W.; Wang, Y.; Wu, S.; Liu, Z.; Wang, J.; Gui, S.; Wang, L.; Zhang, Z.; Liu, W.; Zhou, S.; Jin, W.; Zhang, Q.; Hu, D.; Lin, L.; Zhang, Q.; Li, W.; Wang, J.; Liu, H.; Pan, Y.; Haick, H., Multiplexed Nanomaterial-Based Sensor Array for Detection of COVID-19 in Exhaled Breath. *ACS Nano* **2020**. <https://doi.org/10.1021/acsnano.0c05657>
611. Shekerdemian, L. S.; Mahmood, N. R.; Wolfe, K. K.; Riggs, B. J.; Ross, C. E.; McKiernan, C. A.; Heidemann, S. M.; Kleinman, L. C.; Sen, A. I.; Hall, M. W.; Priestley, M. A.; McGuire, J. K.; Boukas, K.; Sharron, M. P.; Burns, J. P.; Collaborative, f. t. I. C.-P., Characteristics and Outcomes of Children With Coronavirus Disease 2019 (COVID-19) Infection Admitted to US and Canadian Pediatric Intensive Care Units. *JAMA Pediatrics* **2020**. <https://doi.org/10.1001/jamapediatrics.2020.1948>
612. Shen, M.; Zu, J.; Fairley, C. K.; Pagán, J. A.; An, L.; Du, Z.; Guo, Y.; Rong, L.; Xiao, Y.; Zhuang, G.; Li, Y.; Zhang, L., Projected COVID-19 epidemic in the United States in the context of the effectiveness of a potential vaccine and implications for social distancing and face mask use. *medRxiv* **2020**, 2020.10.28.20221234. <https://www.medrxiv.org/content/medrxiv/early/2020/10/30/2020.10.28.20221234.full.pdf>
613. Shepardson, D., U.S. CDC issues 'strong recommendation' for mask mandate on airplanes, trains. *Reuters* **2020**. <https://ca.reuters.com/article/instant-article/idUSL1N2HA24V>
614. Sherina, N.; Piralla, A.; Du, L.; Wan, H.; Kumagai-Braesh, M.; Andrell, J.; Braesch-Andersen, S.; Cassaniti, I.; Percivalle, E.; Sarasini, A.; Bergami, F.; Di Martino, R.; Colaneri, M.; Vecchia, M.; Sambo, M.; Zuccaro, V.; Bruno, R.; Oggionni, T.; Meloni, F.; Abolhassani, H.; Bertoglio, F.; Schubert, M.; Byrne-Steele, M.; Han, J.; Hust, M.; Xue, Y.; Hammarstrom, L.; Baldanti, F.; Marcotte, H.; Pan-Hammarstrom, Q., Persistence of SARS-CoV-2 specific B- and T-cell responses in convalescent COVID-19 patients 6-8 months after the infection. *bioRxiv* **2020**, 2020.11.06.371617. <https://www.biorxiv.org/content/biorxiv/early/2020/11/06/2020.11.06.371617.full.pdf>
615. Shi, J.; Wen, Z.; Zhong, G.; Yang, H.; Wang, C.; Huang, B.; Liu, R.; He, X.; Shuai, L.; Sun, Z.; Zhao, Y.; Liu, P.; Liang, L.; Cui, P.; Wang, J.; Zhang, X.; Guan, Y.; Tan, W.; Wu, G.; Chen, H.; Bu, Z., Susceptibility of ferrets, cats, dogs, and other domesticated animals to SARS–coronavirus 2. *Science* **2020**, eabb7015. <https://science.sciencemag.org/content/sci/early/2020/04/07/science.abb7015.full.pdf>
616. Shi, Q.; Hu, Y.; Peng, B.; Tang, X.-J.; Wang, W.; Su, K.; Luo, C.; Wu, B.; Zhang, F.; Zhang, Y.; Anderson, B.; Zhong, X.-N.; Qiu, J.-F.; Yang, C. Y.; Huang, A.-L., Effective control of SARS-CoV-2 transmission in Wanzhou, China. *Nature Medicine* **2020**. <https://doi.org/10.1038/s41591-020-01178-5>
617. Shi, S.; Qin, M.; Shen, B.; Cai, Y.; Liu, T.; Yang, F.; Gong, W.; Liu, X.; Liang, J.; Zhao, Q.; Huang, H.; Yang, B.; Huang, C., Association of Cardiac Injury With Mortality in Hospitalized Patients With COVID-19 in Wuhan, China. *JAMA Cardiology* **2020**. <https://doi.org/10.1001/jamacardio.2020.0950>
618. Sia, S. F.; Yan, L. M.; Chin, A. W. H.; Fung, K.; Choy, K. T.; Wong, A. Y. L.; Kaewpreedee, P.; Perera, R.; Poon, L. L. M.; Nicholls, J. M.; Peiris, M.; Yen, H. L., Pathogenesis and transmission of SARS-CoV-2 in golden hamsters. *Nature* **2020**.
619. Silcott, D.; Kinahan, S.; Santarpia, J.; Silcott, B.; Silcott, R.; Silcott, P.; Silcott, B.; Distelhorst, S.; Herrera, V.; Rivera, D.; Crown, K.; Lucero, G.; Bryden, W.; McLoughlin, M.; Cetta, M.; Accardi, R., TRANSCOM/AMC Commercial Aircraft Cabin Aerosol Dispersion Tests; USATRANSCOM and AMC: 2020. <https://www.ustranscom.mil/cmd/docs/TRANSCOM%20Report%20Final.pdf>
620. Simmons, S.; Carrion, R.; Alfson, K.; Staples, H.; Jinadatha, C.; Jarvis, W.; Sampathkumar, P.; Chemaly, R. F.; Khawaja, F.; Povroznik, M.; Jackson, S.; Kaye, K. S.; Rodriguez, R. M.; Stibich, M., Deactivation of SARS-CoV-2 with Pulsed Xenon Ultraviolet: implications for environmental COVID-19 control. *Infection Control & Hospital Epidemiology* **2020**, 1-19. <https://www.cambridge.org/core/article/deactivation-of-sarscov2-with-pulsed-xenon-ultraviolet-implications-for-environmental-covid19-control/AD5CF52419E27E86E0114059FBA78D4C>
621. Simonovich, V. A.; Burgos Pratx, L. D.; Scibona, P.; Beruto, M. V.; Vallone, M. G.; Vázquez, C.; Savoy, N.; Giunta, D. H.; Pérez, L. G.; Sánchez, M. D. L.; Gamarnik, A. V.; Ojeda, D. S.; Santoro, D. M.; Camino, P.

- J.; Antelo, S.; Rainero, K.; Vidiella, G. P.; Miyazaki, E. A.; Cornistein, W.; Trabadelo, O. A.; Ross, F. M.; Spotti, M.; Funtowicz, G.; Scordo, W. E.; Losso, M. H.; Ferniot, I.; Pardo, P. E.; Rodriguez, E.; Rucci, P.; Pasquali, J.; Fuentes, N. A.; Esperatti, M.; Speroni, G. A.; Nannini, E. C.; Matteaccio, A.; Michelangelo, H. G.; Follmann, D.; Lane, H. C.; Belloso, W. H., A Randomized Trial of Convalescent Plasma in Covid-19 Severe Pneumonia. *N Engl J Med* **2020**.
622. Singh, K.; Mittal, S.; Gollapudi, S.; Butzmann, A.; Kumar, J.; Ohgami, R. S., A meta-analysis of SARS-CoV-2 patients identifies the combinatorial significance of D-dimer, C-reactive protein, lymphocyte, and neutrophil values as a predictor of disease severity. *International Journal of Laboratory Hematology* n/a (n/a). <https://onlinelibrary.wiley.com/doi/abs/10.1111/ijlh.13354>
623. Sinovac, Clinical Trial of Efficacy and Safety of Sinovac's Adsorbed COVID-19 (Inactivated) Vaccine in Healthcare Professionals (PROFISCOV). <https://clinicaltrials.gov/ct2/show/NCT04456595?term=vaccine&cond=covid-19&draw=2&rank=1>.
624. Sit, T. H. C.; Brackman, C. J.; Ip, S. M.; Tam, K. W. S.; Law, P. Y. T.; To, E. M. W.; Yu, V. Y. T.; Sims, L. D.; Tsang, D. N. C.; Chu, D. K. W.; Perera, R.; Poon, L. L. M.; Peiris, M., Infection of dogs with SARS-CoV-2. *Nature* **2020**.
625. Skalina, K. A.; Goldstein, D. Y.; Sulail, J.; Hahm, E.; Narlieva, M.; Szymczak, W.; Fox, A. S., Extended Storage of SARS-CoV2 Nasopharyngeal Swabs Does Not Negatively Impact Results of Molecular-Based Testing. *medRxiv* **2020**, 2020.05.16.20104158. <https://www.medrxiv.org/content/medrxiv/early/2020/05/20/2020.05.16.20104158.full.pdf>
626. Smarr, B. L.; Aschbacher, K.; Fisher, S. M.; Chowdhary, A.; Dilchert, S.; Puldon, K.; Rao, A.; Hecht, F. M.; Mason, A. E., Feasibility of continuous fever monitoring using wearable devices. *Scientific Reports* **2020**, *10* (1), 21640. <https://doi.org/10.1038/s41598-020-78355-6>
627. Sobel Leonard, A.; Weissman, D. B.; Greenbaum, B.; Ghedin, E.; Koelle, K., Transmission Bottleneck Size Estimation from Pathogen Deep-Sequencing Data, with an Application to Human Influenza A Virus. *Journal of Virology* **2017**, *91* (14), e00171-17. <https://jvi.asm.org/content/jvi/91/14/e00171-17.full.pdf>
628. Song, J.-Y.; Yun, J.-G.; Noh, J.-Y.; Cheong, H.-J.; Kim, W.-J., Covid-19 in South Korea — Challenges of Subclinical Manifestations. *New England Journal of Medicine* **2020**. <https://www.nejm.org/doi/full/10.1056/NEJMc2001801>
629. Soni, M., Evaluation of eosinopenia as a diagnostic and prognostic indicator in COVID-19 infection. *International Journal of Laboratory Hematology* **2020**, n/a (n/a). <https://onlinelibrary.wiley.com/doi/abs/10.1111/ijlh.13425>
630. Ssentongo, A. E.; Ssentongo, P.; Heilbrunn, E. S.; Lekoubou, A.; Du, P.; Liao, D.; Oh, J. S.; Chinchilli, V. M., Renin–angiotensin–aldosterone system inhibitors and the risk of mortality in patients with hypertension hospitalised for COVID-19: systematic review and meta-analysis. *Open Heart* **2020**, *7* (2), e001353. <http://openheart.bmj.com/content/7/2/e001353.abstract>
631. Stadnytskyi, V.; Bax, C. E.; Bax, A.; Anfinrud, P., The airborne lifetime of small speech droplets and their potential importance in SARS-CoV-2 transmission. *Proceedings of the National Academy of Sciences* **2020**, 202006874. <https://www.pnas.org/content/pnas/early/2020/05/12/2006874117.full.pdf>
632. Staff, G. B., Originally Built for Bioterrorism Agents, This Decontamination System Now Clears SARS-CoV-2 from Military Aircraft. *Global Biodefense* **2020**. <https://globalbiodefense.com/2020/11/05/military-aircraft-sars-cov-2-sanitization-with-hot-air-system/>
633. Sterne, J. A. C.; Murthy, S.; Diaz, J. V.; Slutsky, A. S.; Villar, J.; Angus, D. C.; Annane, D.; Azevedo, L. C. P.; Berwanger, O.; Cavalcanti, A. B.; Dequin, P. F.; Du, B.; Emberson, J.; Fisher, D.; Giraudeau, B.; Gordon, A. C.; Granholm, A.; Green, C.; Haynes, R.; Heming, N.; Higgins, J. P. T.; Horby, P.; Jüni, P.; Landray, M. J.; Le Gouge, A.; Leclerc, M.; Lim, W. S.; Machado, F. R.; McArthur, C.; Meziani, F.; Møller, M. H.; Perner, A.; Petersen, M. W.; Savovic, J.; Tomazini, B.; Veiga, V. C.; Webb, S.; Marshall, J. C., Association Between Administration of Systemic Corticosteroids and Mortality Among Critically Ill Patients With COVID-19: A Meta-analysis. *Jama* **2020**. <https://jamanetwork.com/journals/jama/fullarticle/2770279>

634. Strohbehn, G. W.; Heiss, B. L.; Rouhani, S. J.; Trujillo, J. A.; Yu, J.; Kacew, A. J.; Higgs, E. F.; Bloodworth, J. C.; Cabanov, A.; Wright, R. C.; Koziol, A. K.; Weiss, A.; Danahey, K.; Karrison, T. G.; Edens, C. C.; Ventura, I. B.; Pettit, N. N.; Patel, B. K.; Pisano, J.; Strek, M. E.; Gajewski, T. F.; Ratain, M. J.; Reid, P. D., COVIDOSE: A phase 2 clinical trial of low-dose tocilizumab in the treatment of non-critical COVID-19 pneumonia. *Clin Pharmacol Ther* **2020**.
635. Stubblefield, W. B.; Talbot, H. K.; Feldstein, L.; Tenforde, M. W.; Rasheed, M. A. U.; Mills, L.; Lester, S. N.; Freeman, B.; Thornburg, N. J.; Jones, I. D.; Ward, M. J.; Lindsell, C. J.; Baughman, A.; Halasa, N.; Grijalva, C. G.; Rice, T. W.; Patel, M. M.; Self, W. H.; Investigators, I. V. E. i. t. C. I., Seroprevalence of SARS-CoV-2 Among Frontline Healthcare Personnel During the First Month of Caring for COVID-19 Patients — Nashville, Tennessee. *Clinical Infectious Diseases* **2020**. <https://doi.org/10.1093/cid/ciaa936>
636. Su, H.; Yang, M.; Wan, C.; Yi, L.-X.; Tang, F.; Zhu, H.-Y.; Yi, F.; Yang, H.-C.; Fogo, A. B.; Nie, X.; Zhang, C., Renal histopathological analysis of 26 postmortem findings of patients with COVID-19 in China. *Kidney International*. <https://doi.org/10.1016/j.kint.2020.04.003>
637. Suarez, D. L.; Pantin-Jackwood, M. J.; Swayne, D. E.; Lee, S. A.; DeBlois, S. M.; Spackman, E., Lack of susceptibility of poultry to SARS-CoV-2 and MERS-CoV. *bioRxiv* **2020**, 2020.06.16.154658. <http://biorxiv.org/content/early/2020/06/16/2020.06.16.154658.abstract>
638. Sugano, N.; Ando, W.; Fukushima, W., Cluster of SARS-CoV-2 infections linked to music clubs in Osaka, Japan: asymptotically infected persons can transmit the virus as soon as 2 days after infection. *The Journal of Infectious Diseases* **2020**. <https://doi.org/10.1093/infdis/jiaa542>
639. Sukhyun, R.; Seikh Taslim, A.; Cheolsun, J.; Baekjin, K.; Benjamin, J. C., Effect of Nonpharmaceutical Interventions on Transmission of Severe Acute Respiratory Syndrome Coronavirus 2, South Korea, 2020. *Emerging Infectious Disease journal* **2020**, 26 (10). https://wwwnc.cdc.gov/eid/article/26/10/20-1886_article
640. Sun, J.; Zhu, A.; Li, H.; Zheng, K.; Zhuang, Z.; Chen, Z.; Shi, Y.; Zhang, Z.; Chen, S. B.; Liu, X.; Dai, J.; Li, X.; Huang, S.; Huang, X.; Luo, L.; Wen, L.; Zhuo, J.; Li, Y.; Wang, Y.; Zhang, L.; Zhang, Y.; Li, F.; Feng, L.; Chen, X.; Zhong, N.; Yang, Z.; Huang, J.; Zhao, J.; Li, Y. M., Isolation of Infectious SARS-CoV-2 from Urine of a COVID-19 Patient. *Emerg Microbes Infect* **2020**, 1-8.
641. Sun, K.; Wang, W.; Gao, L.; Wang, Y.; Luo, K.; Ren, L.; Zhan, Z.; Chen, X.; Zhao, S.; Huang, Y.; Sun, Q.; Liu, Z.; Litvinova, M.; Vespignani, A.; Ajelli, M.; Viboud, C.; Yu, H., Transmission heterogeneities, kinetics, and controllability of SARS-CoV-2. *Science* **2020**, eabe2424. <https://science.sciencemag.org/content/sci/early/2020/11/23/science.abe2424.full.pdf>
642. Sun, S.; Cai, X.; Wang, H.; He, G.; Lin, Y.; Lu, B.; Chen, C.; Pan, Y.; Hu, X., Abnormalities of peripheral blood system in patients with COVID-19 in Wenzhou, China. *Clinica Chimica Acta* **2020**, 507, 174-180. <http://www.sciencedirect.com/science/article/pii/S0009898120301790>
643. Suthar, M. S.; Zimmerman, M. G.; Kauffman, R. C.; Mantus, G.; Linderman, S. L.; Hudson, W. H.; Vanderheiden, A.; Nyhoff, L.; Davis, C. W.; Adekunle, S.; Affer, M.; Sherman, M.; Reynolds, S.; Verkerke, H. P.; Alter, D. N.; Guarner, J.; Bryksin, J.; Horwath, M.; Arthur, C. M.; Saakadze, N.; Smith, G. H.; Edupuganti, S.; Scherer, E. M.; Hellmeister, K.; Cheng, A.; Morales, J. A.; Neish, A. S.; Stowell, S. R.; Frank, F.; Ortlund, E.; Anderson, E.; Menachery, V. D.; Roupheal, N.; Mehta, A.; Stephens, D. S.; Ahmed, R.; Roback, J. D.; Wrammert, J., Rapid generation of neutralizing antibody responses in COVID-19 patients. *Cell Reports Medicine* **2020**. <https://doi.org/10.1016/j.xcrm.2020.100040>
644. Tabata, S.; Imai, K.; Kawano, S.; Ikeda, M.; Kodama, T.; Miyoshi, K.; Obinata, H.; Mimura, S.; Kodera, T.; Kitagaki, M.; Sato, M.; Suzuki, S.; Ito, T.; Uwabe, Y.; Tamura, K., Clinical characteristics of COVID-19 in 104 people with SARS-CoV-2 infection on the Diamond Princess cruise ship: a retrospective analysis. *The Lancet Infectious Diseases*. [https://doi.org/10.1016/S1473-3099\(20\)30482-5](https://doi.org/10.1016/S1473-3099(20)30482-5)
645. Takahashi, T.; Ellingson, M. K.; Wong, P.; Israelow, B.; Lucas, C.; Klein, J.; Silva, J.; Mao, T.; Oh, J. E.; Tokuyama, M.; Lu, P.; Venkataraman, A.; Park, A.; Liu, F.; Meir, A.; Sun, J.; Wang, E. Y.; Casanovas-Massana, A.; Wyllie, A. L.; Vogels, C. B. F.; Earnest, R.; Lapidus, S.; Ott, I. M.; Moore, A. J.; Anastasio, K.;

- Askenase, M. H.; Batsu, M.; Beatty, H.; Bermejo, S.; Bickerton, S.; Brower, K.; Bucklin, M. L.; Cahill, S.; Campbell, M.; Cao, Y.; Courchaine, E.; Datta, R.; Deluliis, G.; Geng, B.; Glick, L.; Handoko, R.; Kalinich, C.; Khoury-Hanold, W.; Kim, D.; Knaggs, L.; Kuang, M.; Kudo, E.; Lim, J.; Linehan, M.; Lu-Culligan, A.; Malik, A. A.; Martin, A.; Matos, I.; McDonald, D.; Minasyan, M.; Mohanty, S.; Muenker, M. C.; Naushad, N.; Nelson, A.; Nouws, J.; Nunez-Smith, M.; Obaid, A.; Ott, I.; Park, H.-J.; Peng, X.; Petrone, M.; Prophet, S.; Rahming, H.; Rice, T.; Rose, K.-A.; Sewanan, L.; Sharma, L.; Shepard, D.; Silva, E.; Simonov, M.; Smolgovsky, M.; Song, E.; Sonnert, N.; Strong, Y.; Todeasa, C.; Valdez, J.; Velazquez, S.; Vijayakumar, P.; Wang, H.; Watkins, A.; White, E. B.; Yang, Y.; Shaw, A.; Fournier, J. B.; Odio, C. D.; Farhadian, S.; Dela Cruz, C.; Grubaugh, N. D.; Schulz, W. L.; Ring, A. M.; Ko, A. I.; Omer, S. B.; Iwasaki, A.; Yale, I. r. t., Sex differences in immune responses that underlie COVID-19 disease outcomes. *Nature* **2020**.
<https://doi.org/10.1038/s41586-020-2700-3>
646. Tan, C. W.; Ho, L. P.; Kalimuddin, S.; Cherng, B. P. Z.; Teh, Y. E.; Thien, S. Y.; Wong, H. M.; Tern, P. J. W.; Chandran, M.; Chay, J. W. M.; Nagarajan, C.; Sultana, R.; Low, J. G. H.; Ng, H. J., Cohort study to evaluate effect of vitamin D, magnesium, and vitamin B12 in combination on severe outcome progression in older patients with coronavirus (COVID-19). *Nutrition* **2020**, 79-80, 111017.
<http://www.sciencedirect.com/science/article/pii/S0899900720303002>
647. Tan, F.; Wang, K.; Liu, J.; Liu, D.; Luo, J.; Zhou, R., Viral Transmission and Clinical Features in Asymptomatic Carriers of SARS-CoV-2 in Wuhan, China. *Frontiers in Medicine* **2020**, 7 (547).
<https://www.frontiersin.org/article/10.3389/fmed.2020.00547>
648. Team, D. W., 'Covaxin': Bharat Biotech to begin Phase-III trials of COVID-19 vaccine in UP from October. <https://www.dnaindia.com/india/report-covaxin-bharat-biotech-covid-19-vaccine-phase-3-trials-uttar-pradesh-october-2845194>.
649. Tenforde, M. W.; Kim, S. S.; Lindsell, C. J.; al., e., Symptom Duration and Risk Factors for Delayed Return to Usual Health Among Outpatients with COVID-19 in a Multistate Health Care Systems Network — United States, March–June 2020. *Morbidity and Mortality Weekly Report* **2020**, ePub: 24 July 2020.
650. The Novel Coronavirus Pneumonia Emergency Response Epidemiology, T., The Epidemiological Characteristics of an Outbreak of 2019 Novel Coronavirus Diseases (COVID-19) — China, 2020. *China CDC Weekly* **2020**, 2, 1-10. <http://weekly.chinacdc.cn//article/id/e53946e2-c6c4-41e9-9a9b-fea8db1a8f51>
651. Thomas, P.; Alexander, P. E.; Ahmed, U.; Elderhorst, E.; El-Khechen, H.; Mammen, M. J.; Debono, V. B.; Aponte Torres, Z.; Aryal, K.; Brocard, E.; Sagastuy, B.; Alhazzani, W., Vertical transmission risk of SARS-CoV-2 infection in the third trimester: a systematic scoping review. *The Journal of Maternal-Fetal & Neonatal Medicine* **2020**, 1-8. <https://doi.org/10.1080/14767058.2020.1786055>
652. Thomson, E. C.; Rosen, L. E.; Shepherd, J. G.; Spreafico, R.; da Silva Filipe, A.; Wojcechowskyj, J. A.; Davis, C.; Piccoli, L.; Pascall, D. J.; Dillen, J.; Lytras, S.; Czudnochowski, N.; Shah, R.; Meury, M.; Jesudason, N.; De Marco, A.; Li, K.; Bassi, J.; Toole, A.; Pinto, D.; Colquhoun, R. M.; Culap, K.; Jackson, B.; Zatta, F.; Rambaut, A.; Jaconi, S.; Sreenu, V. B.; Nix, J.; Jarrett, R. F.; Beltramello, M.; Nomikou, K.; Pizzuto, M.; Tong, L.; Cameroni, E.; Johnson, N.; Wickenhagen, A.; Ceschi, A.; Mair, D.; Ferrari, P.; Smollett, K.; Sallusto, F.; Carmichael, S.; Garzoni, C.; Nichols, J.; Galli, M.; Hughes, J.; Riva, A.; Ho, A.; Semple, M. G.; Openshaw, P. J. M.; Baillie, K.; Rihn, S. J.; Lycett, S. J.; Virgin, H. W.; Telenti, A.; Corti, D.; Robertson, D. L.; Snell, G., The circulating SARS-CoV-2 spike variant N439K maintains fitness while evading antibody-mediated immunity. *bioRxiv* **2020**, 2020.11.04.355842.
<http://biorxiv.org/content/early/2020/11/05/2020.11.04.355842.abstract>
653. TILLET, R.; SEVINSKY, J.; HARTLEY, P.; KERWIN, H.; CRAWFORD, N.; GORZALSKI, A.; LAVERDURE, C.; VERMA, S.; ROSSETTO, C.; FARRELL, M.; JACKSON, D.; Pandori, M.; VAN HOOSER, S., Genomic Evidence for a Case of Reinfection with SARS-CoV-2. *The Lancet* **2020**.
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3681489

654. To, K. K.-W.; Tsang, O. T.-Y.; Leung, W.-S.; Tam, A. R.; Wu, T.-C.; Lung, D. C.; Yip, C. C.-Y.; Cai, J.-P.; Chan, J. M.-C.; Chik, T. S.-H., Temporal profiles of viral load in posterior oropharyngeal saliva samples and serum antibody responses during infection by SARS-CoV-2: an observational cohort study. *The Lancet Infectious Diseases* **2020**.
655. Tomazini, B. M.; Maia, I. S.; Cavalcanti, A. B.; Berwanger, O.; Rosa, R. G.; Veiga, V. C.; Avezum, A.; Lopes, R. D.; Bueno, F. R.; Silva, M.; Baldassare, F. P.; Costa, E. L. V.; Moura, R. A. B.; Honorato, M. O.; Costa, A. N.; Damiani, L. P.; Lisboa, T.; Kawano-Dourado, L.; Zampieri, F. G.; Olivato, G. B.; Righy, C.; Amendola, C. P.; Roepke, R. M. L.; Freitas, D. H. M.; Forte, D. N.; Freitas, F. G. R.; Fernandes, C. C. F.; Melro, L. M. G.; Junior, G. F. S.; Morais, D. C.; Zung, S.; Machado, F. R.; Azevedo, L. C. P., Effect of Dexamethasone on Days Alive and Ventilator-Free in Patients With Moderate or Severe Acute Respiratory Distress Syndrome and COVID-19: The CoDEX Randomized Clinical Trial. *Jama* **2020**.
<https://jamanetwork.com/journals/jama/fullarticle/2770277>
656. Torres, J. P.; Piñera, C.; De La Maza, V.; Lagomarcino, A. J.; Simian, D.; Torres, B.; Urquidi, C.; Valenzuela, M. T.; O’Ryan, M., Severe Acute Respiratory Syndrome Coronavirus 2 Antibody Prevalence in Blood in a Large School Community Subject to a Coronavirus Disease 2019 Outbreak: A Cross-sectional Study. *Clinical Infectious Diseases* **2020**. <https://doi.org/10.1093/cid/ciaa955>
657. Tortajada, C.; Colomer, E.; Andreu-Ballester, J. C.; Esparcia, A.; Oltra, C.; Flores, J., Corticosteroids for COVID-19 patients requiring oxygen support? Yes, but not for everyone: Effect of corticosteroids on mortality and Intensive Care Unit admission in patients with COVID-19 according to patients' oxygen requirements. *J Med Virol* **2020**.
658. Tosif, S.; Neeland, M. R.; Sutton, P.; Licciardi, P. V.; Sarkar, S.; Selva, K. J.; Do, L. A. H.; Donato, C.; Quan Toh, Z.; Higgins, R.; Van de Sandt, C.; Lemke, M. M.; Lee, C. Y.; Shoffner, S. K.; Flanagan, K. L.; Arnold, K. B.; Mordant, F. L.; Mulholland, K.; Bines, J.; Dohle, K.; Pellicci, D. G.; Curtis, N.; McNab, S.; Steer, A.; Saffery, R.; Subbarao, K.; Chung, A. W.; Kedzierska, K.; Burgner, D. P.; Crawford, N. W., Immune responses to SARS-CoV-2 in three children of parents with symptomatic COVID-19. *Nature Communications* **2020**, *11* (1), 5703. <https://doi.org/10.1038/s41467-020-19545-8>
659. Toubiana, J.; Levy, C.; Allali, S.; Jung, C.; Lerulez-Ville, M.; Varon, E.; Bajolle, F.; Ouldali, N.; Chareyre, J.; Béchet, S.; Elbez, A.; Casanova, J.-L.; Chalumeau, M.; Cohen, R.; Cohen, J. F., Association between SARS-CoV-2 infection and Kawasaki-like multisystem inflammatory syndrome: a retrospective matched case–control study, Paris, France, April to May 2020. *Eurosurveillance* **2020**, *25* (48), 2001813.
<https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.48.2001813>
660. Treibel, T. A.; Manisty, C.; Burton, M.; McKnight, Á.; Lambourne, J.; Augusto, J. B.; Couto-Parada, X.; Cutino-Moguel, T.; Noursadeghi, M.; Moon, J. C., COVID-19: PCR screening of asymptomatic health-care workers at London hospital. *The Lancet*. [https://doi.org/10.1016/S0140-6736\(20\)31100-4](https://doi.org/10.1016/S0140-6736(20)31100-4)
661. Tsay, C.; Lejarza, F.; Stadtherr, M. A.; Baldea, M., Modeling, state estimation, and optimal control for the US COVID-19 outbreak. *Scientific Reports* **2020**, *10* (1), 10711. <https://doi.org/10.1038/s41598-020-67459-8>
662. Tso, F. Y.; Lidenge, S. J.; Peña, P. B.; Clegg, A. A.; Ngowi, J. R.; Mwaiselage, J.; Ngalamika, O.; Julius, P.; West, J. T.; Wood, C., High prevalence of pre-existing serological cross-reactivity against SARS-CoV-2 in sub-Saharan Africa. *International Journal of Infectious Diseases* **2020**.
<https://doi.org/10.1016/j.ijid.2020.10.104>
663. Twin FM, NHS Trials "Unique" New Decontamination Tech to Reduce COVID Transmission Indoors. <https://www.twinfm.com/article/nhs-trials-unique-new-decontamination-tech-to-reduce-covid-transmission-indoors> (accessed 19 Oct 2020).
664. U.S. Food and Drug Administration (FDA), Enforcement Policy for Bioburden Reduction Systems Using Dry Heat to Support Single-User Reuse of Certain Filtering Facepiece Respirators During the Coronavirus Disease 2019 (COVID-19) Public Health Emergency. Guidance for Industry, Healthcare

Organizations, Healthcare Personnel, and Food and Drug Administration Staff.

<https://www.fda.gov/media/143985/download> (accessed 30 No 2020).

665. UCLA, COVID-19 Cases in the United States. <https://covid19.uclaml.org/model.html>.

666. Udawadia, Z. F.; Singh, P.; Barkate, H.; Patil, S.; Rangwala, S.; Pendse, A.; Kadam, J.; Wu, W.; Caracta, C. F.; Tandon, M., Efficacy and Safety of Favipiravir, an Oral RNA-Dependent RNA Polymerase Inhibitor, in Mild-to-Moderate COVID-19: A Randomized, Comparative, Open-Label, Multicenter, Phase 3 Clinical Trial. *Int J Infect Dis* **2020**.

667. Ueki, H.; Furusawa, Y.; Iwatsuki-Horimoto, K.; Imai, M.; Kabata, H.; Nishimura, H.; Kawaoka, Y., Effectiveness of Face Masks in Preventing Airborne Transmission of SARS-CoV-2. *mSphere* **2020**, *5* (5), e00637-20. <https://msphere.asm.org/content/msph/5/5/e00637-20.full.pdf>

668. Ulrich, L.; Wernike, K.; Hoffmann, D.; Mettenleiter, T. C.; Beer, M., Experimental infection of cattle with SARS-CoV-2. *bioRxiv* **2020**, 2020.08.25.254474.

<http://biorxiv.org/content/early/2020/08/25/2020.08.25.254474.abstract>

669. Urigo, C.; Soin, S.; Sahu, A., Spontaneous pneumomediastinum as a complication of a COVID-19 related pneumonia: case report and review of literature. *Radiology Case Reports* **2020**, *15* (12), 2577-2581. <http://www.sciencedirect.com/science/article/pii/S1930043320305148>

670. van de Veerdonk, F. L.; Kouijzer, I. J. E.; de Nooijer, A. H.; van der Hoeven, H. G.; Maas, C.; Netea, M. G.; Brüggemann, R. J. M., Outcomes Associated With Use of a Kinin B2 Receptor Antagonist Among Patients With COVID-19. *JAMA Network Open* **2020**, *3* (8), e2017708-e2017708.

<https://doi.org/10.1001/jamanetworkopen.2020.17708>

671. van der Sande, M.; Teunis, P.; Sabel, R., Professional and Home-Made Face Masks Reduce Exposure to Respiratory Infections among the General Population. *Plos One* **2008**, *3* (7). <Go to ISI>://WOS:000264065800020

672. van Doorn, A. S.; Meijer, B.; Frampton, C. M. A.; Barclay, M. L.; de Boer, N. K. H., Systematic review with meta-analysis: SARS-CoV-2 stool testing and the potential for faecal-oral transmission. *Alimentary Pharmacology & Therapeutics n/a* (n/a). <https://onlinelibrary.wiley.com/doi/abs/10.1111/apt.16036>

673. van Doremalen, N.; Bushmaker, T.; Morris, D. H.; Holbrook, M. G.; Gamble, A.; Williamson, B. N.; Tamin, A.; Harcourt, J. L.; Thornburg, N. J.; Gerber, S. I.; Lloyd-Smith, J. O.; de Wit, E.; Munster, V. J., Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. *New England Journal of Medicine* **2020**. <https://doi.org/10.1056/NEJMc2004973>

674. van Dorp, L.; Acman, M.; Richard, D.; Shaw, L. P.; Ford, C. E.; Ormond, L.; Owen, C. J.; Pang, J.; Tan, C. C. S.; Boshier, F. A. T.; Ortiz, A. T.; Balloux, F., Emergence of genomic diversity and recurrent mutations in SARS-CoV-2. *Infection, Genetics and Evolution* **2020**, 104351.

<http://www.sciencedirect.com/science/article/pii/S1567134820301829>

675. van Dorp, L.; Richard, D.; Tan, C. C. S.; Shaw, L. P.; Acman, M.; Balloux, F., No evidence for increased transmissibility from recurrent mutations in SARS-CoV-2. *Nature Communications* **2020**, *11* (1), 5986.

<https://doi.org/10.1038/s41467-020-19818-2>

676. Varga, Z.; Flammer, A. J.; Steiger, P.; Haberecker, M.; Andermatt, R.; Zinkernagel, A. S.; Mehra, M. R.; Schuepbach, R. A.; Ruschitzka, F.; Moch, H., Endothelial cell infection and endotheliitis in COVID-19. *The Lancet* **2020**, *395* (10234), 1417-1418. [https://doi.org/10.1016/S0140-6736\(20\)30937-5](https://doi.org/10.1016/S0140-6736(20)30937-5)

677. Verma, S.; Dhanak, M.; Frankenfield, J., Visualizing droplet dispersal for face shields and masks with exhalation valves. *arXiv preprint arXiv:2008.00125* **2020**.

678. Vilke, G. M.; Brennan, J. J.; Cronin, A. O.; Castillo, E. M., Clinical features of covid-19 patients: is temperature screening useful? *The Journal of Emergency Medicine* **2020**.

<http://www.sciencedirect.com/science/article/pii/S073646792030977X>

679. Viola, I. M.; Peterson, B.; Pisetta, G.; Pavar, G.; Akhtar, H.; Menolascina, F.; Mangano, E.; Dunn, K.; Gabl, R.; Nila, A.; Molinari, E.; Cummins, C.; Thompson, G.; Lo, M.; Denison, F.; Digard, P.; Malik, O.;

- Dunn, M. J. G.; Mehendale, F., Face Coverings, Aerosol Dispersion and Mitigation of Virus Transmission Risk. arXiv.org: 2020.
680. Vivanti, A. J.; Vauloup-Fellous, C.; Prevot, S.; Zupan, V.; Suffee, C.; Do Cao, J.; Benachi, A.; De Luca, D., Transplacental transmission of SARS-CoV-2 infection. *Nature Communications* **2020**, *11* (1), 3572. <https://doi.org/10.1038/s41467-020-17436-6>
681. Volz, E. M.; Hill, V.; McCrone, J. T.; Price, A.; Jorgensen, D.; Toole, A.; Southgate, J. A.; Johnson, R.; Jackson, B.; Nascimento, F. F.; Rey, S. M.; Nicholls, S. M.; Colquhoun, R. M.; da Silva Filipe, A.; Shepherd, J. G.; Pascall, D. J.; Shah, R.; Jesudason, N.; Li, K.; Jarrett, R.; Pacchiarini, N.; Bull, M.; Geidelberg, L.; Siveroni, I.; Goodfellow, I. G.; Loman, N. J.; Pybus, O.; Robertson, D. L.; Thomson, E. C.; Rambaut, A.; Connor, T. R., Evaluating the effects of SARS-CoV-2 Spike mutation D614G on transmissibility and pathogenicity. *medRxiv* **2020**, 2020.07.31.20166082. <http://medrxiv.org/content/early/2020/09/01/2020.07.31.20166082.abstract>
682. Voss, J. D.; Skarzynski, M.; McAuley, E. M.; Maier, E. J.; Gibbons, T.; Fries, A. C.; Chapleau, R. R., Variants in SARS-CoV-2 Associated with Mild or Severe Outcome. *medRxiv* **2020**, 2020.12.01.20242149. <http://medrxiv.org/content/early/2020/12/03/2020.12.01.20242149.abstract>
683. Wajnberg, A.; Amanat, F.; Firpo, A.; Altman, D. R.; Bailey, M. J.; Mansour, M.; McMahan, M.; Meade, P.; Mendu, D. R.; Muellers, K.; Stadlbauer, D.; Stone, K.; Strohmeier, S.; Simon, V.; Aberg, J.; Reich, D. L.; Krammer, F.; Cordon-Cardo, C., Robust neutralizing antibodies to SARS-CoV-2 infection persist for months. *Science* **2020**, eabd7728. <https://science.sciencemag.org/content/sci/early/2020/10/27/science.abd7728.full.pdf>
684. Walsh, K. A.; Jordan, K.; Clyne, B.; Rohde, D.; Drummond, L.; Byrne, P.; Ahern, S.; Carty, P. G.; O'Brien, K. K.; O'Murchu, E.; O'Neill, M.; Smith, S. M.; Ryan, M.; Harrington, P., SARS-CoV-2 Detection, Viral Load and Infectivity over the Course of an Infection: SARS-CoV-2 Detection, Viral Load and Infectivity. *The Journal of infection* **2020**, S0163-4453(20)30449-7. <https://pubmed.ncbi.nlm.nih.gov/32615199>
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7323671/>
685. Walsh, K. A.; Spillane, S.; Comber, L.; Cardwell, K.; Harrington, P.; Connell, J.; Teljeur, C.; Broderick, N.; de Gascun, C. F.; Smith, S. M.; Ryan, M.; O'Neill, M., The duration of infectiousness of individuals infected with SARS-CoV-2. *Journal of Infection*. <https://doi.org/10.1016/j.jinf.2020.10.009>
686. Wambier, C. G.; Vaño-Galván, S.; McCoy, J.; Gomez-Zubiaur, A.; Herrera, S.; Hermosa-Gelbard, Á.; Moreno-Arrones, O. M.; Jiménez-Gómez, N.; González-Cantero, A.; Pascual, P. F.; Segurado-Miravalles, G.; Shapiro, J.; Pérez-García, B.; Goren, A., Androgenetic Alopecia Present in the Majority of Hospitalized COVID-19 Patients; the “Gabrin sign”. *Journal of the American Academy of Dermatology*. <https://doi.org/10.1016/j.jaad.2020.05.079>
687. Wang, D.; Hu, B.; Hu, C.; Zhu, F.; Liu, X.; Zhang, J.; Wang, B.; Xiang, H.; Cheng, Z.; Xiong, Y.; Zhao, Y.; Li, Y.; Wang, X.; Peng, Z., Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. *JAMA* **2020**. <https://doi.org/10.1001/jama.2020.1585>
https://jamanetwork.com/journals/jama/articlepdf/2761044/jama_wang_2020_oi_200019.pdf
688. Wang, D.; Li, R.; Wang, J.; Jiang, Q.; Gao, C.; Yang, J.; Ge, L.; Hu, Q., Correlation analysis between disease severity and clinical and biochemical characteristics of 143 cases of COVID-19 in Wuhan, China: a descriptive study. *BMC Infectious Diseases* **2020**, *20* (1), 519. <https://doi.org/10.1186/s12879-020-05242-w>
689. Wang, D.; You, Y.; Zhou, X.; Zong, Z.; Huang, H.; Zhang, H.; Yong, X.; Cheng, Y.; Yang, L.; Guo, Q.; Long, Y.; Liu, Y.; Huang, J.; Du, L., Selection of homemade mask materials for preventing transmission of COVID-19: a laboratory study. *medRxiv* **2020**.
690. Wang, K.; Zhao, S.; Li, H.; Song, Y.; Wang, L.; Wang, M. H.; Peng, Z.; Li, H.; He, D., Real-time estimation of the reproduction number of the novel coronavirus disease (COVID-19) in China in 2020

based on incidence data. *Annals of Translational Medicine* **2020**, *8* (11), 689.

<http://atm.amegrouops.com/article/view/43447>

691. Wang, L.; Didelot, X.; Yang, J.; Wong, G.; Shi, Y.; Liu, W.; Gao, G. F.; Bi, Y., Inference of person-to-person transmission of COVID-19 reveals hidden super-spreading events during the early outbreak phase. *Nature Communications* **2020**, *11* (1), 5006. <https://doi.org/10.1038/s41467-020-18836-4>

692. Wang, Q.; Berger, N. A.; Xu, R., Analyses of Risk, Racial Disparity, and Outcomes Among US Patients With Cancer and COVID-19 Infection. *JAMA Oncology* **2020**.
<https://doi.org/10.1001/jamaoncol.2020.6178>

693. Wang, R.; Qian, C.; Pang, Y.; Li, M.; Yang, Y.; Ma, H.; Zhao, M.; Qian, F.; Yu, H.; Liu, Z.; Ni, T.; Zheng, Y.; Wang, Y., opvCRISPR: One-pot visual RT-LAMP-CRISPR platform for SARS-cov-2 detection. *Biosensors and Bioelectronics* **2021**, *172*, 112766.

<http://www.sciencedirect.com/science/article/pii/S0956566320307533>

694. Wang, S.; Ma, P.; Zhang, S.; Song, S.; Wang, Z.; Ma, Y.; Xu, J.; Wu, F.; Duan, L.; Yin, Z.; Luo, H.; Xiong, N.; Xu, M.; Zeng, T.; Jin, Y., Fasting blood glucose at admission is an independent predictor for 28-day mortality in patients with COVID-19 without previous diagnosis of diabetes: a multi-centre retrospective study. *Diabetologia* **2020**. <https://doi.org/10.1007/s00125-020-05209-1>

695. Wang, W.; Xu, Y.; Gao, R.; Lu, R.; Han, K.; Wu, G.; Tan, W., Detection of SARS-CoV-2 in Different Types of Clinical Specimens. *JAMA* **2020**. <https://doi.org/10.1001/jama.2020.3786>

696. Wang, X.; Du, Z.; Huang, G.; Pasco, R.; Fox, S.; Galvani, A.; Pignone, M.; Johnston, S. C.; Meyers, L. A., Effects of Cocooning on Coronavirus Disease Rates after Relaxing Social Distancing. *Emerging Infectious Disease journal* **2020**, *26* (12), 3066. https://wwwnc.cdc.gov/eid/article/26/12/20-1930_article

697. Wang, X.; Ferro, E. G.; Zhou, G.; Hashimoto, D.; Bhatt, D. L., Association Between Universal Masking in a Health Care System and SARS-CoV-2 Positivity Among Health Care Workers. *JAMA* **2020**.
<https://doi.org/10.1001/jama.2020.12897>

698. Wang, X.; Pan, Y.; Zhang, D.; Chen, L.; Jia, L.; Li, X.; Yang, P.; Wang, Q.; Macintyre, C. R., Basic epidemiological parameter values from data of real-world in mega-cities: the characteristics of COVID-19 in Beijing, China. *BMC Infectious Diseases* **2020**, *20* (1), 526. <https://doi.org/10.1186/s12879-020-05251-9>

699. Wang, Y.; Chen, B.; Li, Y.; Zhang, L.; Wang, Y.; Yang, S.; Xiao, X.; Qin, Q., The Use of Renin-Angiotensin-Aldosterone System (RAAS) Inhibitors is Associated with a Lower Risk of Mortality in Hypertensive COVID-19 Patients: A Systematic Review and Meta-analysis. *J Med Virol* **2020**.

700. Wang, Y.; Tian, H.; Zhang, L.; Zhang, M.; Guo, D.; Wu, W.; Zhang, X.; Kan, G. L.; Jia, L.; Huo, D.; Liu, B.; Wang, X.; Sun, Y.; Wang, Q.; Yang, P.; MacIntyre, C. R., Reduction of secondary transmission of SARS-CoV-2 in households by face mask use, disinfection and social distancing: a cohort study in Beijing, China. *BMJ Global Health* **2020**, *5* (5), e002794.

<https://gh.bmj.com/content/bmjgh/5/5/e002794.full.pdf>

701. Wang, Y.; Zhang, D.; Du, G.; Du, R.; Zhao, J.; Jin, Y.; Fu, S.; Gao, L.; Cheng, Z.; Lu, Q.; Hu, Y.; Luo, G.; Wang, K.; Lu, Y.; Li, H.; Wang, S.; Ruan, S.; Yang, C.; Mei, C.; Wang, Y.; Ding, D.; Wu, F.; Tang, X.; Ye, X.; Ye, Y.; Liu, B.; Yang, J.; Yin, W.; Wang, A.; Fan, G.; Zhou, F.; Liu, Z.; Gu, X.; Xu, J.; Shang, L.; Zhang, Y.; Cao, L.; Guo, T.; Wan, Y.; Qin, H.; Jiang, Y.; Jaki, T.; Hayden, F. G.; Horby, P. W.; Cao, B.; Wang, C., Remdesivir in adults with severe COVID-19: a randomised, double-blind, placebo-controlled, multicentre trial. *The Lancet* **2020**, *395* (10236), 1569-1578.

<http://www.sciencedirect.com/science/article/pii/S0140673620310229>

702. Ward, H.; Cooke, G.; Atchison, C.; Whitaker, M.; Elliott, J.; Moshe, M.; Brown, J. C.; Flower, B.; Daunt, A.; Ainslie, K.; Ashby, D.; Donnelly, C.; Riley, S.; Darzi, A.; Barclay, W.; Elliott, P., Declining prevalence of antibody positivity to SARS-CoV-2: a community study of 365,000 adults *Preprint* **2020**.

<https://www.imperial.ac.uk/media/imperial-college/institute-of-global-health-innovation/MEDRXIV-2020-219725v1-Elliott.pdf>

703. Wathore, R.; Gupta, A.; Bherwani, H.; Labhassetwar, N., Understanding air and water borne transmission and survival of coronavirus: Insights and way forward for SARS-CoV-2. *Science of The Total Environment* **2020**, *749*, 141486.

<http://www.sciencedirect.com/science/article/pii/S0048969720350154>

704. WCS, A Tiger at Bronx Zoo Tests Positive for COVID-19; The Tiger and the Zoo's Other Cats Are Doing Well at This Time. <https://newsroom.wcs.org/News-Releases/articleType/ArticleView/articleId/14010/A-Tiger-at-Bronx-Zoo-Tests-Positive-for-COVID-19-The-Tiger-and-the-Zoos-Other-Cats-Are-Doing-Well-at-This-Time.aspx> (accessed April 6, 2020).

705. Wei, W. E.; Li, Z.; Chiew, C. J.; Yong, S. E.; Toh, M. P.; Lee, V. J., Presymptomatic transmission of SARS-CoV-2 - Singapore, January 23 - March 16, 2020. *Morbidity and Mortality Weekly Report* **2020**, *ePub* (1 April 2020). <https://www.cdc.gov/mmwr/volumes/69/wr/mm6914e1.htm>

706. Wei, Y.; Wei, L.; Liu, Y.; Huang, L.; Shen, S.; Zhang, R.; Chen, J.; Zhao, Y.; Shen, H.; Chen, F., A systematic review and meta-analysis reveals long and dispersive incubation period of COVID-19. *medRxiv* **2020**, 2020.06.20.20134387.

<https://www.medrxiv.org/content/medrxiv/early/2020/06/22/2020.06.20.20134387.full.pdf>

707. Weill, J. A.; Stigler, M.; Deschenes, O.; Springborn, M. R., Social distancing responses to COVID-19 emergency declarations strongly differentiated by income. *Proceedings of the National Academy of Sciences* **2020**, 202009412. <https://www.pnas.org/content/pnas/early/2020/07/28/2009412117.full.pdf>

708. Weisberg, S. P.; Connors, T. J.; Zhu, Y.; Baldwin, M. R.; Lin, W.-H.; Wontakal, S.; Szabo, P. A.; Wells, S. B.; Dogra, P.; Gray, J.; Idzikowski, E.; Stelitano, D.; Bovier, F. T.; Davis-Porada, J.; Matsumoto, R.; Poon, M. M. L.; Chait, M.; Mathieu, C.; Horvat, B.; Decimo, D.; Hudson, K. E.; Zotti, F. D.; Bitan, Z. C.; La Carpia, F.; Ferrara, S. A.; Mace, E.; Milner, J.; Moscona, A.; Hod, E.; Porotto, M.; Farber, D. L., Distinct antibody responses to SARS-CoV-2 in children and adults across the COVID-19 clinical spectrum. *Nature Immunology* **2020**. <https://doi.org/10.1038/s41590-020-00826-9>

709. Weissman, D.; Alameh, M. G.; de Silva, T.; Collini, P.; Hornsby, H.; Brown, R.; LaBranche, C. C.; Edwards, R. J.; Sutherland, L.; Santra, S.; Mansouri, K.; Gobeil, S.; McDanal, C.; Pardi, N.; Hengartner, N.; Lin, P. J. C.; Tam, Y.; Shaw, P. A.; Lewis, M. G.; Boesler, C.; Şahin, U.; Acharya, P.; Haynes, B. F.; Korber, B.; Montefiori, D. C., D614G Spike Mutation Increases SARS CoV-2 Susceptibility to Neutralization. *Cell Host Microbe* **2020**.

710. Weissman, D. N.; de Perio, M. A.; Radonovich, L. J., Jr, COVID-19 and Risks Posed to Personnel During Endotracheal Intubation. *JAMA* **2020**. <https://doi.org/10.1001/jama.2020.6627>

711. Wellinghausen, N.; Plonné, D.; Voss, M.; Ivanova, R.; Frodl, R.; Deininger, S., SARS-CoV-2-IgG response is different in COVID-19 outpatients and asymptomatic contact persons. *Journal of Clinical Virology* **2020**, *130*, 104542. <http://www.sciencedirect.com/science/article/pii/S1386653220302845>

712. Westblade, L. F.; Brar, G.; Pinheiro, L. C.; Paidoussis, D.; Rajan, M.; Martin, P.; Goyal, P.; Sepulveda, J. L.; Zhang, L.; George, G.; Liu, D.; Whittier, S.; Plate, M.; Small, C. B.; Rand, J. H.; Cushing, M. M.; Walsh, T. J.; Cooke, J.; Safford, M. M.; Loda, M.; Satlin, M. J., SARS-CoV-2 Viral Load Predicts Mortality in Patients with and Without Cancer Who Are Hospitalized with COVID-19. *Cancer Cell* **2020**.

<http://www.sciencedirect.com/science/article/pii/S1535610820304815>

713. Whitman, J. D.; Hiatt, J.; Mowrey, C. T.; al., e., Test performance evaluation of SARS-CoV-2 serological assays. *Unpublished Preprint* **2020**. https://www.dropbox.com/s/cd1628cau09288a/SARS-CoV-2_Serology_Manuscript.pdf?dl=0

714. Whittaker, E.; Bamford, A.; Kenny, J.; Kaforou, M.; Jones, C. E.; Shah, P.; Ramnarayan, P.; Fraise, A.; Miller, O.; Davies, P.; Kucera, F.; Brierley, J.; McDougall, M.; Carter, M.; Tremoulet, A.; Shimizu, C.; Herberg, J.; Burns, J. C.; Llyall, H.; Levin, M.; Group, f. t. P.-T. S.; EUCLIDS; Consortia, P., Clinical

- Characteristics of 58 Children With a Pediatric Inflammatory Multisystem Syndrome Temporally Associated With SARS-CoV-2. *JAMA* **2020**, 324 (3), 259-269. <https://doi.org/10.1001/jama.2020.10369>
715. Whitworth, C.; Mu, Y.; Houston, H.; Martinez-Smith, M.; Noble-Wang, J.; Coulliette-Salmond, A.; Rose, L., Persistence of Bacteriophage Phi 6 on Porous and Nonporous Surfaces and the Potential for Its Use as an Ebola Virus or Coronavirus Surrogate. *Applied and Environmental Microbiology* **2020**, 86 (17), e01482-20. <https://aem.asm.org/content/aem/86/17/e01482-20.full.pdf>
716. Whitworth, J., U.S. FDA 'aware' of China testing food for coronavirus. <https://www.foodsafetynews.com/2020/06/u-s-fda-aware-of-china-testing-food-for-coronavirus/> (accessed 06/22/2020).
717. WHO, *Advice on the use of masks on the context of COVID-19. Interim Guidance. 5 June 2020.*; World Health Organization: 2020. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/when-and-how-to-use-masks>
718. WHO, "Immunity passports" in the context of COVID-19; World Health Organization: 2020. <https://www.who.int/news-room/commentaries/detail/immunity-passports-in-the-context-of-covid-19>
719. WHO, *Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected*; 2020. [https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-\(ncov\)-infection-is-suspected-20200125](https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-(ncov)-infection-is-suspected-20200125)
720. WHO, International Nonproprietary Names for Pharmaceutical Substances (INN). https://www.who.int/medicines/publications/druginformation/issues/WHO_DI_34-3_PL124-SpecialEdition.pdf.
721. WHO, Laboratory testing for 2019 novel coronavirus (2019-nCoV) in suspected human cases.
722. WHO, *Mask use in the context of COVID-19*; World Health Organization: 1 December 2020, 2020. <https://apps.who.int/iris/rest/bitstreams/1319378/retrieve>
723. WHO, Multisystem inflammatory syndrome in children and adolescents temporally related to COVID-19. World Health Organization: 2020. <https://www.who.int/news-room/commentaries/detail/multisystem-inflammatory-syndrome-in-children-and-adolescents-with-covid-19>
724. WHO, *Transmission of SARS-CoV-2: implications for infection prevention precautions*; World Health Organization: 2020. <https://www.who.int/news-room/commentaries/detail/transmission-of-sars-cov-2-implications-for-infection-prevention-precautions>
725. Widge, A. T.; Roupael, N. G.; Jackson, L. A.; Anderson, E. J.; Roberts, P. C.; Makhene, M.; Chappell, J. D.; Denison, M. R.; Stevens, L. J.; Pruijssers, A. J.; McDermott, A. B.; Flach, B.; Lin, B. C.; Doria-Rose, N. A.; O'Dell, S.; Schmidt, S. D.; Neuzil, K. M.; Bennett, H.; Leav, B.; Makowski, M.; Albert, J.; Cross, K.; Edara, V.-V.; Floyd, K.; Suthar, M. S.; Buchanan, W.; Luke, C. J.; Ledgerwood, J. E.; Mascola, J. R.; Graham, B. S.; Beigel, J. H., Durability of Responses after SARS-CoV-2 mRNA-1273 Vaccination. *New England Journal of Medicine* **2020**. <https://www.nejm.org/doi/full/10.1056/NEJMc2032195>
726. Wiersinga, W. J.; Rhodes, A.; Cheng, A. C.; Peacock, S. J.; Prescott, H. C., Pathophysiology, Transmission, Diagnosis, and Treatment of Coronavirus Disease 2019 (COVID-19): A Review. *JAMA* **2020**. <https://doi.org/10.1001/jama.2020.12839>
727. Williams, S.; Sheard, N.; Stuart, B.; Phan, H. T. T.; Borca, F.; Wilkinson, T. M. A.; Burke, H.; Freeman, A.; Investigators, R. C., Comparisons of early and late presentation to hospital in COVID-19 patients. *Respirology* **2020**, n/a (n/a). <https://onlinelibrary.wiley.com/doi/abs/10.1111/resp.13985>
728. Wölfel, R.; Corman, V. M.; Guggemos, W.; Seilmaier, M.; Zange, S.; Müller, M. A.; Niemeyer, D.; Jones, T. C.; Vollmar, P.; Rothe, C.; Hoelscher, M.; Bleicker, T.; Brünink, S.; Schneider, J.; Ehmann, R.; Zwirgmaier, K.; Drosten, C.; Wendtner, C., Virological assessment of hospitalized patients with COVID-2019. *Nature* **2020**. <https://doi.org/10.1038/s41586-020-2196-x>

729. Wong, F.; Collins, J. J., Evidence that coronavirus superspreading is fat-tailed. *Proceedings of the National Academy of Sciences* **2020**, 202018490.
<https://www.pnas.org/content/pnas/early/2020/10/30/2018490117.full.pdf>
730. Wong, M. C.; Javornik Cregeen, S. J.; Ajami, N. J.; Petrosino, J. F., Evidence of recombination in coronaviruses implicating pangolin origins of nCoV-2019. *bioRxiv* **2020**, 2020.02.07.939207.
<https://www.biorxiv.org/content/biorxiv/early/2020/02/13/2020.02.07.939207.full.pdf>
731. Wong, Y. C.; Lau, S. Y.; Wang To, K. K.; Mok, B. W. Y.; Li, X.; Wang, P.; Deng, S.; Woo, K. F.; Du, Z.; Li, C.; Zhou, J.; Woo Chan, J. F.; Yuen, K. Y.; Chen, H.; Chen, Z., Natural transmission of bat-like SARS-CoV-2 PRRA variants in COVID-19 patients. *Clinical Infectious Diseases* **2020**.
<https://doi.org/10.1093/cid/cia953>
732. Woodworth, K. R.; Olsen, E. O. M.; Neelam, V.; Lewis, E. L.; Galang, R. R.; Oduyobo, T.; Aveni, K.; Yazdy, M. M.; Harvey, E.; Longcore, N. D.; Barton, J.; Fussman, C.; Siebman, S.; Lush, M.; Patrick, P. H.; Halai, U.-A.; Valencia-Prado, M.; Orkis, L.; Sowunmi, S.; Schlosser, L.; Khuwaja, S.; Read, J. S.; Hall, A. J.; Meaney-Delman, D.; Ellington, S. R.; Gilboa, S. M.; Tong, V. T., Birth and Infant Outcomes Following Laboratory-Confirmed SARS-CoV-2 Infection in Pregnancy SET-NET, 16 Jurisdictions, March 29–October 14, 2020.
https://www.cdc.gov/mmwr/volumes/69/wr/mm6944e2.htm?s_cid=mm6944e2_w.
733. Woolf, S. H.; Chapman, D. A.; Sabo, R. T.; Weinberger, D. M.; Hill, L., Excess Deaths From COVID-19 and Other Causes, March–April 2020. *JAMA* **2020**. <https://doi.org/10.1001/jama.2020.11787>
734. Woolsey, C. B.; Borisevich, V.; Prasad, A. N.; Agans, K. N.; Deer, D. J.; Dobias, N. S.; Heymann, J. C.; Foster, S. L.; Levine, C. B.; Medina, L.; Melody, K.; Geisbert, J. B.; Fenton, K. A.; Geisbert, T. W.; Cross, R. W., Establishment of an African green monkey model for COVID-19. *bioRxiv* **2020**, 2020.05.17.100289.
<http://biorxiv.org/content/early/2020/05/17/2020.05.17.100289.abstract>
735. Worthham, J. M.; Lee, J. T.; Althomsons, S.; al., e., Characteristics of Persons Who Died with COVID-19 — United States, February 12–May 18, 2020. *Morbidity and Mortality Weekly Report* **2020**, ePub: July 10, 2020 (69). <https://www.cdc.gov/mmwr/volumes/69/wr/mm6928e1.htm>
736. Wrapp, D.; Wang, N.; Corbett, K. S.; Goldsmith, J. A.; Hsieh, C.-L.; Abiona, O.; Graham, B. S.; McLellan, J. S., Cryo-EM Structure of the 2019-nCoV Spike in the Prefusion Conformation. *bioRxiv* **2020**, 2020.02.11.944462.
<https://www.biorxiv.org/content/biorxiv/early/2020/02/15/2020.02.11.944462.full.pdf>
737. Wright, E. S.; Lakdawala, S. S.; Cooper, V. S., SARS-CoV-2 genome evolution exposes early human adaptations. *bioRxiv* **2020**, 2020.05.26.117069.
<https://www.biorxiv.org/content/biorxiv/early/2020/05/26/2020.05.26.117069.full.pdf>
738. Wu, C.; Hou, D.; Du, C.; Cai, Y.; Zheng, J.; Xu, J.; Chen, X.; Chen, C.; Hu, X.; Zhang, Y.; Song, J.; Wang, L.; Chao, Y. C.; Feng, Y.; Xiong, W.; Chen, D.; Zhong, M.; Hu, J.; Jiang, J.; Bai, C.; Zhou, X.; Xu, J.; Song, Y.; Gong, F., Corticosteroid therapy for coronavirus disease 2019-related acute respiratory distress syndrome: a cohort study with propensity score analysis. *Crit Care* **2020**, *24* (1), 643.
739. Wu, G.; Yang, P.; Xie, Y.; Woodruff, H. C.; Rao, X.; Guiot, J.; Frix, A.-N.; Louis, R.; Moutschen, M.; Li, J.; Li, J.; Yan, C.; Du, D.; Zhao, S.; Ding, Y.; Liu, B.; Sun, W.; Albarello, F.; D'Abramo, A.; Schininà, V.; Nicastri, E.; Occhipinti, M.; Barisione, G.; Barisione, E.; Halilaj, I.; Lovinfosse, P.; Wang, X.; Wu, J.; Lambin, P., Development of a Clinical Decision Support System for Severity Risk Prediction and Triage of COVID-19 Patients at Hospital Admission: an International Multicenter Study. *European Respiratory Journal* **2020**, 2001104. <https://erj.ersjournals.com/content/erj/early/2020/06/25/13993003.01104-2020.full.pdf>
740. Wu, J. T.; Leung, K.; Leung, G. M., Nowcasting and forecasting the potential domestic and international spread of the 2019-nCoV outbreak originating in Wuhan, China: a modelling study. *The Lancet* **2020**. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30260-9/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30260-9/fulltext)

741. Wu, L.-P.; Wang, N.-C.; Chang, Y.-H.; Tian, X.-Y.; Na, D.-Y.; Zhang, L.-Y.; Zheng, L.; Lan, T.; Wang, L.-F.; Liang, G.-D., Duration of antibody responses after severe acute respiratory syndrome. *Emerging infectious diseases* **2007**, *13* (10), 1562.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2851497/pdf/07-0576_finalD.pdf
742. Xiao, K.; Zhai, J.; Feng, Y.; Zhou, N.; Zhang, X.; Zou, J. J.; Li, N.; Guo, Y.; Li, X.; Shen, X.; Zhang, Z.; Shu, F.; Huang, W.; Li, Y.; Zhang, Z.; Chen, R. A.; Wu, Y. J.; Peng, S. M.; Huang, M.; Xie, W. J.; Cai, Q. H.; Hou, F. H.; Chen, W.; Xiao, L.; Shen, Y., Isolation of SARS-CoV-2-related coronavirus from Malayan pangolins. *Nature* **2020**.
743. Xie, Y.; Bowe, B.; Maddukuri, G.; Al-Aly, Z., Comparative evaluation of clinical manifestations and risk of death in patients admitted to hospital with covid-19 and seasonal influenza: cohort study. *BMJ* **2020**, *371*, m4677. <https://www.bmj.com/content/bmj/371/bmj.m4677.full.pdf>
744. Xinhua, China detects large quantity of novel coronavirus at Wuhan seafood market
http://www.xinhuanet.com/english/2020-01/27/c_138735677.htm.
745. Xu, X. K.; Liu, X. F.; Wu, Y.; Ali, S. T.; Du, Z.; Bosetti, P.; Lau, E. H. Y.; Cowling, B. J.; Wang, L., Reconstruction of Transmission Pairs for novel Coronavirus Disease 2019 (COVID-19) in mainland China: Estimation of Super-spreading Events, Serial Interval, and Hazard of Infection. *Clin Infect Dis* **2020**.
746. Yan, C. H.; Faraji, F.; Prajapati, D. P.; Boone, C. E.; DeConde, A. S., In *Association of chemosensory dysfunction and Covid-19 in patients presenting with influenza-like symptoms*, International Forum of Allergy & Rhinology, Wiley Online Library: 2020.
747. Yan, F.; Huang, F.; Xu, J.; Yang, P.; Qin, Y.; Lv, J.; Zhang, S.; Ye, L.; Gong, M.; Liu, Z.; Wei, J.; Xie, T.; Xu, K. F.; Gao, G. F.; Wang, F. S.; Cai, L.; Jiang, C., Antihypertensive drugs are associated with reduced fatal outcomes and improved clinical characteristics in elderly COVID-19 patients. *Cell Discov* **2020**, *6* (1), 77.
748. Yan, L.; Shu, K.; Guan, J.; Shanchang, H., Unusual Features of the SARS-CoV-2 Genome Suggesting Sophisticated Laboratory Modification Rather Than Natural Evolution and Delineation of Its Probable Synthetic Route. *Zenodo* **2020**. <https://zenodo.org/record/4028830#.X3JdatpKiUn>
749. Yang, C.; Jiang, M.; Wang, X.; Tang, X.; Fang, S.; Li, H.; Zuo, L.; Jiang, Y.; Zhong, Y.; Chen, Q.; Zheng, C.; Wang, L.; Wu, S.; Wu, W.; Liu, H.; Yuan, J.; Liao, X.; Zhang, Z.; Shi, X.; Geng, Y.; Zhang, H.; Zheng, H.; Wan, M.; Lu, L.; Ren, X.; Cui, Y.; Zou, X.; Feng, T.; Xia, J.; Yang, R.; Liu, Y.; Mei, S.; Li, B.; Yang, Z.; Hu, Q., Viral RNA level, serum antibody responses, and transmission risk in recovered COVID-19 patients with recurrent positive SARS-CoV-2 RNA test results: a population-based observational cohort study. *Emerging Microbes & Infections* **2020**, *9* (1), 2368-2378.
<https://doi.org/10.1080/22221751.2020.1837018>
750. Yang, L.; Dai, J.; Zhao, J.; Wang, Y.; Deng, P.; Wang, J., Estimation of incubation period and serial interval of COVID-19: analysis of 178 cases and 131 transmission chains in Hubei province, China. *Epidemiology and Infection* **2020**, *148*, e117. <https://www.cambridge.org/core/article/estimation-of-incubation-period-and-serial-interval-of-covid19-analysis-of-178-cases-and-131-transmission-chains-in-hubei-province-china/C1B194C01268F005AAFBE8D50CB5F945>
751. Yang, P.; Qi, J.; Zhang, S.; Bi, G.; Wang, X.; Yang, Y.; Sheng, B.; Mao, X., Feasibility of Controlling COVID-19 Outbreaks in the UK by Rolling Interventions. *medRxiv* **2020**, 2020.04.05.20054429.
<https://www.medrxiv.org/content/medrxiv/early/2020/04/07/2020.04.05.20054429.full.pdf>
752. Yap, T. F.; Liu, Z.; Shveda, R. A.; Preston, D. J., A predictive model of the temperature-dependent inactivation of coronaviruses. *Applied Physics Letters* **2020**, *117* (6), 060601.
<https://aip.scitation.org/doi/abs/10.1063/5.0020782>
753. Yehya, N.; Venkataramani, A.; Harhay, M. O., Statewide Interventions and Covid-19 Mortality in the United States: An Observational Study. *Clinical Infectious Diseases* **2020**.
<https://doi.org/10.1093/cid/ciaa923>

754. Yekta, R.; Vahid-Dastjerdi, L.; Norouzbeigi, S.; Mortazavian, A. M., Food Products as Potential Carriers of SARS-CoV-2. *Food Control* **2020**, 107754.
<http://www.sciencedirect.com/science/article/pii/S0956713520306708>
755. Yonker, L. M.; Neilan, A. M.; Bartsch, Y.; Patel, A. B.; Regan, J.; Arya, P.; Gootkind, E.; Park, G.; Hardcastle, M.; St. John, A.; Appleman, L.; Chiu, M. L.; Fialkowski, A.; De la Flor, D.; Lima, R.; Bordt, E. A.; Yockey, L. J.; D'Avino, P.; Fischinger, S.; Shui, J. E.; Lerou, P. H.; Bonventre, J. V.; Yu, X. G.; Ryan, E. T.; Bassett, I. V.; Irimia, D.; Edlow, A. G.; Alter, G.; Li, J. Z.; Fasano, A., Pediatric SARS-CoV-2: Clinical Presentation, Infectivity, and Immune Responses. *The Journal of Pediatrics* **2020**.
<https://doi.org/10.1016/j.jpeds.2020.08.037>
756. Yu, B.; Li, C.; Sun, Y.; Wang, D. W., Insulin Treatment Is Associated with Increased Mortality in Patients with COVID-19 and Type 2 Diabetes. *Cell Metab* **2020**.
757. Yu, W.-B.; Tang, G.-D.; Zhang, L.; Corlett, R. T., Decoding evolution and transmissions of novel pneumonia coronavirus using the whole genomic data. *ChinaXiv* **2020**.
<http://www.chinaxiv.org/abs/202002.00033>
758. Yuki, F.; Eiichiro, S.; Naho, T.; Reiko, M.; Ikkoh, Y.; Yura, K. K.; Mayuko, S.; Konosuke, M.; Takeaki, I.; Yugo, S.; Shohei, N.; Kazuaki, J.; Tadatsugu, I.; Tomimasa, S.; Motoi, S.; Hiroshi, N.; Hitoshi, O., Clusters of Coronavirus Disease in Communities, Japan, January–April 2020. *Emerging Infectious Disease journal* **2020**, 26 (9). https://wwwnc.cdc.gov/eid/article/26/9/20-2272_article
759. Zangmeister, C. D.; Radney, J. G.; Vicenzi, E. P.; Weaver, J. L., Filtration Efficiencies of Nanoscale Aerosol by Cloth Mask Materials Used to Slow the Spread of SARS CoV-2. *ACS Nano* **2020**.
<https://doi.org/10.1021/acsnano.0c05025>
760. Zeng, H.-L.; Lu, Q.-B.; Yang, Q.; Wang, X.; Yue, D.-Y.; Zhang, L.-K.; Li, H.; Liu, W.; Li, H.-J., Longitudinal Profile of Laboratory Parameters and Their Application in the Prediction for Fatal Outcome Among Patients Infected With SARS-CoV-2: A Retrospective Cohort Study. *Clinical Infectious Diseases* **2020**.
<https://doi.org/10.1093/cid/ciaa574>
761. Zhang, J.; Wu, J.; Sun, X.; Xue, H.; Shao, J.; Cai, W.; Jing, Y.; Yue, M.; Dong, C., Associations of hypertension with the severity and fatality of SARS-CoV-2 infection: A meta-analysis. *Epidemiology and Infection* **2020**, 1-19. <https://www.cambridge.org/core/article/associations-of-hypertension-with-the-severity-and-fatality-of-sarscov2-infection-a-metaanalysis/4116FAD7D866737099F976E7E7FAEB15>
762. Zhang, L.; Jackson, C. B.; Mou, H.; Ojha, A.; Rangarajan, E. S.; Izzard, T.; Farzan, M.; Choe, H., The D614G mutation in the SARS-CoV-2 spike protein reduces S1 shedding and increases infectivity. *bioRxiv* **2020**, 2020.06.12.148726. <http://biorxiv.org/content/early/2020/06/12/2020.06.12.148726.abstract>
763. Zhang, Q.; Zhang, H.; Huang, K.; Yang, Y.; Hui, X.; Gao, J.; He, X.; Li, C.; Gong, W.; Zhang, Y.; Peng, C.; Gao, X.; Chen, H.; Zou, Z.; Shi, Z.; Jin, M., SARS-CoV-2 neutralizing serum antibodies in cats: a serological investigation. *bioRxiv* **2020**, 2020.04.01.021196.
<http://biorxiv.org/content/early/2020/04/03/2020.04.01.021196.abstract>
764. Zhang, T.; Wu, Q.; Zhang, Z., Probable Pangolin Origin of SARS-CoV-2 Associated with the COVID-19 Outbreak. *Current Biology* **2020**, 30 (7), 1346-1351.e2.
<http://www.sciencedirect.com/science/article/pii/S0960982220303602>
765. Zhang, Y.; Muscatello, D.; Tian, Y.; Chen, Y.; Li, S.; Duan, W.; Ma, C.; Sun, Y.; Wu, S.; Ge, L.; Yang, P.; Jia, L.; Wang, Q.; MacIntyre, C. R., Role of presymptomatic transmission of COVID-19: evidence from Beijing, China. *Journal of Epidemiology and Community Health* **2020**, jech-2020-214635.
<https://jech.bmj.com/content/jech/early/2020/08/26/jech-2020-214635.full.pdf>
766. Zhao; Musa; Lin; Ran; Yang; Wang; Lou; Yang; Gao; He; Wang, Estimating the Unreported Number of Novel Coronavirus (2019-nCoV) Cases in China in the First Half of January 2020: A Data-Driven Modelling Analysis of the Early Outbreak. *Journal of Clinical Medicine* **2020**, 9 (2), 388.
767. Zhao, G.; Jiang, Y.; Qiu, H.; Gao, T.; Zeng, Y.; Guo, Y.; Yu, H.; Li, J.; Kou, Z.; Du, L.; Tan, W.; Jiang, S.; Sun, S.; Zhou, Y., Multi-Organ Damage in Human Dipeptidyl Peptidase 4 Transgenic Mice Infected with

- Middle East Respiratory Syndrome-Coronavirus. *PLoS One* **2015**, *10* (12), e0145561.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4689477/pdf/pone.0145561.pdf>
768. Zhao, J.; Yuan, Q.; Wang, H.; Liu, W.; Liao, X.; Su, Y.; Wang, X.; Yuan, J.; Li, T.; Li, J.; Qian, S.; Hong, C.; Wang, F.; Liu, Y.; Wang, Z.; He, Q.; He, B.; Zhang, T.; Ge, S.; Liu, L.; Zhang, J.; Xia, N.; Zhang, Z., Antibody Responses to SARS-CoV-2 in Patients of Novel Coronavirus Disease 2019. *SSRN* **2020**.
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3546052#
769. Zhao, L.; Qi, Y.; Luzzatto-Fegiz, P.; Cui, Y.; Zhu, Y., COVID-19: Effects of Environmental Conditions on the Propagation of Respiratory Droplets. *Nano Letters* **2020**, *20* (10), 7744-7750.
<https://doi.org/10.1021/acs.nanolett.0c03331>
770. Zhen-Dong, T.; An, T.; Ke-Feng, L.; Peng, L.; Hong-Ling, W.; Jing-Ping, Y.; Yong-Li, Z.; Jian-Bo, Y., Potential Presymptomatic Transmission of SARS-CoV-2, Zhejiang Province, China, 2020. *Emerging Infectious Disease journal* **2020**, *26* (5). https://wwwnc.cdc.gov/eid/article/26/5/20-0198_article
771. Zheng, H.; Li, H.; Guo, L.; Liang, Y.; Li, J.; Wang, X.; Hu, Y.; Wang, L.; Liao, Y.; Yang, F.; Li, Y.; Fan, S.; Li, D.; Cui, P.; Wang, Q.; Shi, H.; Chen, Y.; Yang, Z.; Yang, J.; Shen, D.; Cun, W.; Zhou, X.; Dong, X.; Wang, Y.; Chen, Y.; Dai, Q.; Jin, W.; He, Z.; Li, Q.; Liu, L., Virulence and pathogenesis of SARS-CoV-2 infection in rhesus macaques: A nonhuman primate model of COVID-19 progression. *PLOS Pathogens* **2020**, *16* (11), e1008949. <https://doi.org/10.1371/journal.ppat.1008949>
772. Zhifei, A., Vaccine to undergo 3rd phase of trials. http://en.nhc.gov.cn/2020-11/20/c_82209.htm.
773. Zhou, F.; Yu, T.; Du, R.; Fan, G.; Liu, Y.; Liu, Z.; Xiang, J.; Wang, Y.; Song, B.; Gu, X.; Guan, L.; Wei, Y.; Li, H.; Wu, X.; Xu, J.; Tu, S.; Zhang, Y.; Chen, H.; Cao, B., Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The Lancet*.
[https://doi.org/10.1016/S0140-6736\(20\)30566-3](https://doi.org/10.1016/S0140-6736(20)30566-3)
774. Zhou, H.; Chen, X.; Hu, T.; Li, J.; Song, H.; Liu, Y.; Wang, P.; Liu, D.; Yang, J.; Holmes, E. C.; Hughes, A. C.; Bi, Y.; Shi, W., A novel bat coronavirus reveals natural insertions at the S1/S2 cleavage site of the Spike protein and a possible recombinant origin of HCoV-19. *bioRxiv* **2020**, 2020.03.02.974139.
<https://www.biorxiv.org/content/biorxiv/early/2020/03/11/2020.03.02.974139.full.pdf>
775. Zhou, L.; Yao, M.; Zhang, X.; Hu, B.; Li, X.; Chen, H.; Zhang, L.; Liu, Y.; Du, M.; Sun, B.; Jiang, Y.; Zhou, K.; Hong, J.; Yu, N.; Ding, Z.; Xu, Y.; Hu, M.; Morawska, L.; Grinshpun, S. A.; Biswas, P.; Flagan, R. C.; Zhu, B.; Liu, W.; Zhang, Y., Breath-, air- and surface-borne SARS-CoV-2 in hospitals. *Journal of Aerosol Science* **2020**, 105693. <http://www.sciencedirect.com/science/article/pii/S0021850220301786>
776. Zhou, P.; Yang, X.-L.; Wang, X.-G.; Hu, B.; Zhang, L.; Zhang, W.; Si, H.-R.; Zhu, Y.; Li, B.; Huang, C.-L.; Chen, H.-D.; Chen, J.; Luo, Y.; Guo, H.; Jiang, R.-D.; Liu, M.-Q.; Chen, Y.; Shen, X.-R.; Wang, X.; Zheng, X.-S.; Zhao, K.; Chen, Q.-J.; Deng, F.; Liu, L.-L.; Yan, B.; Zhan, F.-X.; Wang, Y.-Y.; Xiao, G.; Shi, Z.-L., Discovery of a novel coronavirus associated with the recent pneumonia outbreak in humans and its potential bat origin. *bioRxiv* **2020**, 2020.01.22.914952.
<https://www.biorxiv.org/content/biorxiv/early/2020/01/23/2020.01.22.914952.1.full.pdf>
777. Zhu, F.-C.; Guan, X.-H.; Li, Y.-H.; Huang, J.-Y.; Jiang, T.; Hou, L.-H.; Li, J.-X.; Yang, B.-F.; Wang, L.; Wang, W.-J.; Wu, S.-P.; Wang, Z.; Wu, X.-H.; Xu, J.-J.; Zhang, Z.; Jia, S.-Y.; Wang, B.-S.; Hu, Y.; Liu, J.-J.; Zhang, J.; Qian, X.-A.; Li, Q.; Pan, H.-X.; Jiang, H.-D.; Deng, P.; Gou, J.-B.; Wang, X.-W.; Wang, X.-H.; Chen, W., Immunogenicity and safety of a recombinant adenovirus type-5-vectored COVID-19 vaccine in healthy adults aged 18 years or older: a randomised, double-blind, placebo-controlled, phase 2 trial. *The Lancet* **2020**. [https://doi.org/10.1016/S0140-6736\(20\)31605-6](https://doi.org/10.1016/S0140-6736(20)31605-6)
778. Zhu, S.; Zong, Z., Why did so few healthcare workers in China get COVID-19 infection. *QJM: An International Journal of Medicine* **2020**.
779. Zhu, Y.; Bloxham, C. J.; Hulme, K. D.; Sinclair, J. E.; Tong, Z. W. M.; Steele, L. E.; Noye, E. C.; Lu, J.; Xia, Y.; Chew, K. Y.; Pickering, J.; Gilks, C.; Bowen, A. C.; Short, K. R., A meta-analysis on the role of children in SARS-CoV-2 in household transmission clusters. *Clinical Infectious Diseases* **2020**.
<https://doi.org/10.1093/cid/ciaa1825>

Updated 12/21/2020

780. Zietz, M.; Zucker, J.; Tatonetti, N. P., Associations between blood type and COVID-19 infection, intubation, and death. *Nature Communications* **2020**, *11* (1), 5761. <https://doi.org/10.1038/s41467-020-19623-x>

781. Zou, L.; Ruan, F.; Huang, M.; Liang, L.; Huang, H.; Hong, Z.; Yu, J.; Kang, M.; Song, Y.; Xia, J.; Guo, Q.; Song, T.; He, J.; Yen, H.-L.; Peiris, M.; Wu, J., SARS-CoV-2 Viral Load in Upper Respiratory Specimens of Infected Patients. *New England Journal of Medicine* **2020**.
<https://www.nejm.org/doi/full/10.1056/NEJMc2001737>

782. Zuo, J.; Dowell, A.; Pearce, H.; Verma, K.; Long, H.; Begum, J.; Aiano, F.; Amin-Chowdhury, Z.; Hallis, B.; Stapley, L.; Borrow, R.; Linley, E.; Ahmad, S.; Parker, B.; Horsley, A.; Amirthalingam, G.; Brown, K.; Ramsay, M. E.; Ladhani, S.; Moss, P., Robust SARS-CoV-2-specific T-cell immunity is maintained at 6 months following primary infection. *bioRxiv* **2020**, 2020.11.01.362319.
<https://www.biorxiv.org/content/biorxiv/early/2020/11/02/2020.11.01.362319.full.pdf>

