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Dr. Meg Schaeffer, EdD, MPH, MPA

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- Immunology
- Infectious Diseases
  - Types
  - Transmission
  - Pandemics & how they emerge
- Vaccination & Disease Prevention
  - History of vaccines
  - Vaccines series
  - Vaccine function
  - Origin of vaccine aversion
  - What happens when we STOP vaccinating
  - Finding good information
- Notes on COVID

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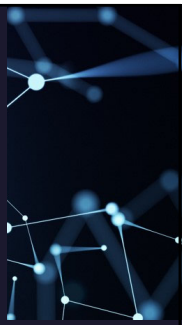
Study of structure and function of the immune system



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Immune system: Cells, tissues, and molecules that mediate resistance to infections

Immunology: Study of structure and function of the immune system

Immunity: Resistance of a host to pathogens and their toxic effects

Immune response: Collective and coordinated response to the introduction of foreign substances in an individual mediated by the cells and molecules of the immune system

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FUNCTION

- Defense against microbes
- Defense against the growth of tumor cells
  - kills the growth of tumor cells
- Homeostasis
  - destruction of abnormal or dead cells (e.g. dead red or white blood cells, antigen-antibody complex)

COMPONENTS

- Organs
- Cells
- Molecules

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ORGANS

- Tonsils and adenoids
- Thymus
- Lymph nodes
- Spleen
- Payer's patches
- Appendix
- Lymphatic vessels
- Bone marrow

CELLS

- Lymphocytes
  - T-lymphocytes
  - B-Lymphocytes, plasma cells
  - natural killer lymphocytes
- Monocytes, Macrophage
- Granulocytes
  - Neutrophils
  - Eosinophils
  - Basophils

MOLECULES

- Antibodies
- Complement
- Cytokines
- Interleukins
- Interferons

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INNATE

- Based on genetic make-up
- Relies on already formed components
- Rapid response: within minutes of infection
- Not specific
  - Same molecules/cells respond to a range of pathogens
- Has no memory
  - Same response after repeated exposure

ADAPTIVE

- Based upon resistance acquired during life
- Relies on genetic events and cellular growth
- Responds more slowly, over few days
- Is specific
  - Each cell responds to a single epitope on an antigen
- Has anamnestic memory
  - Repeated exposure leads to faster, stronger response

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	Active Immunity	Passive Immunity
Natural	Clinical or sub-clinical infection	Via breast milk, placenta
Artificial	Vaccination: Live, killed, purified antigen vaccine	Immune serum, immune cells

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- Belong to the gamma-globulin fraction of serum proteins
- All immunoglobulins are not antibodies
- Five kinds of antibodies
  - IgG, IgM, IgA, IgD, IgE

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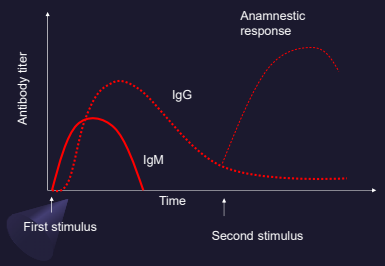
IgM
- Produced as a first response to many antigens levels remain high transiently

IgG
- Produced after IgM
- Higher levels persist in small amounts throughout life
- Produced in large amounts during secondary response
  - Persistence of antigen sensitive 'memory cells' after primary response



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IgM
- Secreted initially during primary infection
- Cannot cross the placenta
- Major functions / applications
  - Secreted first during primary exposure
  - Activates the complement
  - Used as a marker of recent infection

IgG
- 70-75% of total immunoglobulin
- Secreted in high quantities in secondary exposures
- Cross the placenta
- Major functions / applications
  - neutralize microbes and toxins
  - opsonize antigens for phagocytosis
  - activate the complement
  - protect the newborn

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D
- Monomeric
- Major functions / applications
  - Present on the surface of B lymphocytes
  - Functions as membrane receptor
  - Has a role in antigen stimulated lymphocyte differentiation

E
- Mediates type I hypersensitivity
- Monomeric
- Major functions / applications
  - Associated with anaphylaxis
  - Plays a role in immunity to parasites

A
- Monomeric in serum
- Dimeric with secretory component in the lumen of the gastro-intestinal tract and in the respiratory tract
- Major function / application
  - Neutralizes microbes and toxins

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- In acute infection or vaccination the body learns how to fight infection. It also captures the blueprint for how to make antibodies in the future.
- Sometimes the body needs to be reminded or "boosted" as to how to fight infection.
- The duration of immunity from natural infection varies by pathogen.
- The duration of immunity from vaccination is easier to measure and anticipate thanks to clinical trials and real-world vaccine efficacy studies.
- Example - Tetanus

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Contact tracing – an epidemiologic practice where an index case (ill person) is interviewed to determine who he/she may have exposed to illness. Contact tracing is typically handled by public health agencies. Contacts of index cases may be asked or required to remain in quarantine until the disease incubation period has passed OR until illness develops.

Epidemiology – the study of disease patterns and trend in populations

Host – Animal or plant that acts as the refuge for an infectious disease

Incubation period – the time from exposure to symptom onset

Isolation – a requirement for a sick person to stay away from other people for a set period of time

Pathogen – virus, bacteria, or parasite causing infection in humans

Pandemic – a disease resulting in widespread illness throughout the world

Pandemic wave – a wave begins at the start of disease activity from a level where little or none was detected. Multiple peaks can occur within one wave of a pandemic. There are usually multiple waves within a single pandemic.

Peak – peaks within pandemic waves are the points of highest case counts at the end of a surge in activity.

Quarantine – a requirement for a well person to stay away from other people for a set period of time

Vector – Animal or insect able to carry a pathogen and spread disease to humans, but is likely unaffected

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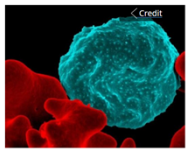
Infectious diseases are disorders that are caused by organisms, usually microscopic in size, such as bacteria, viruses, fungi, or parasites that are passed, directly or indirectly, from one person to another. Humans can also become infected following exposure to an infected animal that harbors a pathogenic organism that is capable of infecting humans.



Infectious diseases are a leading cause of death worldwide, particularly in low-income countries, especially in young children.

In 2019, two infectious diseases - lower respiratory infections and diarrheal diseases - were ranked in the top ten causes of death worldwide by the World Health Organization (WHO). Both of these diseases can be caused by a variety of infectious agents.

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- Infectious diseases can be caused by several different classes of pathogenic organisms (commonly called germs). These are viruses, bacteria, protozoa, and fungi. Almost all of these organisms are microscopic in size and are often referred to as microbes or microorganisms.
- Although microbes can be agents of infection, most microbes do not cause disease in humans. In fact, humans are inhabited by a collection of microbes, known as the microbiome, that plays important and beneficial roles in our bodies.
- The majority of agents that cause disease in humans are viruses or bacteria, although the parasite that causes malaria is a notable example of a protozoan.
- Examples of diseases caused by viruses are COVID-19, influenza, HIV/AIDS, Ebola, diarrheal diseases, hepatitis, and West Nile. Diseases caused by bacteria include anthrax, tuberculosis, salmonella, and respiratory and diarrheal diseases.

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- **Bacteria** are simple, single-celled microorganisms. Bacteria live in air, soil, food, and in and on the bodies of plants and animals, including you.
- Some bacteria injure cells by giving off poisons called **toxins**.

Bacteria

strep throat, Lyme disease, meningitis, tuberculosis, cholera, diphtheria, pertussis, tetanus, typhoid fever, staph infection, **food poisoning** ▼

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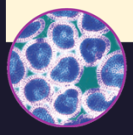
- The smallest pathogens are **viruses**.
- A virus can multiply only after entering a living cell.
- The virus then takes over the cell's reproductive mechanisms, resulting in cell damage or death.

Viruses

common cold, hepatitis, chickenpox, measles, mononucleosis, mumps, polio, rabies, rubella, West Nile virus, **influenza** ▼



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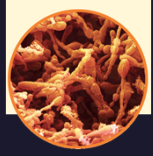
- Organisms such as yeasts, molds, and mushrooms are known as **fungi**.
- Fungi grow best in warm, dark, moist areas.

Fungi

athlete's foot, **ringworm** ▼



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- Single-celled organisms that are much larger and more complex than bacteria are known as **protozoans**.
- Protozoans have the ability to move through fluids in search of food.

Protozoans

malaria, amebic dysentery, **African sleeping sickness** ▼

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- There are a number of different routes by which a person can become infected with an infectious agent. For some agents, humans must come in direct contact with a source of infection, such as contaminated food, water, fecal material, body fluids or animal products. With other agents, infection can be transmitted through the air.
- The route of transmission of infectious agents is clearly an important factor in how quickly an infectious agent can spread through a population. An agent that can spread through the air has greater potential for infecting a larger number of individuals than an agent that is spread through direct contact.
- Another important factor in transmission is the survival time of the infectious agent in the environment. An agent that survives only a few seconds between hosts will not be able to infect as many people as an agent that can survive in the environment for hours, days, or even longer. These factors are important considerations when evaluating the risks of potential bioterrorism agents.

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- Many infectious diseases are spread through some form of contact with a person who has the disease.
- The contact may be direct physical contact.
- Infectious diseases can also spread through indirect contact.

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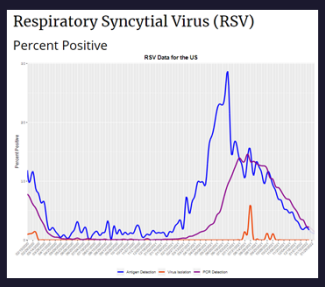
- Seasonal influenza
- RSV
- COVID-19
- Parainfluenza
- Adenovirus
- Seasonal coronavirus
- Human metapneumovirus
- Norovirus (causes gastrointestinal illness)



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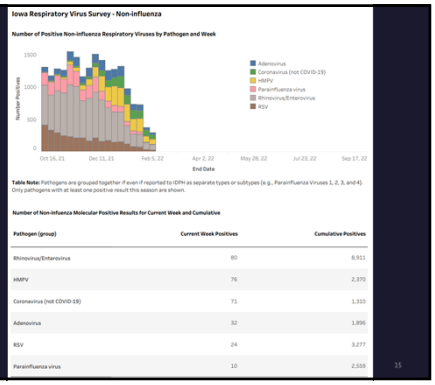
Iowa Flu Reports



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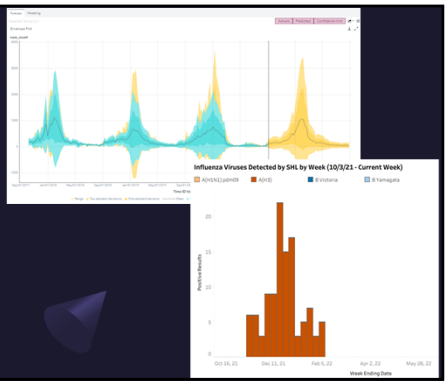
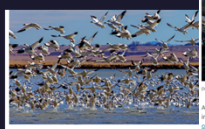
- Highly affected by temperature
- Always at least TWO strains
  - Influenza A – H3N2 of H1N1
  - Influenza B – Yamagata, Victoria
- Season begins in December and extends through March
- Flu + Pneumonia is dangerous for adults
- Flu + RSV is dangerous for infants
- Mutates constantly and can acquire genes from multiple animals
  - Birds, swine, equine
- Vaccination is ESSENTIAL to preventing flu
  - Immunity improves each successive year the vaccine is received



Emerging Influenza Strains

- Highly pathogenic and low pathogenic
- Significant impact to poultry industry
- Recently found in domestic poultry in NC and IN
- Can mutate and infect humans
- Human infection is rare, but highly fatal
- Person-to-person spread is also rare, but could emerge anytime



Another highly pathogenic avian influenza strain invades southern states

By News Desk on February 9, 2022

A new strain of Avian influenza that was present in Europe, only last year, is reported in the southern states of North Carolina, South Carolina, Virginia and Florida.

It is another highly pathogenic avian influenza (HPAI) strain.

'Highly pathogenic' bird flu hits U.S. farm

By Nicoletta Lanese published about 22 hours ago

To prevent viral spread, the farm culled 29,000 turkeys.

Image credit: EAE via Getty Images)

A highly pathogenic strain of bird flu was detected in a commercial turkey flock in Dubois County, Indiana, the U.S. Department of Agriculture (USDA) reported on Wednesday (Feb. 9). State officials said that 29,000 turkeys have now been culled to prevent the virus's spread, Reuters reported.

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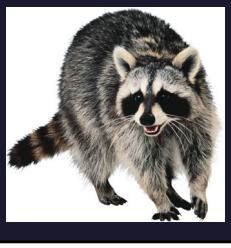
Some infectious diseases are transmitted to humans through the bites of animals

These diseases are referred to as Zoonoses



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Vector-Borne

- West Nile Virus - mosquitoes
- Lyme Disease - ticks
- Hantavirus – mouse feces
- SARS - bats

Zoonotic Diseases: Etiology, Impact, and Control (nih.gov)

Direct from Animals

- Rabies
- Brucellosis – concern for pigs
- Anthrax – rare, but highly fatal
- *E. coli*
- Campylobacter
- Salmonellosis

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- Some pathogens can survive for a period of time outside a person's body.
- These pathogens can be spread from person to person on objects such as
  - Doorknobs
  - Eating utensils
  - Towels
  - Needles used for body piercing

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- Some pathogens are naturally present in food and soil.
- Sometimes water and food become contaminated with pathogens from infected people.

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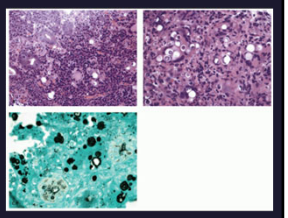
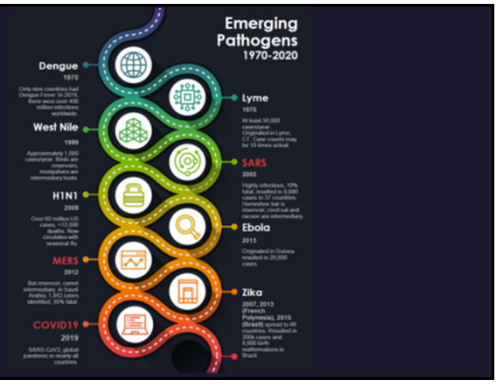
- Enteric Diseases
  - Enterohemorrhagic E.coli – cows; infected berries, meat, cow products, produce. Can cause HUS or TTP in young children.
  - Salmonellosis – common in eggs, poultry products, produce. Can cause serious gastrointestinal illness
  - Campylobacter – raw milk, cow products, produce.
  - Shigella
  - Listeria – lunchmeat, cheese
  - Vibrio
  - Staphylococcus
  - Botulism – different pathogenesis in infants (honey/environment) than adults
- Waterborne Diseases
  - E. coli
  - Cryptosporidiosis
  - Cyclospora

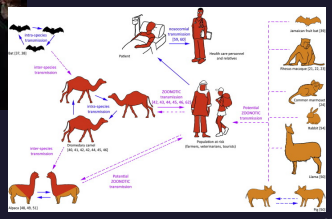




How do new diseases emerge? Where did COVID-19 come from?

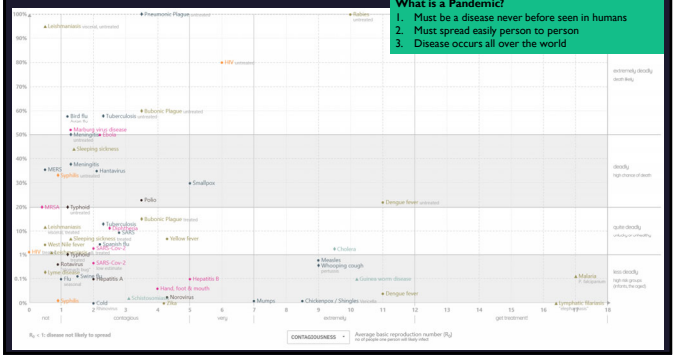
- Extensive interactions between people and animals
- A disease involving a "vector" or animal or insect able to spread disease to people
- Animal markets in China and mass agriculture production facilitate mutations
- Some animals serve as "reservoirs" allowing long term mutations of diseases

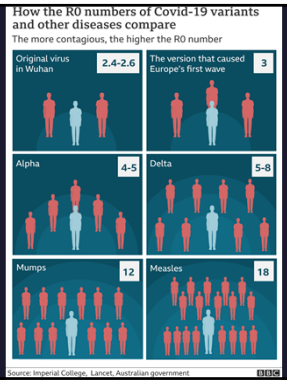
MERS interspecies transmission



What is a Pandemic?

1. Must be a disease never before seen in humans
2. Must spread easily person to person
3. Disease occurs all over the world

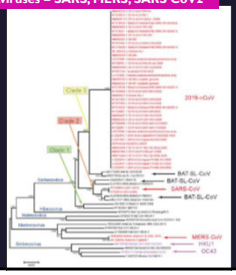




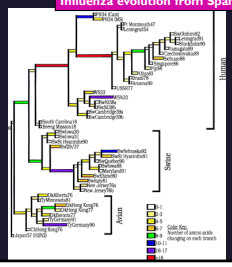
How are Pandemics identified?

- CDC types more than 30,000 strains of influenza every year
- The World Health Organization (WHO) facilitates information sharing of new pathogens between countries

Coronaviruses – SARS, MERS, SARS CoV2



Influenza evolution from Spanish Flu



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Current, Emerging, and Future

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- Vaccines or immunizations contain antigens that stimulate antibody response
- They mimic natural infection with a pathogen and cause immunologic response and subsequent memory to prevent future infection or reduce the impact of infect following exposure
- Uses
  - Prophylactic – rubella, pertussis, tetanus, all other routine vaccines
  - Therapeutic - measles, hepatitis A

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- Anthrax
- Cervical Cancer (Human Papillomavirus/HPV)
- COVID-19
- Diphtheria
- Hepatitis A
- Hepatitis B
- *Haemophilus influenzae* type b (Hib)
- Human Papillomavirus (HPV)
- Influenza (Flu)
- Japanese encephalitis (JE)
- Lyme disease
  Lyme disease vaccine no longer available in the United States.
- Measles
- Meningococcal
- Monkeypox
  There is NO monkeypox vaccine. The smallpox vaccine is used for this disease.
- Mumps
- Pertussis
- Pneumococcal
- Polio
- Rabies
- Rotavirus
- Rubella
- Shingles (Herpes Zoster)
- Smallpox
- Tetanus
- Typhoid
- Tuberculosis (TB)
- Varicella (Chickenpox)
- Yellow Fever

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KIDS

- Birth-18 Years Immunization Schedule
- Advisory Committee on Immunization Practices (ACIP)
  - >40 clinical advisors meet regularly to evaluate safety, risk-benefits, and clinical trial data to determine whether a vaccine should be recommended for a population
  - Different from FDA in that FDA approves a medication for use and has a clinical trial focus. ACIP is only focused on vaccines.

ADULTS

- Influenza (higher dose version is needed for 65+)
- Shingles
- Pneumococcal
- Tetanus or Tdap

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- **Immediate, short-term protection-** passive immunity; lasts only slight longer than incubation period of disease
  - Hepatitis A immune globulin
  - Rabies immune globulin
- **Short-term or multi-dose-** immunity lasts set period of time, typically a few years. Vaccine efficacy may increase with additional doses.
  - Pertussis
  - Hepatitis B

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- **Single-dose, long-term immunity**- lasting immunity inferred from one dose.
  - Pneumovax

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First Generation of Vaccines (pre-1950s)

1798 Smallpox

1885 Rabies

1897 Plague

1917 Cholera

1917 Typhoid vaccine (parenteral)

1923 Diphtheria

1926 Pertussis

1927 Tuberculosis (BCG)

1927 Tetanus

1935 Yellow Fever

1940s DTP

1945 The first influenza vaccines (**flu**) began being used.

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- Andrew Wakefield published a study proposing a link between the MMR vaccine and autism
- Study was retracted, later found to be funded by attorneys who were suing the vaccine manufacturer at the same time that Wakefield had patented a rival vaccine
- Medical license was revoked
- Unsubstantiated concerns emerged with Thimerosal, a preservative, and autism. Thimerosal was removed from childhood vaccines in 2002.
- A second concern around the MMR vaccine containing live, attenuated (weakened) virus.
- Both theories have been disproven with hundreds of longitudinal studies.

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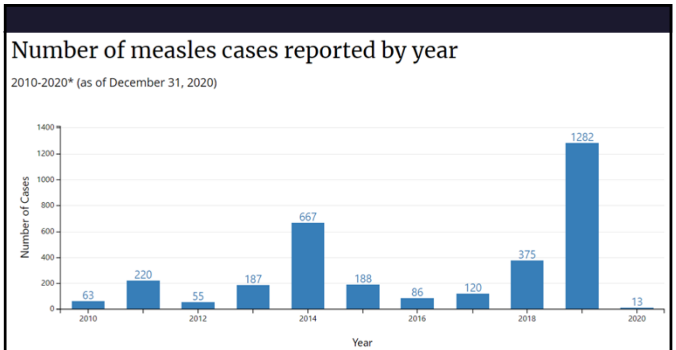
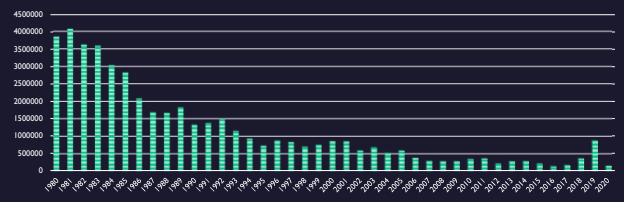
ALL LABORATORY-CONFIRMED CASES OF MEASLES, MUMPS & RUBELLA
England and Wales, 1996 – 2009*

	Measles	Mumps	Rubella
1996	112	94	3922
1997	177	182	117
1998	56	121	119
1999	92	373	162
2000	100	730	62
2001	70	784	45
2002	319	500	64
2003	437	1541	16
2004	188	8129	14
2005	78	43378	29
2006	740	4420	34
2007	990	1476	35
2008	1370	2405	27
2009*	1144	7628	8

- Decline in the rate of vaccination with MMR from 92% in 1996 to 84% in 2002
- Rates in London in 2003 were as low as 61%
- Measles declared “endemic” for the first time in 14 years in UK
- Mumps “epidemic” by 2005
- WHO recommends 95% vaccination rate to protect community



GLOBAL MEASLES CASES 1980-2020



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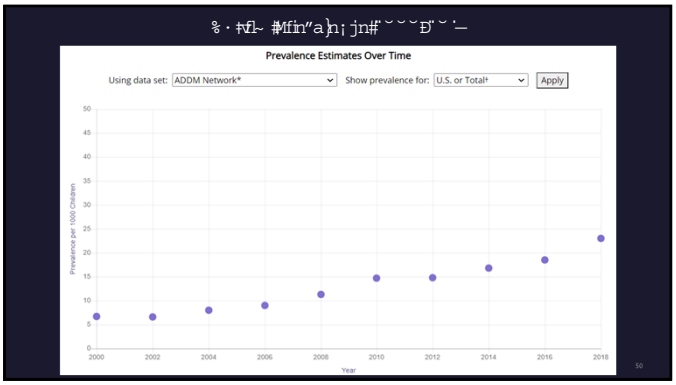

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SEARCH ENGINES

- PubMed.gov
  - ~2 million more articles than Medline
  - Most articles come from Medline
  - Authors submit publications to search engine

LITERATURE SEARCH

Medline (searched through pubmed.gov)

- Medical subject heading
- Indexing of journals is based on decision of Director of the National Library of Medicine, based on considerations of both scientific policy and scientific quality
- Analogous to NIH grant decision-making process
- Time coverage- 1947-present

JOURNAL CITATIONS

- Reports of original research
- Original clinical observations accompanied by analysis and discussion
- Analysis of philosophical, ethical, or social aspects of the health professions or biomedical sciences

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HILLS POSTULATES

1. Correct temporal sequence
   - Exposure MUST come before Outcome
2. Strength of association
   - Outcome is consistent among those with Exposure
3. Consistency of the association
   - Outcome is repeated by different researchers, in different locations, and multiple study formats
4. Dose-response relationship
   - Higher Exposure leads to a worse Outcome
5. Biologic plausibility
   - Exposure must have a biologic pathway to cause the Outcome
6. Experimental evidence
   - Evidence in multiple research approaches (e.g., cell culture, animals, clinical trials) demonstrate a relationship

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1. Randomized controlled trial
2. Randomized community trial
3. Prospective cohort study
4. Retrospective cohort study
5. Case-control study
6. Cross-sectional study
7. Ecologic study
8. Descriptive study

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Find a source you can digest in 60 seconds or less…
CDC COVID Data Tracker – look at County Transmission Level
New York Times
Johns Hopkins

Interpretation
- Avoid listening to those who are not specialists in infectious disease, pharmacology, and epidemiology
- Be wary of professionals lacking full credentials
- Trust the clinical evaluation process and if concerned, 1) talk to you primary care doctor or public health agency, and/or 2) give it time to show the real world results following clinical evaluation
- Remember the FDA evaluates all potential COVID treatments THOROUGHLY. They are not incentivized to exclude a therapy; however, the BENEFIT of the therapy MUST outweigh the RISK.

Points to consider
- If you look at case data, remember there are significant lags in reporting
  - Lab tests – 3-5 days after specimen collection
  - Hospitalizations rise 10+ days later
  - Deaths occur 10-14 days later
- Forecasts are not super valuable

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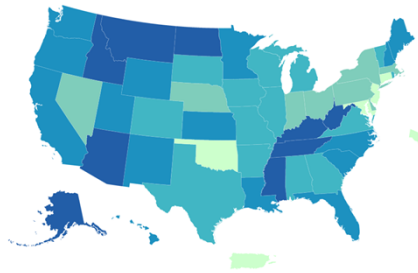
US COVID-19 7-Day Case Rate per 100,000, by State/Territory

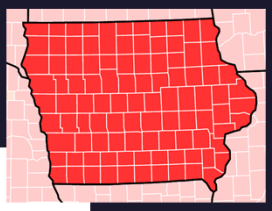


CDC COVID Data Tracker

Territories

7-Day Case Rate per 100,000

Iowa Covid As of 2/11

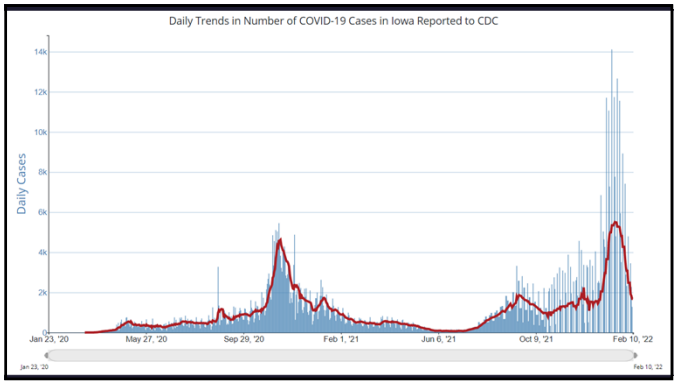


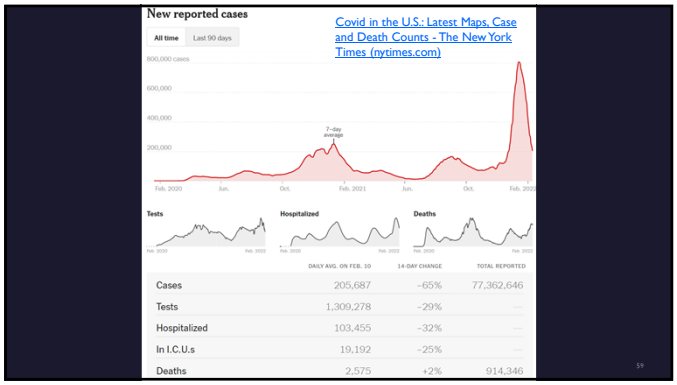
Iowa

State Health Department

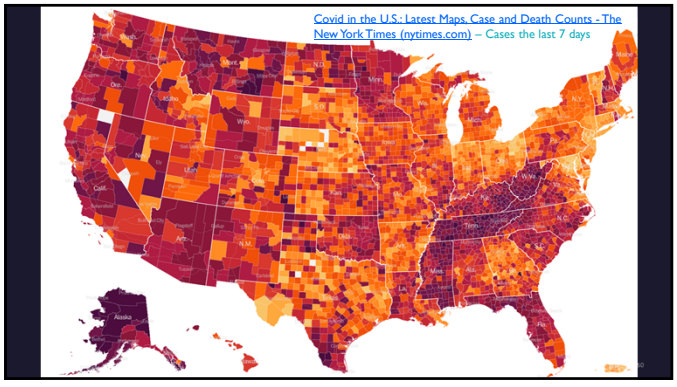
7-day Metrics

Community Transmission	High
Cases	11,791
% Positivity	15-19.9%
Deaths	172
% of Population ≥ 5 Years of Age Fully Vaccinated	64.7%
New Hospital Admissions (7-Day Moving Avg)	95.14





Covid in the U.S.: Latest Maps, Case and Death Counts - The New York Times (nytimes.com)



Covid in the U.S.: Latest Maps, Case and Death Counts - The New York Times (nytimes.com) – Cases the last 7 days

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TRANSMISSION

- Person to person via aerosolized virus
  - This includes talking, sneezing, coughing
  - Laughing, singing, and shouting increase the distance virus can spread
- From person to surface to person
  - Needs to be recent contamination from a person actively shedding virus
  - Uninfected person has to touch his/her nose/face/mouth in order to become infected
- Aerosolized droplets
  - This newly identified mechanism for spread is still under study; however, it is known the virus can linger in the air for a period of time. The smaller and less ventilated a room, the more likely transmission will occur even with mask usage.

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Symptom Comparison

Symptoms	Allergies	Cold	Influenza (Flu)	Coronavirus (COVID-19)
Body Aches	Never	Often	Often	Sometimes
Cough	Sometimes	Often	Often	Often
Diarrhea/GI	Rare	Rare	Sometimes	Sometimes
Fatigue	Sometimes	Sometimes	Often	Often
Fever / Chills / Shaking	Never	Rare	Often	Often
Headache	Rare	Rare	Often	Sometimes
Loss of Taste or Smell	Never	Never	Never	Sometimes
Shortness of Breath or Difficulty Breathing	Rare	Rare	Rare	Often
Sneezing	Often	Often	Rare	Rare
Sore Throat	Rare	Often	Sometimes	Sometimes
Stuffy Nose	Often	Often	Sometimes	Rare

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- **Masks** – there is resounding evidence masks protect you and prevent others from getting infected by you. The reduction in transmission when wearing a mask is between 60-80%. Wear a mask at work, in public settings, and anytime you perceive risk of transmission.
- **Social distancing** – this in combination with mask wearing nearly completely removes risk of transmission. It is essential to maintain distance while in public, in the office, and around those you do not routinely see.
- **Use hand sanitizer** and **wash hands** often. If you touch a widely shared surface, sanitize.
- Protect your **general health and well-being**. Get sleep. Eat well. Move your body.
- Spend time around the same groups of people and promote safe interactions.
- **Ventilation** including HEPA filter air purifiers

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I already had COVID-19

People who have gotten sick with COVID-19 may still benefit from getting vaccinated. Due to the severe health risks associated with COVID-19 and the fact that re-infection with COVID-19 is possible, people may be advised to get a COVID-19 vaccine even if they have been sick with COVID-19 before.

It was developed too fast

The COVID-19 vaccines from Pfizer/BioNTech and Moderna were created with a method that has been in development for years, so the companies could start the vaccine development process early in the pandemic.

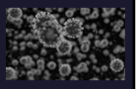
The vaccine developers didn't skip any testing steps, but conducted some of the steps on an overlapping schedule to gather data faster.

Ivermectin

Ivermectin is not authorized or approved by FDA for prevention or treatment of COVID-19. The National Institutes of Health's (NIH) COVID-19 Treatment Guidelines Panel has also determined that there are currently insufficient data to recommend ivermectin for treatment of COVID-19. ClinicalTrials.gov has listings of ongoing clinical trials that might provide more information about these hypothesized uses in the future.

Vaccine changes your DNA

The messenger RNA from two of the first types of COVID-19 vaccines does enter cells, but not the nucleus of the cells where DNA resides. The mRNA does its job to cause the cell to make protein to stimulate the immune system, and then it quickly breaks down – without affecting your DNA.



mRNA technology is new

The mRNA technology behind the new coronavirus vaccines has been in development for almost two decades. Vaccine makers created the technology to help them respond quickly to a new pandemic illness, such as COVID-19.

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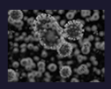
Kids are getting sicker with Omicron than previous strains

New studies are showing kids are affected at the same rates as in previous surges. Some state are experiencing higher numbers of pediatric hospitalizations due to the volume of cases overall.



Children are only now being tested

Test availability is actually more scarce in high transmission areas than last fall. Before the Nov 2020 surge, lab testing was scaled to handle catastrophic increases.

There are no long-term studies of vaccine safety and efficacy

Clinical trials started in April 2020. Over 100k people part of those trials continue to be monitored for long-term effects and antibody retention.

The vaccine is causing a spike in blood clots and death

Outcomes from vaccination are tracked through multiple mechanisms – VSAFE is a self-reporting system that tracks instances of adverse events from vaccination. VAERS is a national surveillance system that tracks physician reports of adverse events. The ACIP reviews these reports every single month; the FDA is also required continuously monitor clinical trial and real-world research data. Those systems also result in publicly available publications showing the background rates of adverse events and those attributed to vaccine administration.

ACIP VSAFE

VAERS Safety data

Summary of adverse events

Myocarditis – 0.2 cases per million doses; primarily males <30 with certain medical conditions; >65% of cases are asymptomatic
Blood clots– 3 cases per million doses; primarily in women and only for J&J
Anaphylaxis – 2-5 people per million; all vaccine sites are required to have supplies to respond to anaphylaxis
Guillain-Barre – 13 cases per million doses; most fully recover

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The government is using the vaccine to track you

All vaccine vials are multi-dose, meaning each injection must be drawn up individually. It seems impractical to assume the nanoparticle would be drawn up in each individual dose by thousands of health professionals everywhere.

The vaccine was made from aborted fetal tissue.

Let's start with this – the Pope says it's okay. Second, neither Pfizer or Moderna require fetal cell lines for manufacturing.

COVID-19 Vaccine Fetal Cell Handout.pdf

The vaccine contains heavy metals and other harmful ingredients

Vaccine ingredients vary by manufacturer. None of the vaccines contain eggs, gelatin, latex, or preservatives. All COVID-19 vaccines are **free from metals** such as iron, nickel, cobalt, lithium, and rare earth alloys. They are also free from manufactured products such as microelectronics, electrodes, carbon nanotubes, or nanowire semiconductors.

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- Impact on periods
- Impact on fertility
- Overlap of S protein target of vaccine with placental marker
- Spontaneous abortion

Table 4. Pregnancy Loss and Neonatal Outcomes in Published Studies and V-safe Pregnancy Registry Participants.

Participant-Reported Outcome	Published Incidence[a]	V-safe Pregnancy Registry[†]
	%	*no./total no. (%)*
Pregnancy loss among participants with a completed pregnancy		
Spontaneous abortion: <20 wk[9-17]	10-26	104/827 (12.6)[‡]
Stillbirth: ≥ 20 wk[18-20]	<1	1/725 (0.1)[§]
Neonatal outcome among live-born infants		
Preterm birth: <37 wk[21,22]	8-15	60/636 (9.4)[¶]
Small size for gestational age[21,24][‖]	3.5	23/724 (3.2)
Congenital anomalies[23][**]	3	16/724 (2.2)
Neonatal death[25][††]	<1	0/724

ASRM, ACOG and SMFM Issue Joint Statement: Medical Experts Continue to Assert that COVID Vaccines Do Not Impact Fertility

Feb 05, 2021
By: ASRM
Origin: ASRM Bulletin

The following is a statement from the American College of Obstetricians and Gynecologists (ACOG), the American Society for Reproductive Medicine (ASRM) and the Society for Maternal-Fetal Medicine (SMFM):

"Throughout the COVID-19 pandemic, patients have had questions about the impact of the virus on their health. Now, as the rollout of the COVID vaccines progresses, patients similarly have questions about whether the vaccine is right for their individual health needs.

"As experts in reproductive health, we continue to recommend that the vaccine be available to pregnant individuals. We also assure patients that there is no evidence that the vaccine can lead to loss of fertility. While fertility was not specifically studied in the clinical trials of the vaccine, no loss of fertility has been reported among trial participants or among the millions who have received the vaccines since their authorization, and no signs of infertility appeared in animal studies. Loss of fertility is scientifically unlikely."

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Pros of Vaccination

- Protection of pregnant women against
  - 42 studies, over 5,000 vaccinated pregnant women extensively monitored. Incidence of adverse outcomes not identified.
  - 155,000 pregnant women participating in V-Safe were vaccinated, including hundreds in original clinical trials
- Transmission of antibodies from mother to fetus in utero
- Transmission of antibodies from mother to infants through breastfeeding (this happens with other vaccine preventable diseases)
- Vaccines have only a short term effect on the body

Cons of Not Vaccination

- More likely to go to the ICU, need ventilation, and/or need oxygen compared to non-pregnant
- More likely to have preeclampsia
- More likely to die from COVID19
- More likely to have babies born preterm or stillborn
- More likely to have their babies admitted to the neonatal unit

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Consumer-grade masks	Fitted Filtration Efficiency (FFE)
2-layer woven nylon mask	
Without aluminum nose bridge	44.7%
With aluminum nose bridge	56.3%
With aluminum nose bridge and filter insert	74.4%
With aluminum nose bridge, washed (no filter)	79.0%
Cotton bandana	49.9%
Folded surgeon general style	49.0%
Folded bandit style	
Single-layer woven polyester gaiter	37.8%
Single-layer woven polyester/nylon mask with ties	39.3%
Non-woven polypropylene mask with fixed ear loops	28.6%
3-layer knitted cotton mask with ear loops	26.5%
N95 respirator: 98.4% FFE	
Surgical mask with ties: 71.6% FFE	

How effective is a mask in preventing COVID-19 infection? (nih.gov)

Procedure mask modifications	Fitted Filtration Efficiency (FFE)	Image
Procedure mask with ear loops (no modifications)	38.5%	
With loops tied, corners tucked	60.3%	
With ear guard	61.7%	
With clawed hair clip	64.8%	
Fix-the-mask technique (rubber bands)	78.2%	
Nylon hosiery sleeve	80.2%	

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- Clinical manifestations, risk factors, and maternal and perinatal outcomes of coronavirus disease 2019 in pregnancy: living systematic review and meta-analysis | The BMJ
- The impact of COVID-19 on pregnancy outcomes: a systematic review and meta-analysis | CMAJ
- Clinical manifestations, risk factors, and maternal and perinatal outcomes of coronavirus disease 2019 in pregnancy: living systematic review and meta-analysis | The BMJ
- Update: Characteristics of Symptomatic Women of Reproductive Age with Laboratory-Confirmed SARS-CoV-2 Infection by Pregnancy Status — United States, January 22–October 3, 2020 | MMWR (cdc.gov)
- Birth and Infant Outcomes Following Laboratory-Confirmed SARS-CoV-2 Infection in Pregnancy — SET-NET, 16 Jurisdictions, March 29–October 14, 2020 | MMWR (cdc.gov)
- The impact of COVID-19 on pregnancy outcomes: a systematic review and meta-analysis | CMAJ
- Clinical manifestations, risk factors, and maternal and perinatal outcomes of coronavirus disease 2019 in pregnancy: living systematic review and meta-analysis | The BMJ
- Receipt of mRNA COVID-19 vaccines preconception and during pregnancy and risk of self-reported spontaneous abortions, CDC v-safe COVID-19 Vaccine Pregnancy Registry 2020-21
- COVID-19 Vaccines While Pregnant or Breastfeeding (cdc.gov)
- Newborn Antibodies to SARS-CoV-2 detected in cord blood after maternal vaccination | medRxiv
- Cord blood antibodies following maternal coronavirus disease 2019 vaccination during pregnancy - American Journal of Obstetrics & Gynecology
- Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), ... : Obstetrics & Gynecology (lww.com)
- Antibody Response to Coronavirus Disease 2019 (COVID-19) Mes... : Obstetrics & Gynecology (lww.com)
- Can We Protect Pregnant Women and Young Infants From COVID-19 Through Maternal Immunization? | Infectious Diseases | JAMA Pediatrics
- Assessment of Maternal and Neonatal Cord Blood SARS-CoV-2 Antibodies and Placental Transfer Ratios | Global Health | JAMA Pediatrics
- Coronavirus disease 2019 vaccine response in pregnant and lactating women: a cohort study – ScienceDirect
- BNT162b2 COVID-19 mRNA vaccine elicits a rapid and synchronized antibody response in blood and milk of breastfeeding women | medRxiv
- Immune response during lactation after anti-SARS-CoV2 mRNA vaccine | medRxiv

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PREVENTIVE MEASURES

How effective is a mask in preventing COVID-19 infection? (nih.gov)
EPA Researchers Test Effectiveness of Face Masks, Disinfection Methods Against COVID-19 | US EPA
Your Guide to Masks | CDC
A rapid systematic review of the efficacy of face masks and respirators against coronaviruses and other respiratory transmissible viruses for the community, healthcare workers and sick patients - PubMed (nih.gov)
Effectiveness of Mask Wearing to Control Community Spread of SARS-CoV-2 | Infectious Diseases | JAMA | JAMA Network

VACCINE IMMUNITY STUDIES

SARS-CoV-2-antibody response in health care workers after vaccination or natural infection in a longitudinal observational study | medRxiv
Reduced Risk of Reinfection with SARS-CoV-2 After COVID-19 Vaccination — Kentucky, May–June 2021 | MMWR (cdc.gov)
Transmission, infectivity, and antibody neutralization of an emerging SARS-CoV-2 variant in California carrying a L452R spike protein mutation | medRxiv
Efficacy and Safety of the mRNA-1273 SARS-CoV-2 Vaccine | NEJM
Safety of the BNT162b2 mRNA Covid-19 Vaccine in a Nationwide Setting | NEJM
Safety, Immunogenicity, and Efficacy of the BNT162b2 Covid-19 Vaccine in Adolescents | NEJM
Evaluation of mRNA-1273 SARS-CoV-2 Vaccine in Adolescents | NEJM
Preliminary Findings of mRNA Covid-19 Vaccine Safety in Pregnant Persons | NEJM

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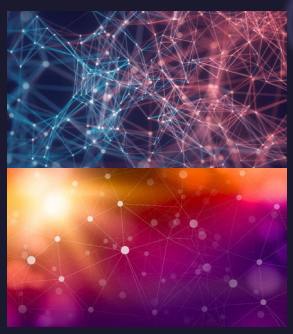
Aperio Statistical Consulting

Aperio Statistical Consulting



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