CPH Exam Review Webinar

Biological and Genetic Factors that Influence Health

CPH Certified in Public Health
by National Board of Public Health Examiners

USF HEALTH

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Credentialing Public Health Leaders

6

CPH Study Resources

1. Content Outline
2. Sample Exam Questions
3. Practice Exams
4. Webinars
5. ASPPH Study Guide
6. APHA Study Guide

www.nbphe.org/cph-study-resources/

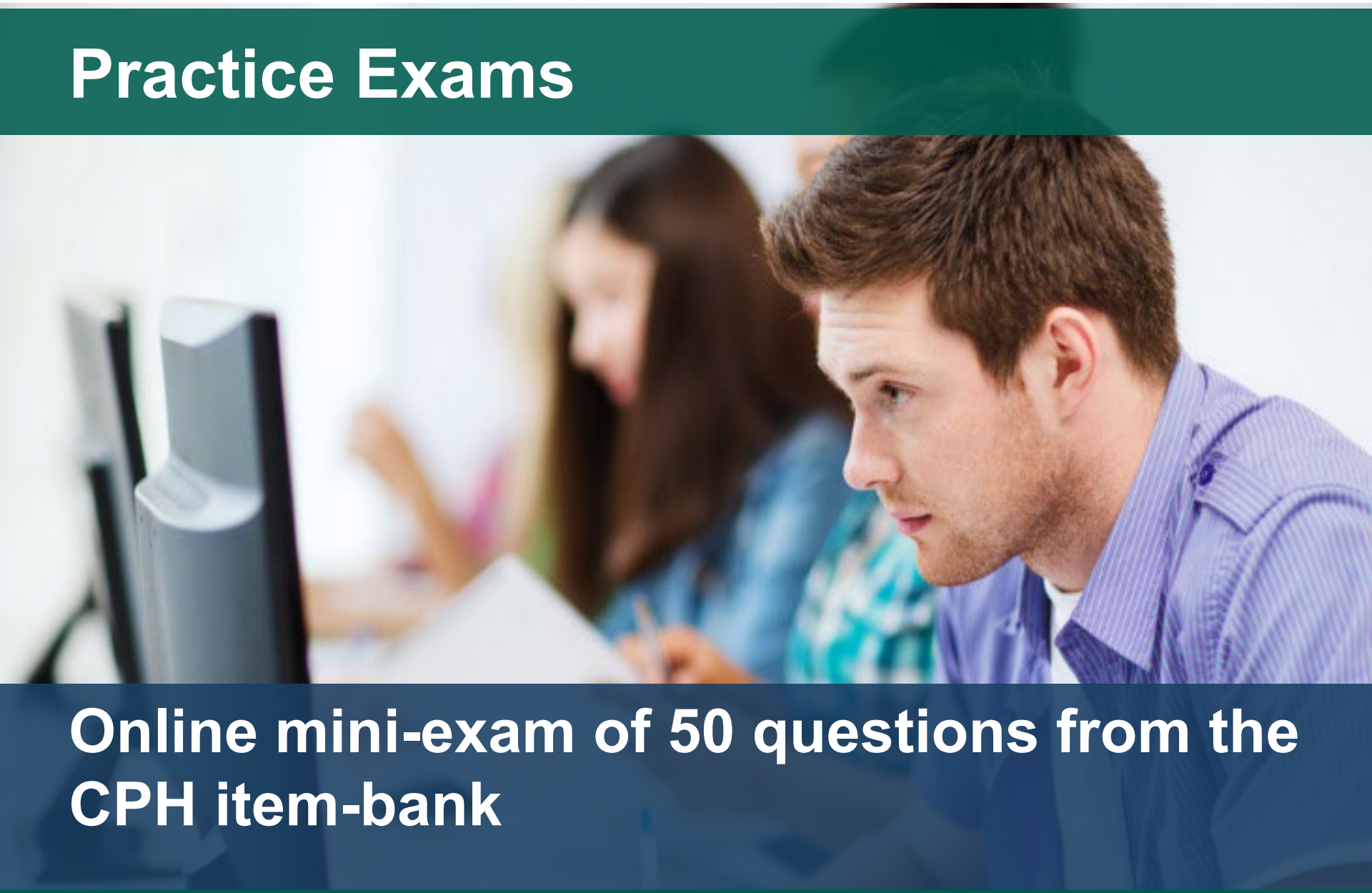
Content Outline

- Evidence-based Approaches to Public Health (10%)
- Communication (10%)
- Leadership (10%)
- Law and Ethics (10%)
- Public Health Biology and Human Disease Risk (10%)
- Collaboration and Partnership (10%)
- Program Planning and Evaluation (10%)
- Program Management (10%)
- Policy in Public Health (10%)
- Health Equity and Social Justice (10%)

Sample Exam Questions

Sample questions in the format of the CPH exam

Practice Exams



Online mini-exam of 50 questions from the CPH item-bank

Study Webinars

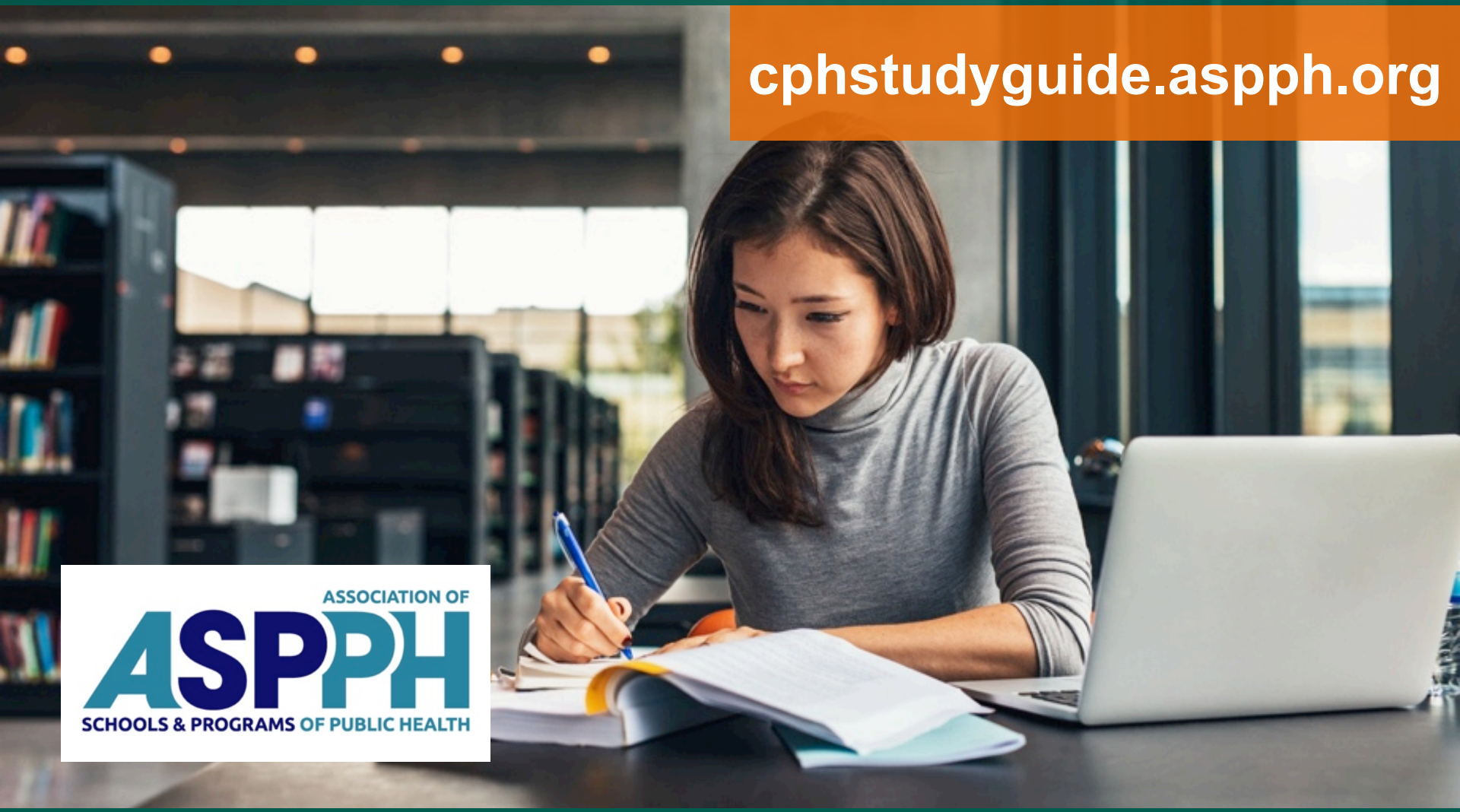
Upcoming Webinars Lecture and Q&A

Evidence Based Public Health: Biostatistics

October 22, 1-3 pm ET

Today's webinar and all past webinars /presentations are posted on https://www.nbphe.org/cph-study-resources/

ASPPH CPH Study Guide



cphstudyguide.aspph.org

ASSOCIATION OF ASPPH SCHOOLS & PROGRAMS OF PUBLIC HEALTH

APHA Press Study Guide

APHA
AMERICAN PUBLIC HEALTH ASSOCIATION
For science. For action. For health.

Editors: Karen Liller, Jaime Corvin and Hari Venkatachalam
University of South Florida College of Public Health
Certified in Public Health Exam Review Guide
$41.95 APHA member /$51.95 non-member
eBook and print available via the APHA Bookstore at https://www.apha.org/publications-and-periodicals


Let’s Get Started!

Biological and Genetic Factors that Influence Health

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Associate Professor and Director of the MPH
University of South Florida College of Public Health

ASPPH CPH Exam Webinar Series

September 26, 2019

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Learning Objectives

1. Assess how biological agents affect human health
2. Apply evidence-based biological concepts to inform public health laws, policies, and regulations
3. Identify risk factors and modes of transmission for infectious diseases and how these diseases affect both personal and population health
4. Gain confidence in your ability to successfully complete the CPH exam

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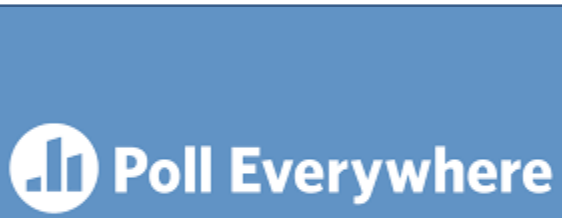
Topics

- ❑ Biological Basis for Public Health
- ❑ Disease Transmission
- ❑ Immunity
- ❑ Global Burden of Disease
- ❑ Human Genetics and Genomics
- ❑ Injuries and Violence
- ❑ Physical Environment
  - Air, water, soil
- ❑ Social Environment
- ❑ Food Safety
- ❑ Hazardous Waste
- ❑ Chemical Agents
- ❑ Policies and Federal Law



When it is time – you will be promoted to text ASPPH to log into the poll.

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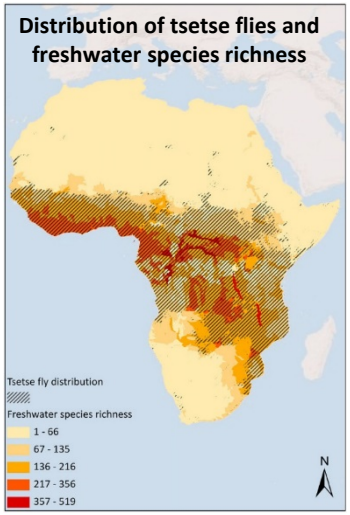
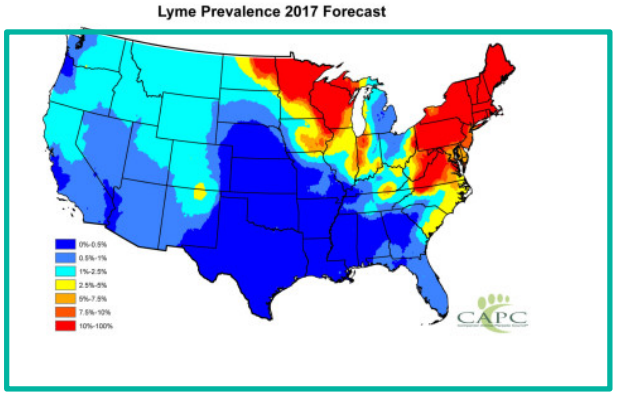
How are you feeling about the CPH exam?

Biological and Molecular Basis for Public Health

- Public Health
  - Based on premise health events are **not random**
    - Occur as a result of risk factors
  - Risk factors are **not randomly** distributed in the population
    - Influenced by biological & social determinants of health



Trypanosomiasis (African Sleeping Sickness) is transmitted by a blood sucking insect, the **tsetse fly.**



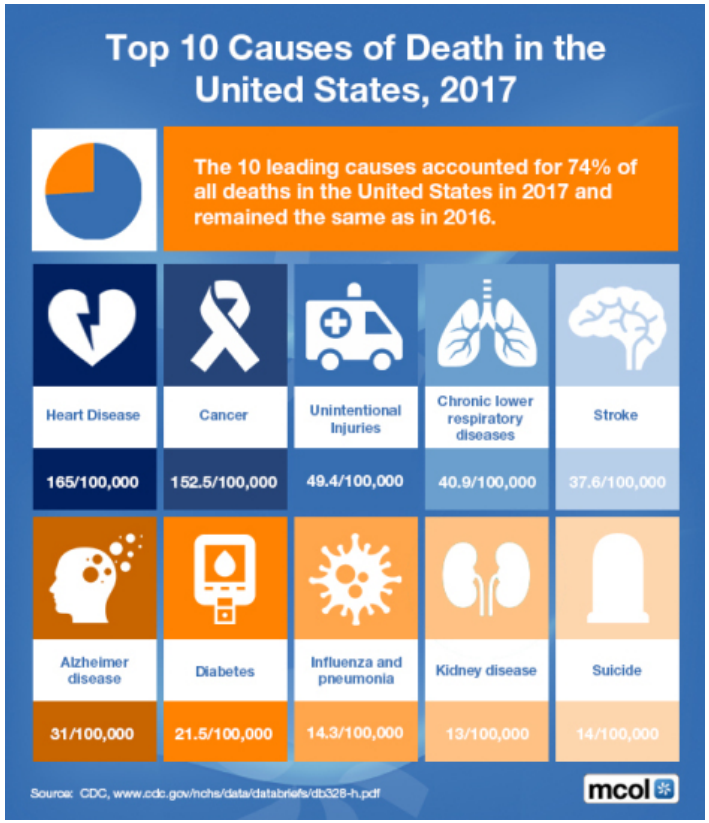
Lyme disease: Caused by bacteria, *Borrelia Burgdorferi.* *T*ransmitted to humans through bite from an infected **deer tick**.

WHO estimates that more than 13 million deaths are due to preventable environmental causes

Lyme Image Source: https://www.lymedisease.org/clemson-tick-map/
Tsetse Fly Image Source: https://www.researchgate.net/figure/Overlap-of-the-distribution-of-tsetse-flies-and-freshwater-species-richness-The-latter_fig1_316542012

Disease Causation

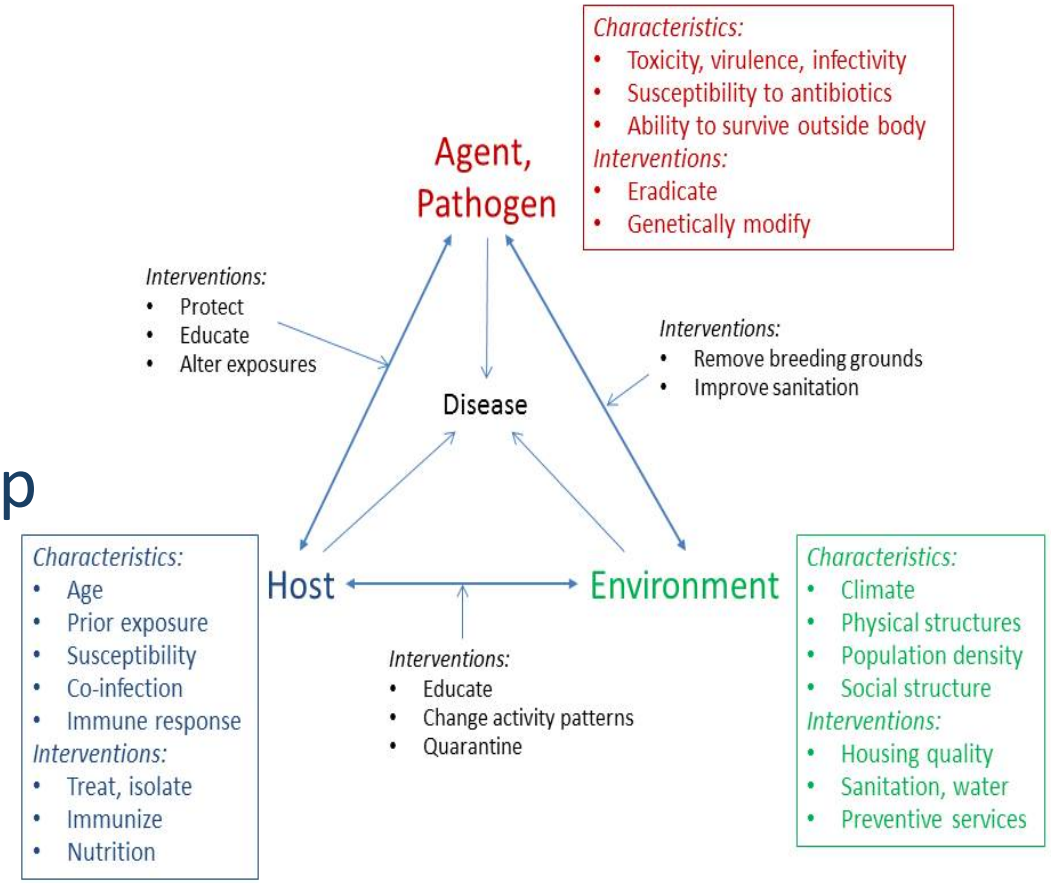
- One role of Public Health
  - Determine causes of disease
    - i.e. the etiology (cause, origin)
  - Determine environmental factors that play a role
  - Understand the mechanisms



Discover the factors which affect health so that we can prevent disease and promote health!

Models of Disease Causation

- The Epidemiologic Triangle
  - One of the most commonly used models to explain infectious disease
  - Illustrate relationship between:
    - Agent
    - Host
    - Environment.



What is the chain of infection a model of?

How bacteria multiply

How an infection affects the immune system

How infections can be prevented

How pathogenic microorganisms are transmitted from one person to another

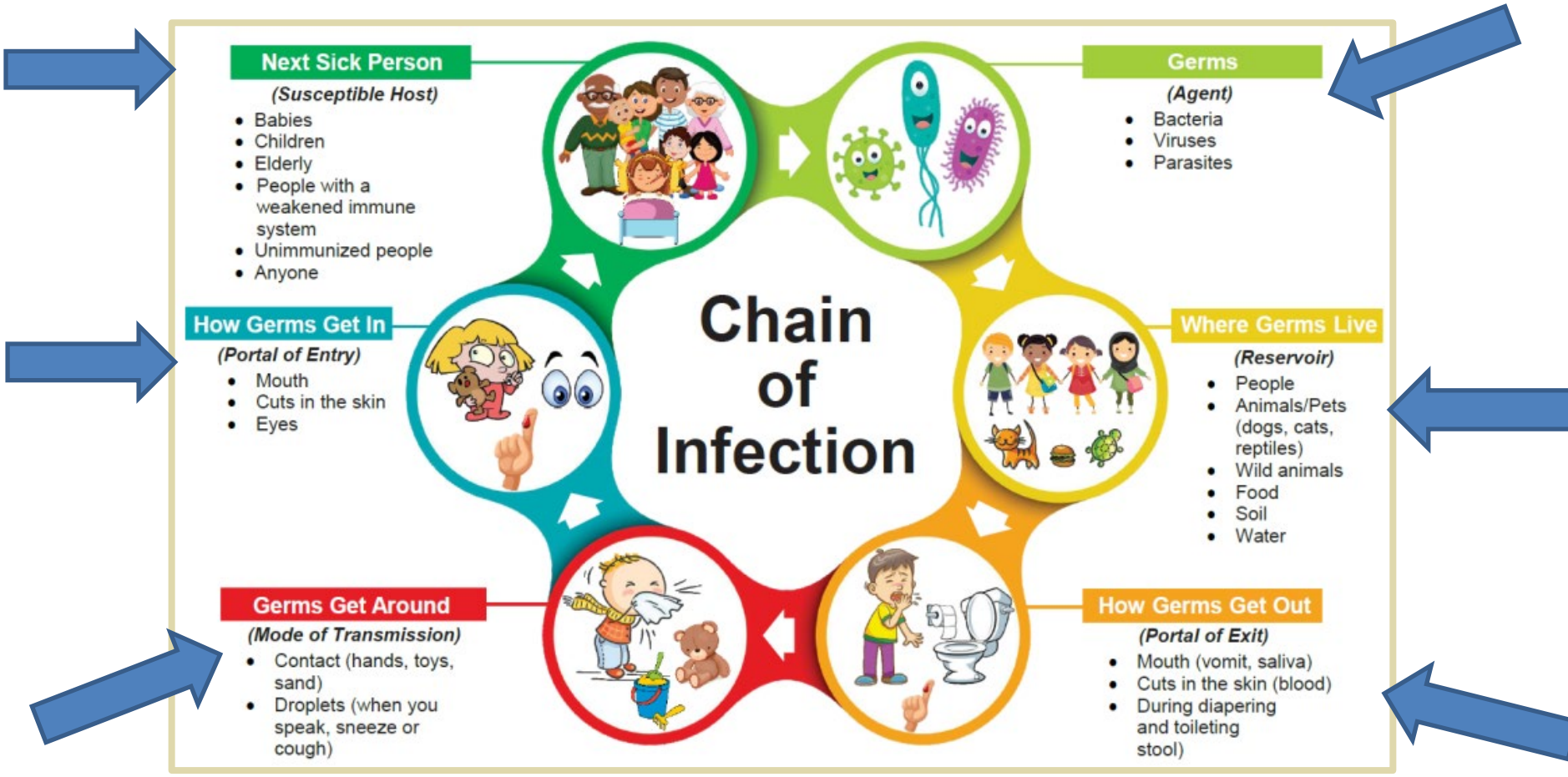
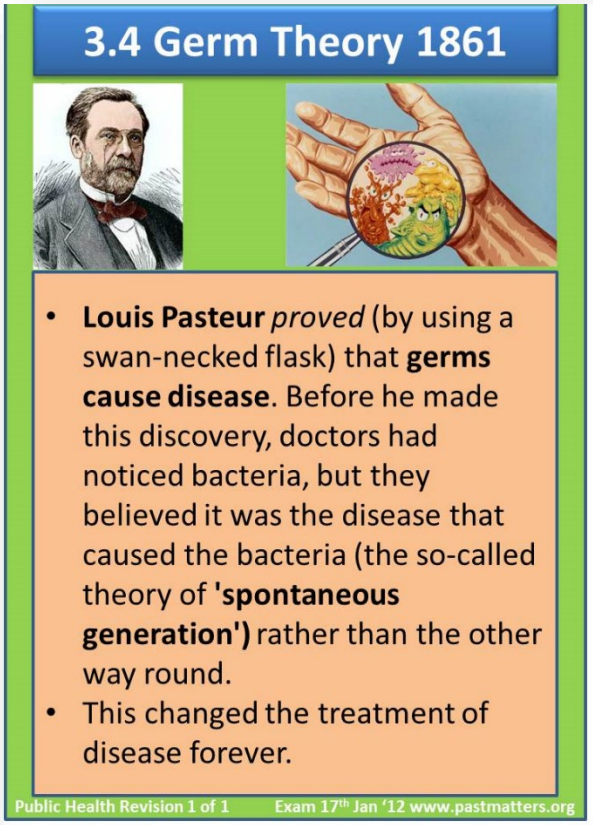


Image Source: http://www.ottawapublichealth.ca/en/professionals-and-partners/chain-of-infection.aspx

Theories of Infectious Diseases

- Past scholars sought ways to:
  - Explain how infectious diseases work
  - Underlying biologic mechanisms.



Pasteur: Father of germ theory and bacteriology

- created the first vaccines for rabies and anthrax
- Best known for:
  - ➔ Invention of the technique of treating milk to stop bacterial contamination -- pasteurization.

Understanding ➔ predicting spread of infectious diseases.

Theories of Infectious Diseases

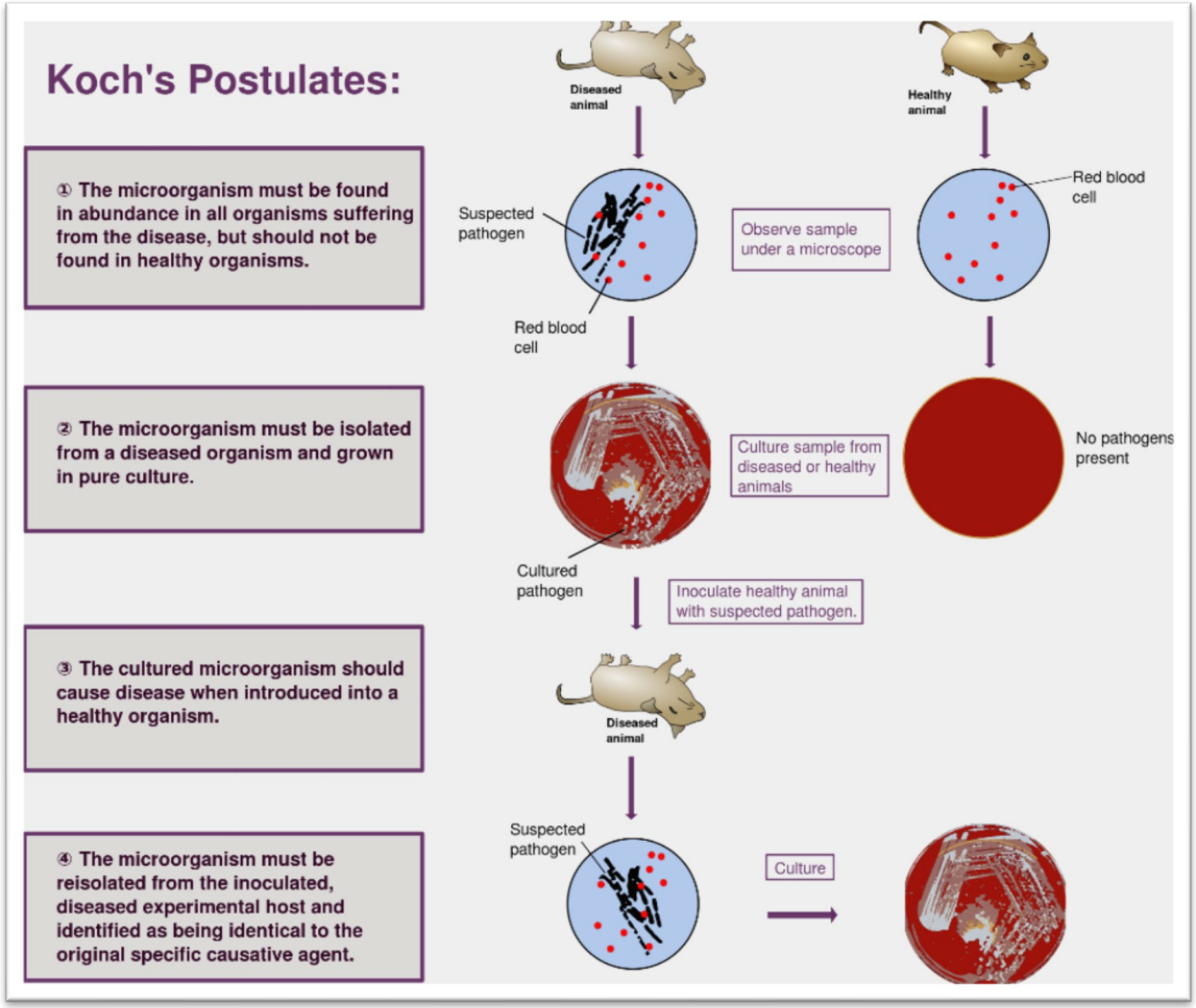


Photo: https://microbenotes.com/robert-koch-and-kochs-postulates/

A mosquito bites an individual who later develops a fever and abdominal rash. What type of transmission would this be?

mechanical vector transmission

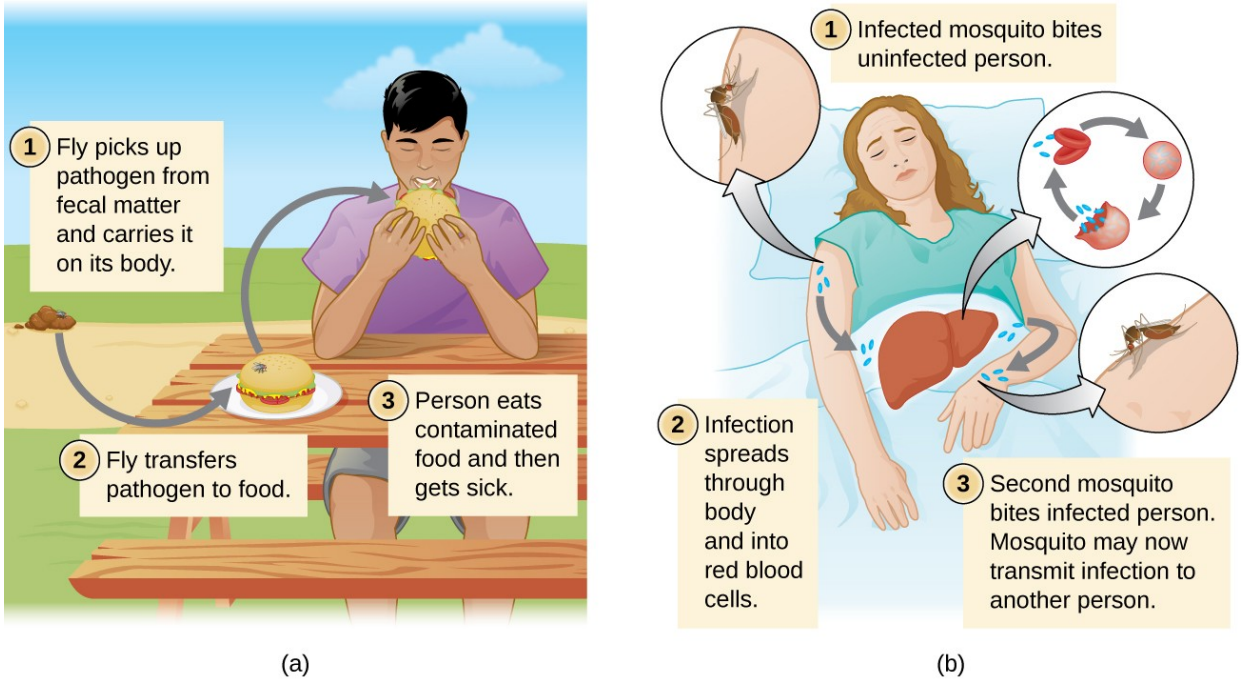
biological vector transmission

direct contact transmission

vehicle transmission

Vector Transmission

Picture from: https://courses.lumenlearning.com/microbiology/chapter/modes-of-disease-transmission/



(a) A mechanical vector carries a pathogen on its body from one host to another, not as an infection.
(b) A biological vector carries a pathogen from one host to another after becoming infected itself.

A blanket belonging to a child who has chickenpox is likely to be contaminated with Varicella-zoster virus, the virus that causes chickenpox. What is the blanket called?

agent

host

pathogen

fomite

Fomites

- Inanimate objects
  - can become contaminated with infectious agents
- Serve as a mechanism for transfer between hosts.

Photo: https://www.belson.com/Haws-Barrier-Free-Powder-Coated-Hi-Lo-with-Pet-Bowl-Pedestal-Drinking-Fountain

The classic **example of a fomite** is a park water fountain from which many people drink. Infectious agents deposited by one person can potentially be transmitted to a subsequent drinker.

Biological Insect Vectors

DISEASE	CAUSATIVE AGENT	VECTOR(S)	VECTOR	TRANSMISSI
MALARIA	*Plasmodium falciparum, P. malariae, P. ovale, P. knowlesi, P. vivax*	*Anopheles spp (An. gambiae* most common)	Mosquito	Biological
LYMPHATIC FILARIASIS (ELEPHANTIASIS)	*Wuchereria bancrofti, Brugia malayi, B. timori*	*Culex quinquefasciatus, Anopheles spp. Mansonia spp.*	Mosquito	Biological
BREAKBONE FEVER	Dengue virus	*Aedes aegypti*	Mosquito	Biological
YELLOW FEVER	Yellow fever virus	*Aedes aegypti*	Mosquito	Biological
WEST NILE FEVER	West Nile Virus	*Culex spp (quinquefasciatus/pipiens & tarsalis most common in US)*	Mosquito	Biological
ZIKA	Zika virus	*Aedes aegypti/Aedes albopictus*	Mosquito	Biological
TRACHOMA	*Chlamydia trachomatis*	*Musca domestica*	housefly	Mechanical
PLAGUE	*Yersinia pestis*	*Xenopsylla cheopis*	Flea	Biological
LYME DISEASE	*Borrelia burgdorferi*	*Ixodes scapularis*	dog tick	Biological
ROCKY MTN. SPOTTED FEVER	*Rickettsia rickettsii*	*Dermacentor variabilis*	tick	Biological
SLEEPING SICKNESS	*Trypanosoma bruceii*	*Glossina spp.*	tsete fly	Biological
LEISHMANIASIS	*Leishmania donovani, L. infantum, L. chagasi*	*Lutzomyia spp.*	sandflies	Biological
RIVER BLINDNESS	*Onchocerca volvulus*	*Simulium spp. (major vector S. damnosum in Africa)*	black flies	Biological
GUINEA WORM	*Dracunculus medinensis*	*Cyclops spp.*	water fleas (copepods)	Biological

The infectious agent that causes malaria is known as which of the following?

Protozoan parasite 

Bacterial parasite

Viral parasite

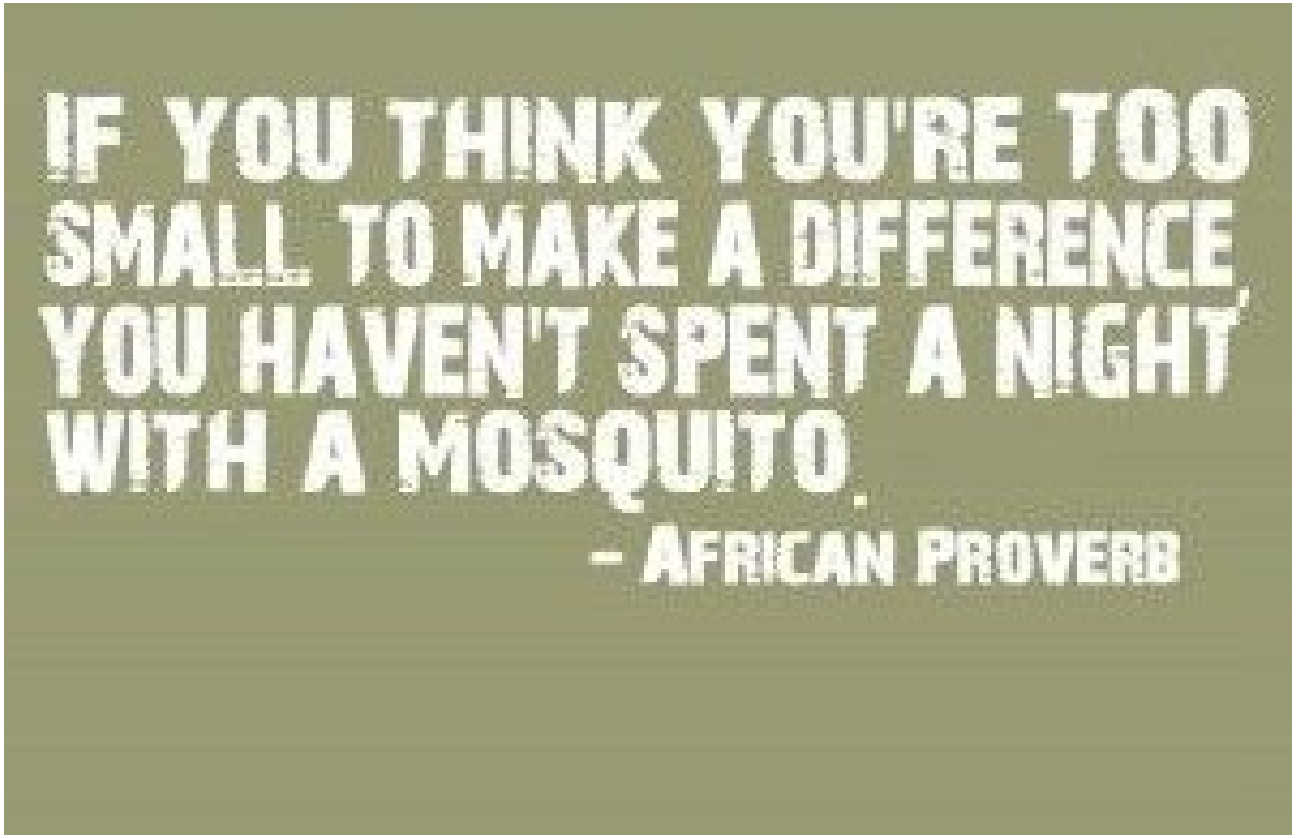
Fungal parasite

Mosquitoes

3,000+ species worldwide!!

MOSQUITO-BORNE DISEASES

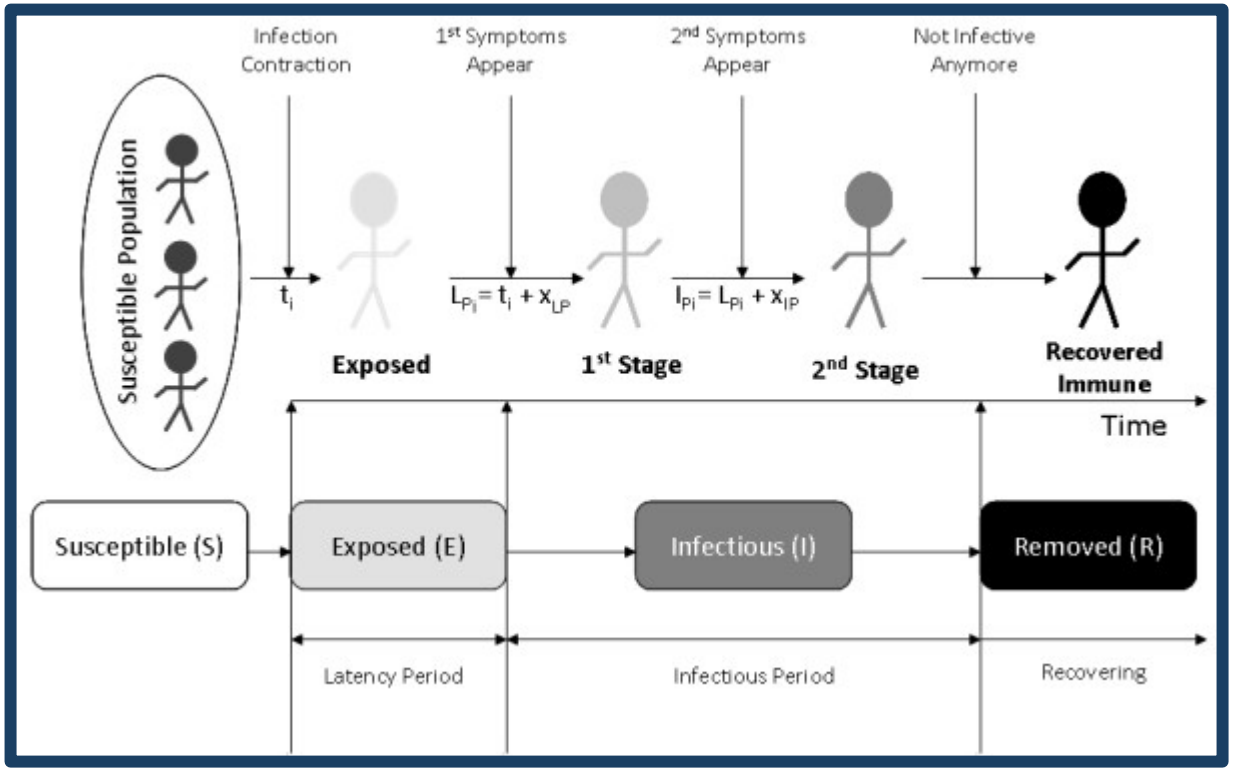
Disease	Causative agent	Genus of mosquito	Estimated annual cases	Estimated annual deaths	Estimated countries affected	Vaccine status
Dengue fever	Dengue virus	*Aedes*	50–100 million	20,000	>100	In clinical trials
Yellow fever	Yellow fever virus	*Aedes* and *Haemogogus*	200,000	30,000	>42	Available
Japanese encephalitis	Japanese encephalitis virus	*Culex*	50,000	>10,000	>10	Available
West Nile fever	West Nile virus	*Culex*	Varies from year to year, depending on outbreaks	Varies	Africa, Australia, Europe, Middle East, Asia and North America	In clinical trials
Malaria	*Plasmodium falciparum, P. vivax, P. malaria* and *P. ovale*	*Anopheles*	500 million	>1 million	>105	In clinical trials



Infectious Disease Models

SEIR infection model

- **Susceptible, Exposed, Infectious, Recovered**
- Simulate progress of epidemic in a human population.
  - LPi: latency period
  - IPi: infectious period
  - ti: first time individual is exposed to the virus
  - xLP: number of days for an exposed individual to become infective
  - xIP: number of days for an individual to recover from the disease.



States of the SEIR infection model

An agent-based approach for modeling dynamics of contagious disease spread - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Different-states-of-the-SEIR-infection-model-to-simulate-the progress-of-and-epidemic-in_fig1_26718591 [accessed 23 Sep, 2019]

Why Is Surveillance Important?

- Surveillance is VITAL to Public Health:
  - Monitoring disease trends
  - Describing natural history of diseases
  - Identifying epidemics or new syndromes
  - Monitoring changes in infectious agents
  - Identifying areas for research
  - Planning public health policy
  - Evaluating public health policy/interventions

Image source: West Umatilla Mosquito Control; http://www.wumcd.org/surveillance/chicken.html

A NOTE ABOUT WEST NILE VIRUS:

- **As of September 24, 2019, 46 states and the District of Columbia have reported West Nile virus infections in people, birds, or mosquitoes.**
- **543 cases of WNV in people have been reported to CDC.**

Surveillance Systems

- **Passive surveillance**:
  - local and state health departments rely on health care providers or laboratories to report cases of disease
    - Advantage
      - Efficiency
      - Simple and requires relatively few resources
      - Occurs continuously
    - Disadvantage
      - Incomplete data due to underreporting
  - Majority of public health surveillance systems are passive
- **Active surveillance**:
  - health department contacts health care providers and laboratories requesting information about conditions or diseases
    - Advantage
      - More complete data
      - Occurs when proactively requesting information
    - Disadvantage:
      - Requires resources and time
  - Useful when you must identify all cases

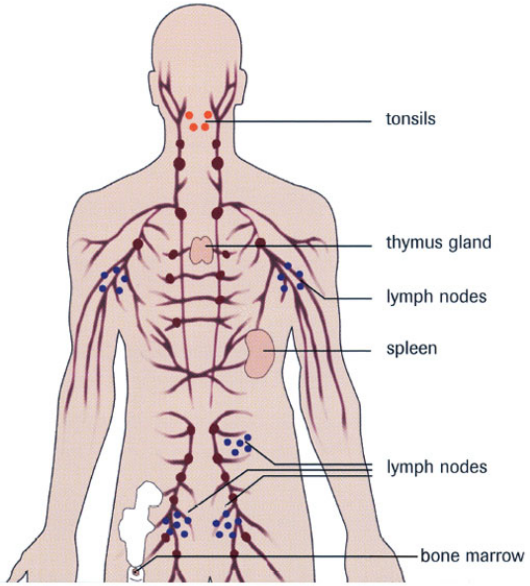
Strategies Used to Prevent Epidemics and Spread of Disease

- Pasteurization
- Disinfection (hand washing)
- Barrier contraceptive methods
- Antibiotics
- Quarantine
- Vaccination

Immune System

Network of organs, cells, tissues

- Skin
- Lymphatic system
- Thymus
- Bone marrow
- Spleen
- White blood cells (leukocytes)



Which of the following best describes how vaccines work?

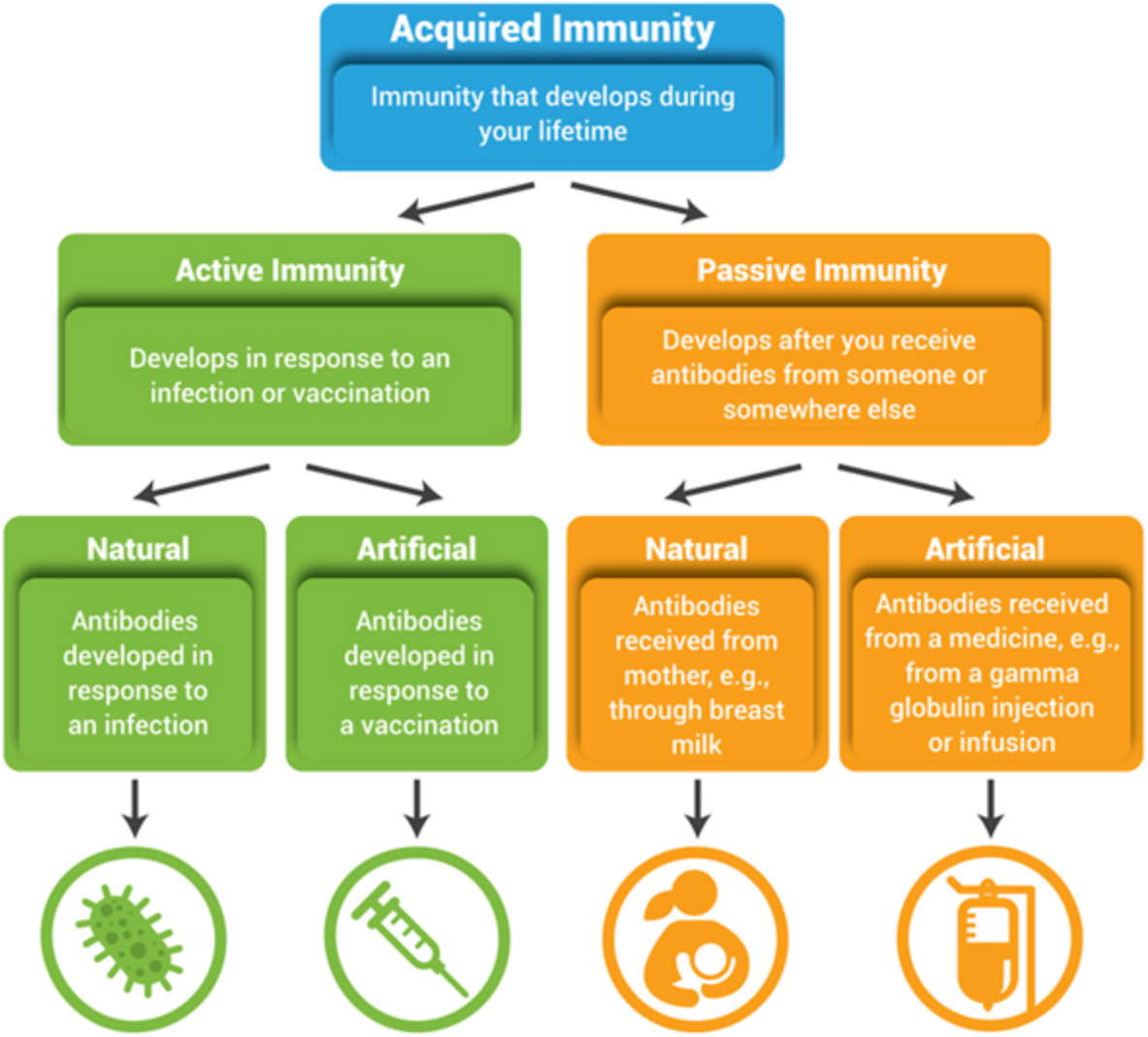
Most vaccines work by providing artificially produced antibodies that can attack specific pathogens

Most vaccines trigger the body's innate immune system which results in macrophages that engulf the pathogens

Most vaccines work by triggering the body's adaptive immune system including antibody production that can target a specific pathogen

Most vaccines work through epigenetic mechanisms that turn on genes that produce specific antibodies

Acquired Immunity



https://aidsinfo.nih.gov/understanding-hiv-aids/glossary/2/acquired-immunity

Which of the following is the best description of herd immunity?

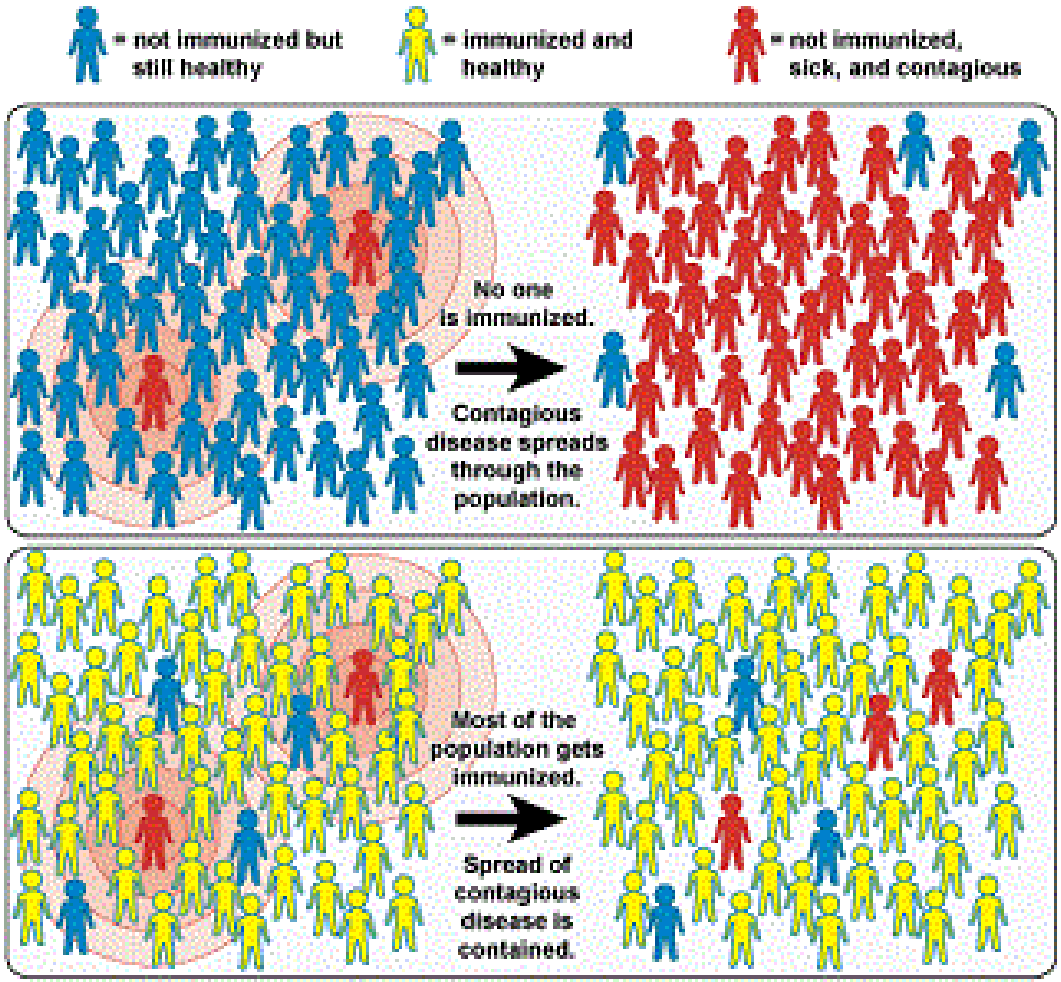
The phenomenon by which some people are naturally resistant to a disease

The time it takes for a disease to spread in a population

Resistance within a population to a certain infection

A person's resistance to diseases that are transmitted by other mammals such as cows

Herd Immunity



Herd Immunity Threshold

Disease	Threshold (%)
Mumps	75–86
Polio	80–86
Smallpox	80–85
Diphtheria	85
Rubella	83–85
Pertussis	92–94
Measles	83–94

Why do we need such high vaccination rates for pertussis and measles?

Data from Epidemiologic Reviews 1993

New vaccines for influenza must be developed every year because:

new strains of the virus evolve that are not affected by existing vaccines

viruses produce enzymes that break down existing vaccines

the human body produces enzymes that break down existing vaccines

the human body produces enzymes that break down existing vaccines

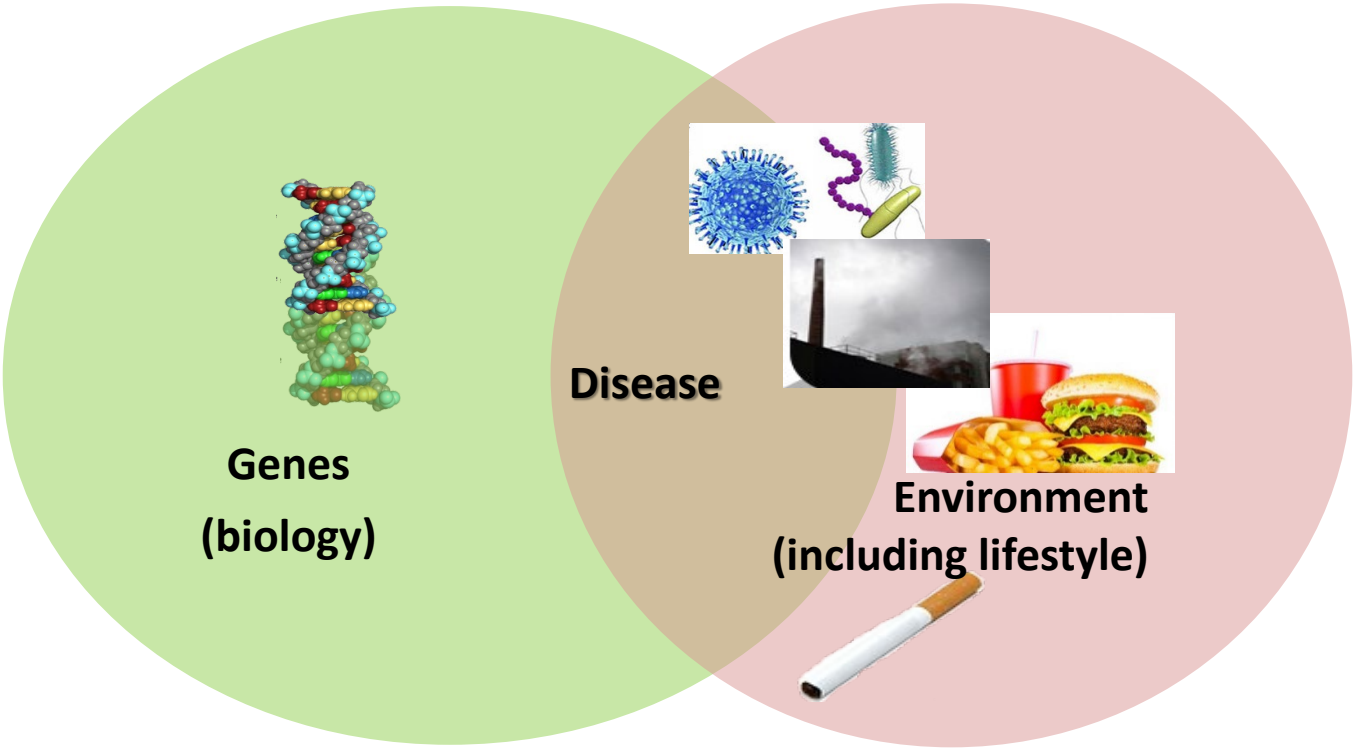
Influenza & Antigenic Drift and Antigenic Shift

- Antigenic Drift - Minor
  - Minor change within subtype
    - Point mutations
  - Occurs in A and B Subtypes
  - May cause **Epidemics**
- Antigenic Shift - **Major**
  - Major change
    - New subtype
    - Exchange of gene segments
  - Occurs ONLY in A subtypes
  - May cause **Pandemic**

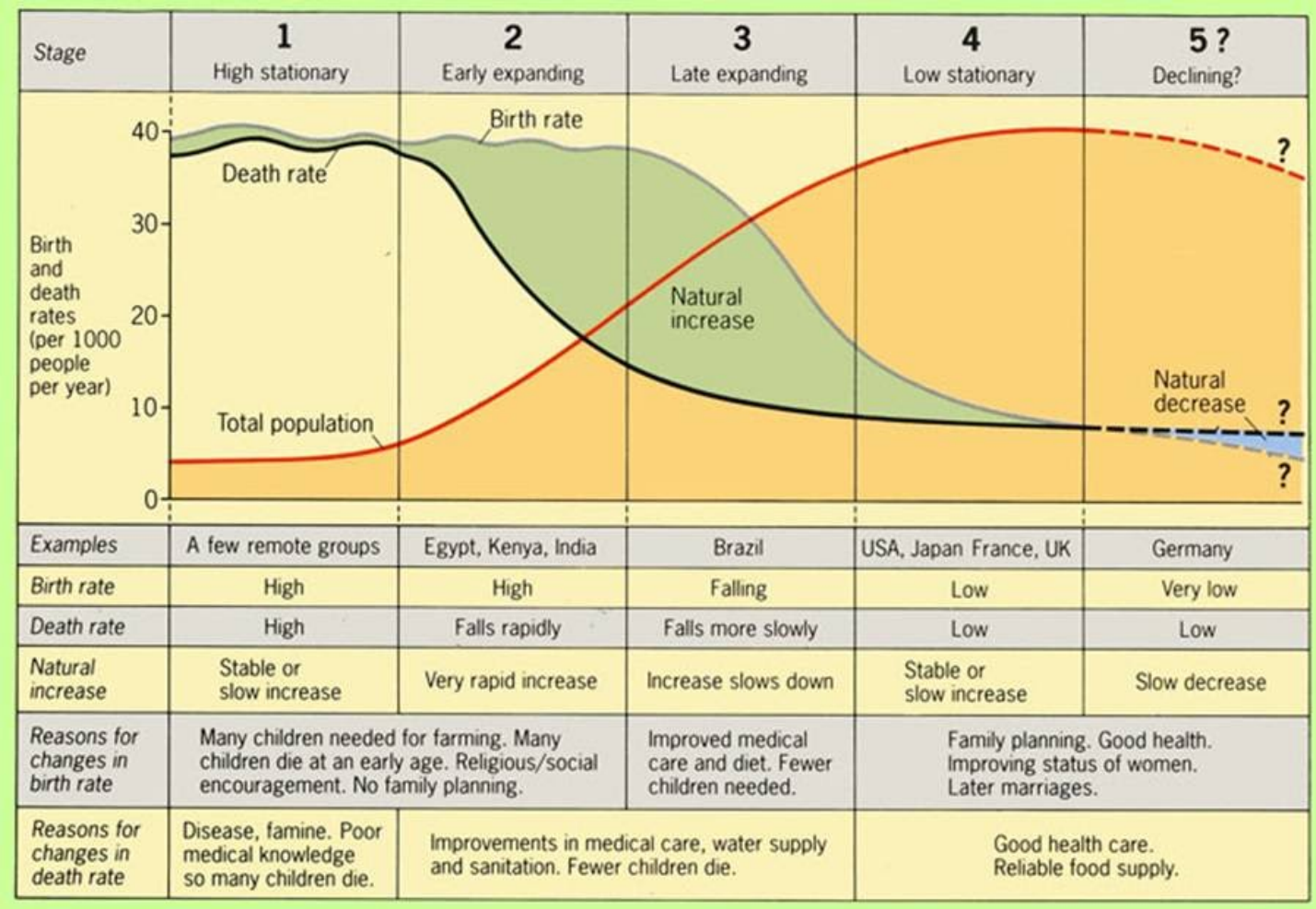
Antigenic drift is the reason we need new flu vaccines every year and the reason we can get sick from the flu multiple times in our lives.

Usually disease is caused by:

Complex interactions between genes and environment



Demographic Transition



Stage	1 High stationary	2 Early expanding	3 Late expanding	4 Low stationary	5 ? Declining?
Examples	A few remote groups	Egypt, Kenya, India	Brazil	USA, Japan France, UK	Germany
Birth rate	High	High	Falling	Low	Very low
Death rate	High	Falls rapidly	Falls more slowly	Low	Low
Natural increase	Stable or slow increase	Very rapid increase	Increase slows down	Stable or slow increase	Slow decrease
Reasons for changes in birth rate	Many children needed for farming. Many children die at an early age. Religious/social encouragement. No family planning.		Improved medical care and diet. Fewer children needed.	Family planning. Good health. Improving status of women. Later marriages.	
Reasons for changes in death rate	Disease, famine. Poor medical knowledge so many children die.	Improvements in medical care, water supply and sanitation. Fewer children die.		Good health care. Reliable food supply.	

Compared with the situation in 1900, the prevalence of deaths due to infectious diseases in the USA is:

About the same

Much less

Much more

About the same, but caused by different pathogens such as HIV

Leading Causes of Death

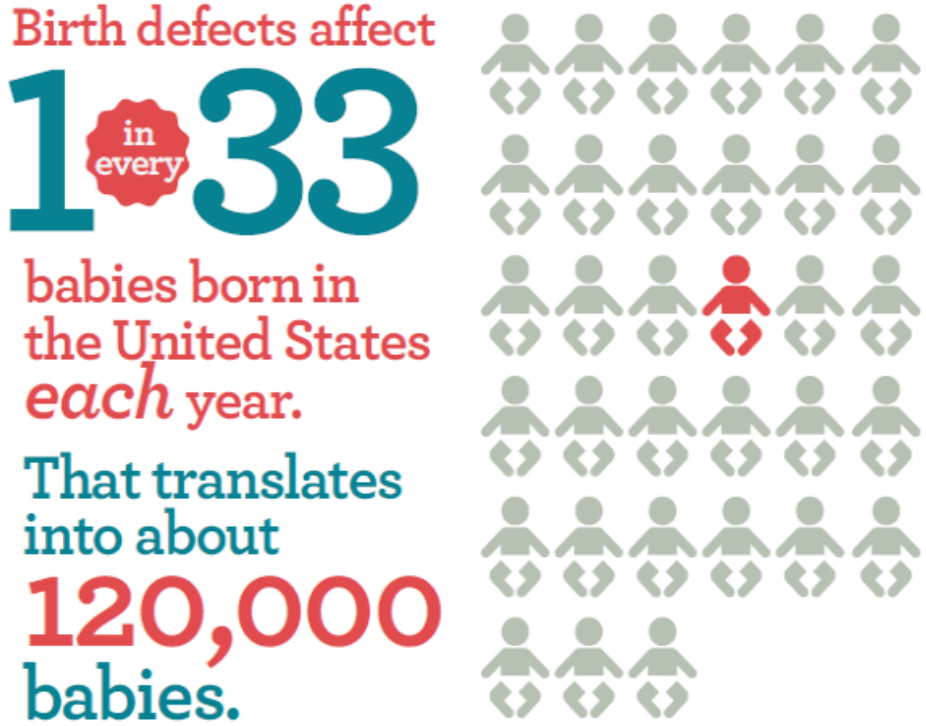
mid 1800	1900	2017
Tuberculosis	Pneumonia	Heart Disease
Dysentery/diarrhea	Tuberculosis	Cancer
Cholera	Diarrhea	Chronic lower respiratory Dz
Malaria	Heart Disease	Unintentional Injuries
Typhoid fever	Cerebrovascular Disease	Stroke
Pneumonia	Liver Disease	Alzheimer's Disease
Diphtheria	Injuries	Diabetes
Meningitis	Cancer	Influenza and Pneumonia
Whooping Cough	Senility	Liver Disease

The most important reason for reduced mortality during the initial stage of a demographic/epidemiologic transition in a population is:

- Increased use of antibiotics
- Improved sanitation
- Increased immunization
- Screening for common infectious diseases

Congenital Disorders

Cause 1 in 5 deaths during first year of life



Which of these groups of conditions include one or more single gene disorders that are part of the recommended uniform newborn screening panel?

- Metabolic disorders (e.g., PKU, fatty acid oxidation disorders)
- Endocrine disorders (e.g., congenital adrenal hyperplasia)
- Hemoglobin disorders (e.g., sickle cell disease)
- Hearing loss (e.g., connexin 26)
- All of the above

Which of the following is true about newborn screening programs?

All states in the U.S. screen for the same set of genetic conditions in newborns

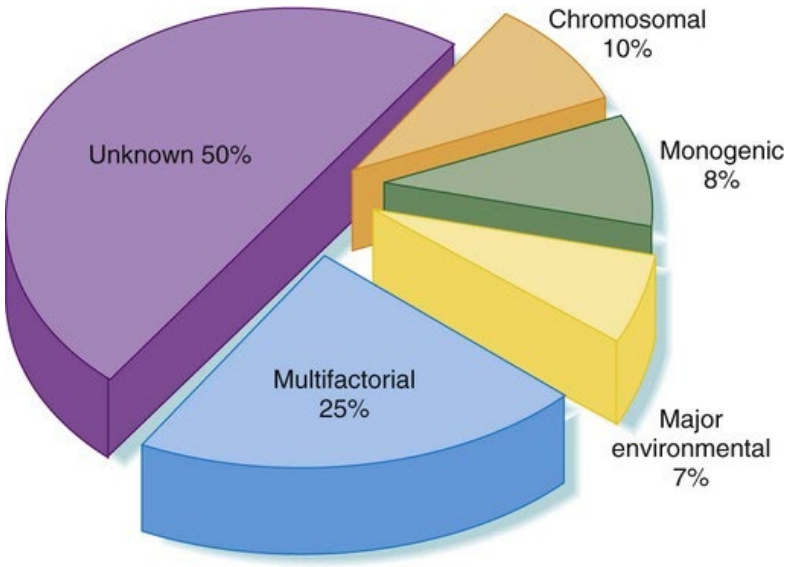
Most of the genetic conditions screened for follow an autosomal recessive pattern of inheritance

Almost all babies who have a positive newborn screen end up being diagnosed with the condition

In the U.S., most state newborn screening programs began in the 1990's

Screening identifies individuals who may be at an increased risk for a certain disease.
Early detection → Early Treatment.

Environmental Teratogens



Teratogens are agents that induce structural abnormality, growth deficiency or functional alteration during prenatal development

Teratogens

- Ionizing Radiation
  - Gamma or x-rays: Microcephaly or intellectual disabilities
- Chemicals
  - Accutane: birth defects
  - Alcohol: Fetal Alcohol syndrome
  - Cigarette use: LBW, stillbirth, miscarriage
  - Dioxin: linked to cancer
  - Thalidomide: absence of long bones
- Pathogens
  - Rubella: Congenital defects
  - Syphilis: Microcephaly or intellectual disabilities
  - Toxoplasmosis: stillbirth, miscarriage, developmental

https://incrediblenews24.com/20180522/global-thalidomide-market

Most teratogens effect the embryo during **organogenesis**, a critical stage of early development when tissues and organs are formed.

Which of the following is currently the most common cause of unintentional death for adults in the U.S.?

Motor vehicle (traffic) accidents

Unintentional poisoning (e.g. drug abuse)

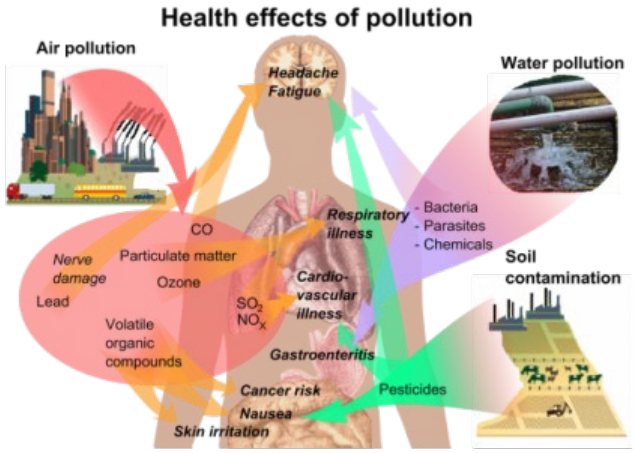
Unintentional gunshot wounds

Unintentional falls

Physical Environment

6 Criteria Air Pollutants

The Clean Air Act requires the Environmental Protection Agency's (EPA) to set **National Ambient Air Quality Standards** for 6 primary criteria air pollutants:



1. **Sulfur dioxide** (acid rain): Causes respiratory effects
   - People with asthma and other susceptible populations
2. **Nitrogen oxides** (smog, acid rain): Linked to respiratory effects
   - People with asthma
3. **Carbon monoxide**: Reduces oxygen to body tissues.
   - Those with cardiovascular conditions.
4. **Ozone:** Causes airway irritation, coughing, and difficulty breathing.
   - Those with chronic obstructive pulmonary disease (COPD) or asthma
5. **Lead:** Can cause neurological effects
   - Children; Can also affect kidney, immune, development, and reproductive systems
6. **Particulate matter**: Smaller than 10 micrometers. Can cause respiratory effects
   - People with asthma

Air pollutants are chemicals in the atmosphere whose concentrations are high enough to cause harm

Let's Practice

- In a small community in the highlands (elevation of 1,000 meters above sea level) of Ecuador, locals earned their living by manufacturing rugs. Rugs were made in indoor, closed rooms. The crowded rooms were heated by an open charcoal fire, provided approximately 5 cubic meters of air volume per person.

- Workers began to complain of stiffness in the shoulders, backache, fatigue, and dizziness. As the disease progressed, workers became short of breath on exertion and experienced tightness and pain below the breast bone, numbness in the arms and hands, and swelling of the face. The attacks of shortness of breath occurred mostly at night, whereas the episodes of pain and tightness around the heart, a condition known as angina pectoris, followed light work during the day.

The most likely contaminants causing the described symptoms was

Sulfur dioxide

Particulates

Carbon Monoxide

Carbon Dioxide

Start the presentation to see live content. Still no live content? In

What was the portal of entry?

Dermal

Transplacental

Oral

Respiratory /Inhalation

What is a solution to the problem posed in the scenario?

Larger, well-ventilated rooms

Providing a medical staff to monitor workers

Moving the industry to sea level

Changing the material used to make the rugs

Which term is used to characterize the social conditions of unequal distribution of environmental hazards?

Environmental equity

Environmental justice

Environmental pollution

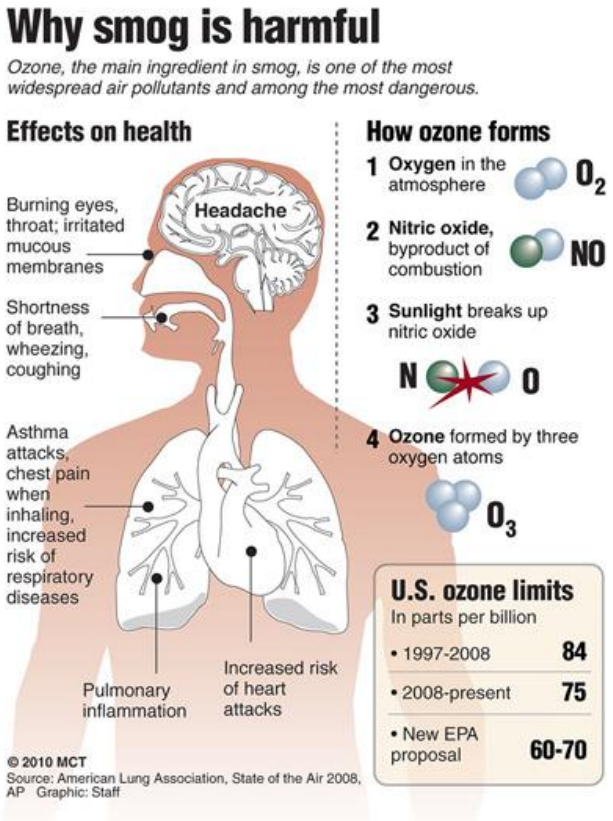
Environmental democracy

Ozone in the Work Place

- Ozone is found in the Earth's stratosphere
  - Absorbs most of the sun's ultraviolet (UVB) radiation.
  - Stratosphere contains high concentrations of ozone (O3) compared to other parts of the atmosphere
    - Still small in relation to other gases found in the stratosphere.
  - Atmospheric ozone can have a positive effect.
- Ground-level ozone is a principal component of smog.
  - Result of the chemical reactions between VOCs and nitrogen
  - Harmful to human health
  - Responsible for aging lung tissue, reducing resistance to colds, and breathing problems

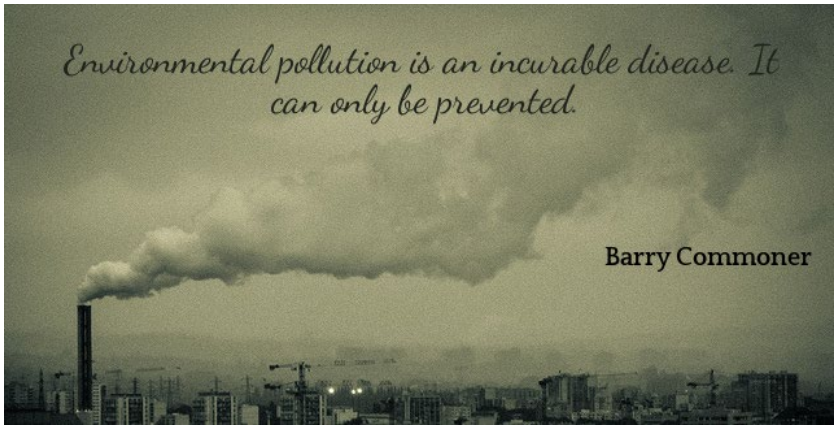
Ozone and the EPA

- EPA strengthened the guidelines
  - Reduced the NAAQS acceptable level of ground-level ozone to 70 parts per billion (ppb) or 0.07 parts per million (ppm)
    - 0.2 ppm for no more than 2 hours exposure
    - 0.1 ppm for 8 hours per day exposure doing light work
    - 0.08 ppm for 8 hours per day exposure doing moderate work
    - 0.05 ppm for 8 hours per day exposure doing heavy work



Climate Change

- Earths temperature increased by 1.5°F in the past 100 years
  - Affects weather patterns that change disease patterns
    - Warm winters and hot, wet summers
      - increase vector-borne diseases
        - Ex. increases in tick populations and Lyme disease
    - Increased rainfall and flooding
      - increase mosquito populations
    - Higher CO2 levels
      - increase pollen
        - Ex. increases to asthma rates

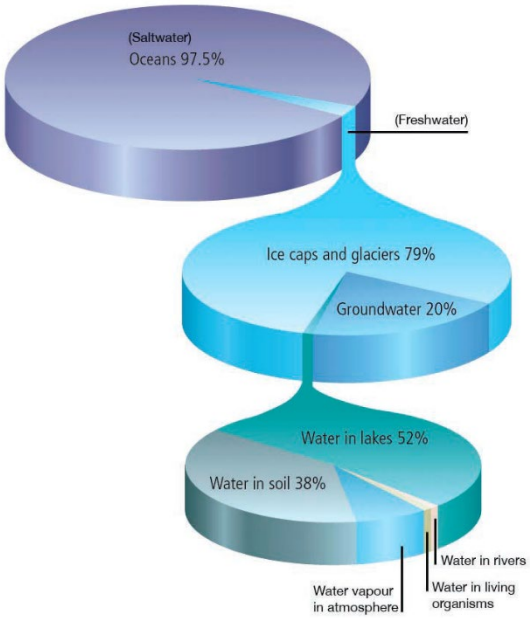


Greatest Driver of Climate Change

- Greenhouse gases
  - Created by humans
  - Largest driver of climate change

The primary greenhouse gases found in Earth's atmosphere include: carbon dioxide, methane, nitrous oxide, ozone, and water vapor.

Water



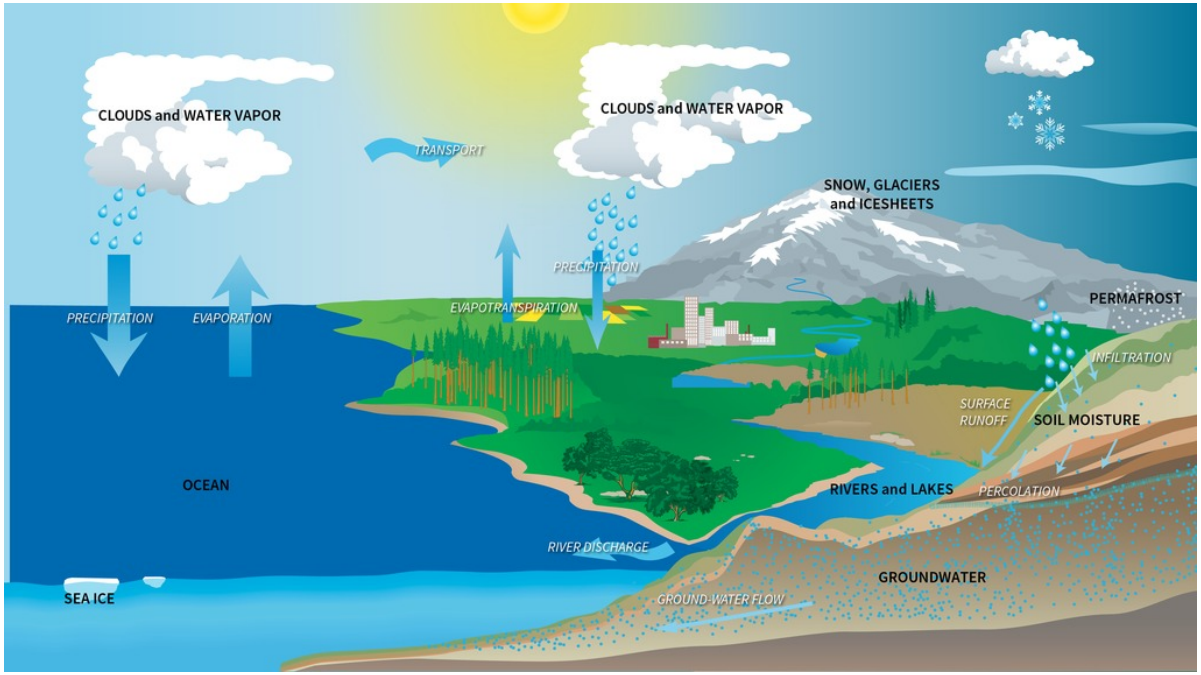


Photo: https://olc.worldbank.org/sites/default/files/sco/E7B1C4DE-C187-5EDB-3EF2-897802DEA3BF/Nasa/chapter1.html

When the accumulation of rain flows over roadways and grasses, it washes pollutants, into local bodies of water. How is the pollution classified?

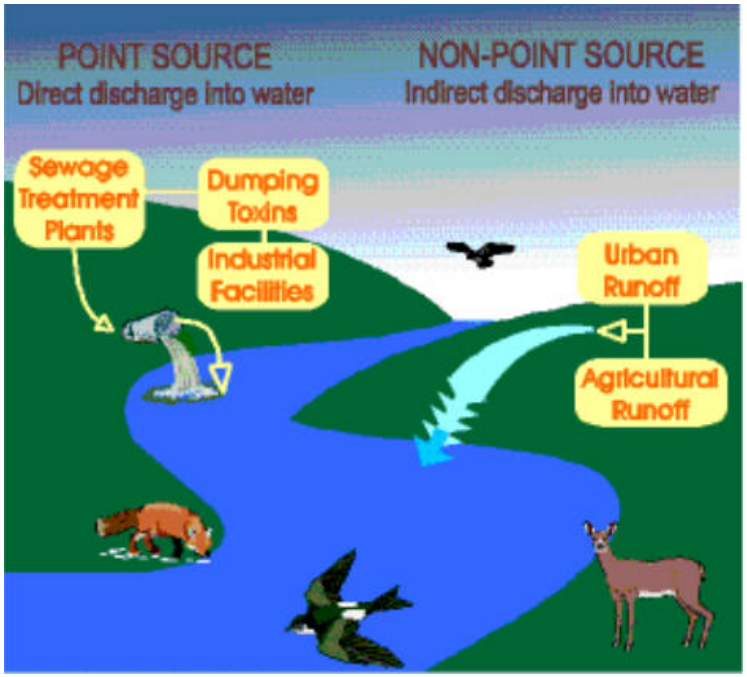
Organophosphate pollution

Chlorofluorocarbon pollution

Point source pollution

Non-point source pollution 

Water Quality



- Organophosphates
  - widely used in insecticides
- Chlorofluorocarbon
  - volatile organic compounds
- Point source pollution
  - Direct source
- Non-point source pollution
  - runoff

Photo:www.google.com/search?q=water+quality&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiAzM-Z97PeAhXNq1MKHZx6AecQ_AUIDygC&biw=1680&bih=948#imgrc=ti6shZ-eQGHEVM:

Drinking Water Standards

- Drinking water standards are regulated by the:

EPA

- Several pathogens are regulated by the EPA
  - Cryptosporidium
  - Giardia lamblia
  - Legionella
  - Enteric viruses

An outbreak of pneumonia has occurred at a resort and it is determined that Legionella is the organism that is responsible. To find the source of the bacteria, one of the highest priorities would be to check:

food handlers for infected cuts and sores

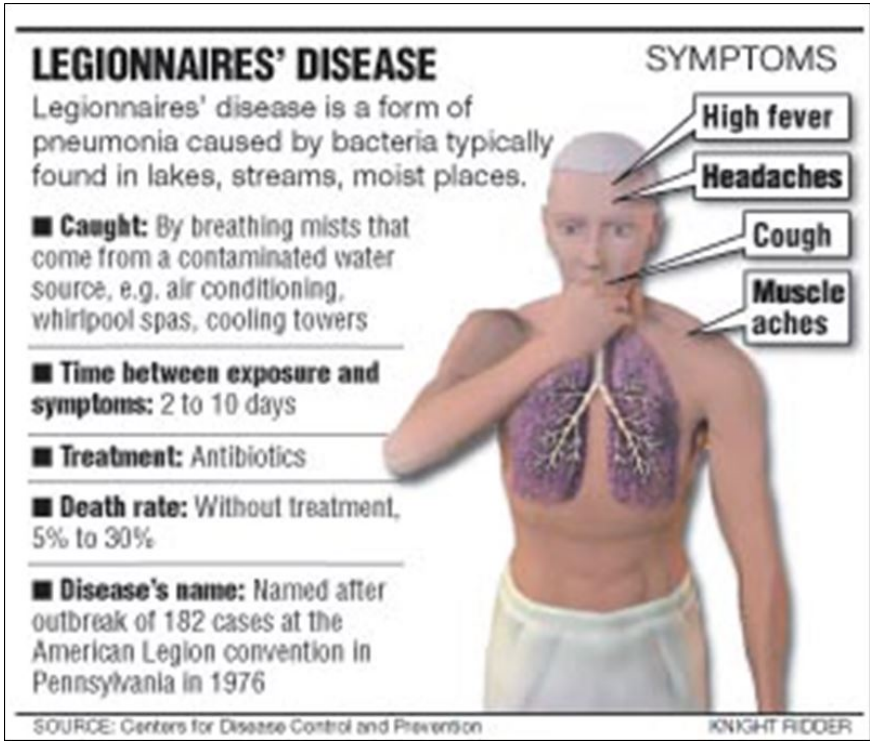
for dead animals on the property

resort water supply and storage

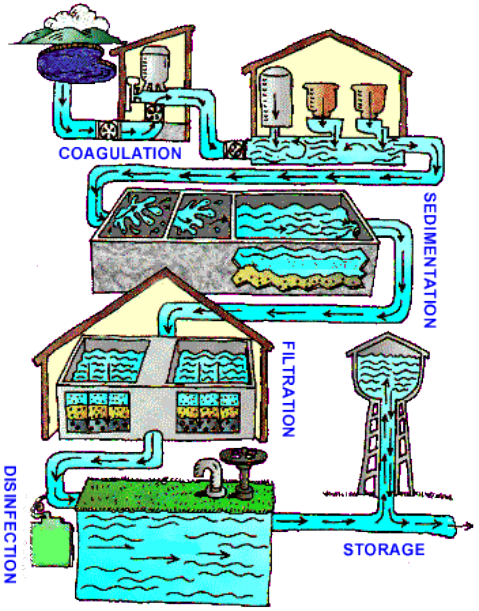
employees who have come to work with influenza

Legionella

- Legionellosis first discovered in 1976
  - 34 people attending the American Legion bicentennial conference in Philadelphia, USA died of a severe respiratory flu-like disease.
  - The bacterium responsible: Legionella pneumophila
  - Source: contaminated water that contained the bacteria
  - Approximately 8,000 to 18,000 individuals are hospitalized with Legionnaires' disease each year in the U.S.
- To prevent major outbreaks
  - Proper maintenance of water systems
    - drinking water systems, hot tubs, air conditioning lines, plumbing lines



Steps in Water Treatment



- The most common steps in water treatment used by community water systems (mainly surface water treatment) include:
  1. Coagulation and Flocculation: First steps in water treatment. Chemicals with a positive charge are added to the water
     - Neutralizes the negative charge of dirt and other dissolved particles in the water
     - Causes the particles bind with the chemicals and form larger particles, called floc.
  2. Sedimentation: Floc settles to the bottom of the water supply, due to its weight.
  3. Filtration: Once floc has settled, the clear water on top will pass through filters
     - Varying compositions (sand, gravel, and charcoal) and pore sizes
     - Remove dissolved particles, parasites, bacteria, viruses, and chemicals
  4. Disinfection: After filtration, a disinfectant is added
     - Chlorine or chloramine
     - Kills any remaining parasites, bacteria, and viruses
     - Protect the water from germs when it is piped to homes and businesses.

Public drinking water systems use various methods of water treatment to provide safe drinking

Safe drinking water is vital to public health. Which of the following should not be in potable water?

Chlorine

Disinfection residual

Radionuclides

Flourides

In low resource countries during an outbreak, what simple, low-tech sanitation measure can dramatically reduce the spread of enteric bacteria and viruses?

Disposing of stagnant water

Sleeping under an insecticide-soaked bed net

Vaccination of those individuals who work on the water supply

Add chlorine to water storage containers

Cryptosporidium can become a problem in municipal water supplies because it:

Bioaccumulates in fish

Can survive the chlorine treatment process

Can infect the lungs when water is vaporized, such as in a shower

Can bore directly through the skin

Food Safety

Danger Zone: 40˚F - 140˚F

- Foodborne Illness outbreaks
  - Tend to be detected on local or state level
- Health agencies are required to report all cases of foodborne illness to CDC
- Food and Drug Administration investigates outbreaks that involve FDA regulated products

If a food contaminated with a virus, such as hepatitis A, is left out for 4 hours in a kitchen at a temperature of 85 degrees Fahrenheit, the virus count in the food:

- increases exponentially
- increases exponentially
- depends on acidity of the food
- does not change

In some cases of food bourne illness, Hemolytic Uremic Syndrome is caused by which organism?

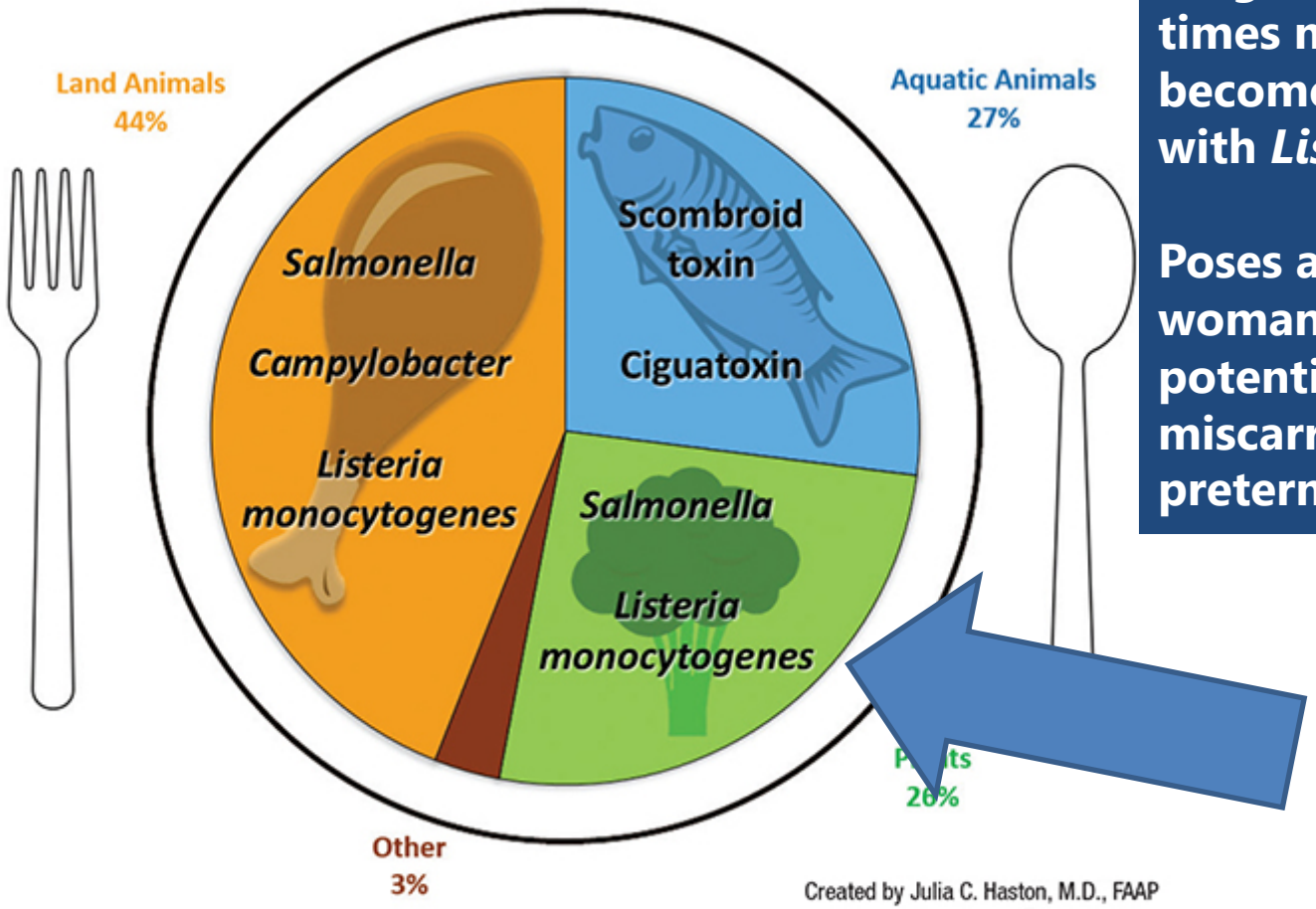
Listeria

E. coli strain 0157:H7

Cryptosporidium

Salmonella

Figure 1: Most common pathogens associated with foodborne disease outbreaks, by food category



Pregnant women are 10 times more likely to become infected with *Listeria*.

Poses a risk to both the woman and the fetus, potentially causing miscarriage, stillbirth or preterm labor,

Foods included in the above categories:
Land animals: dairy, chicken, beef, pork, turkey, eggs
Aquatic animals: fish, mollusks
Plants: vegetable row crops, fruits, seeded vegetables, grains and beans, sprouts, root and underground vegetables

Dewey-Mattia D, et al. *MMWR Surveill Summ.* 2018;67(No. SS-10):1–11, http://dx.doi.org/10.15585/mmwr.ss6710a1.

Hazard Analysis and Critical Control Points

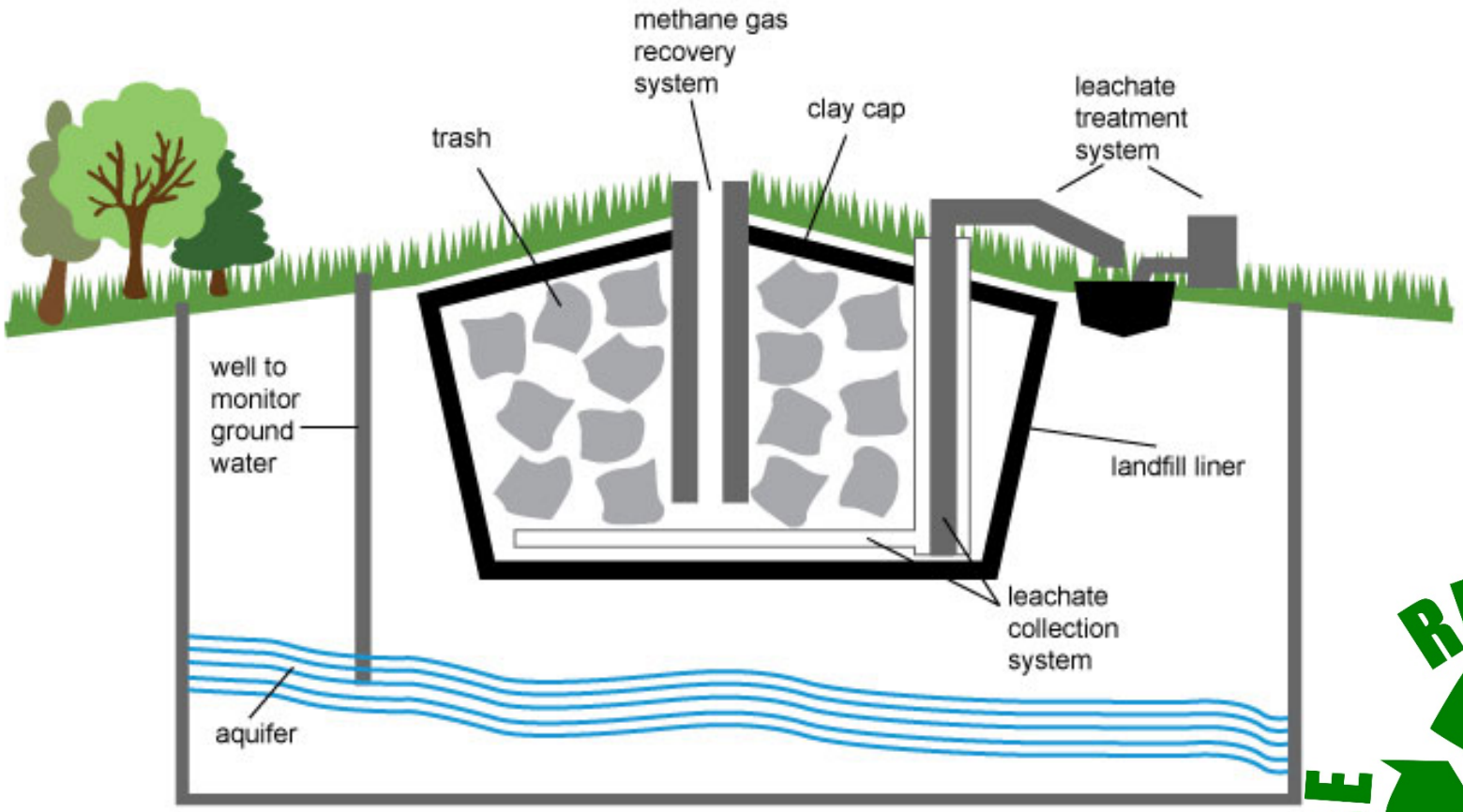
Hazard Analysis and Critical Control Points

Which of the following is the HA employed to:

- Detect bacterial contamination in food after it happens
- Identify potential problems that may cause foodborne illness
- Isolate and identify bacterial pathogens from a foodborne illness outbreak
- Set temperature limits for raw food

Solid Waste

Modern landfill



Source: Adapted from National Energy Education Development Project (public domain)

Hazardous Waste

- Potentially hazardous to human or environmental health when not disposed of properly
  - From home: pesticides, cleaning products, paint and auto products
  - Medical waste
  - Industrial hazardous waste (Chemicals, solvents and heavy metals)
  - Radioactive waste
  - Mining waste

Toxic Waste Site: The Love Canal

- Near Niagara Falls
  - Disposal of toxic chemicals in 1952
    - Halogenated organic compounds, chlorobenzenes, and dioxin
  - High rates of miscarriage, birth defects and cancer

Illustrated link between hazardous chemicals and human health

Superfund regulations

- Created and administered by the EPA
- Requires that responsible parties must assume liability for the cleanup of environmental hazards they cause.
- Superfund Sites
  - Any land contaminated by hazardous waste and identified by the EPA as a candidate for cleanup because it poses a risk to human health and/or the environment.
  - Sites are placed on the National Priorities List (NPL).

https://www.epa.gov/superfund/proposed-national-priorities-list-npl-sites-state

In the US, which is the largest source of radiation does to the general public?

Automobiles

Radon gas

Medical use of x-rays

Nuclear waste

Toxicology

- Toxicology:
  - The study of how chemicals cause injury to living cells
- Dose:
  - The amount of the chemical in the body
- Risk:
  - The probability that harm will occur

Risk = Toxicity x Exposure

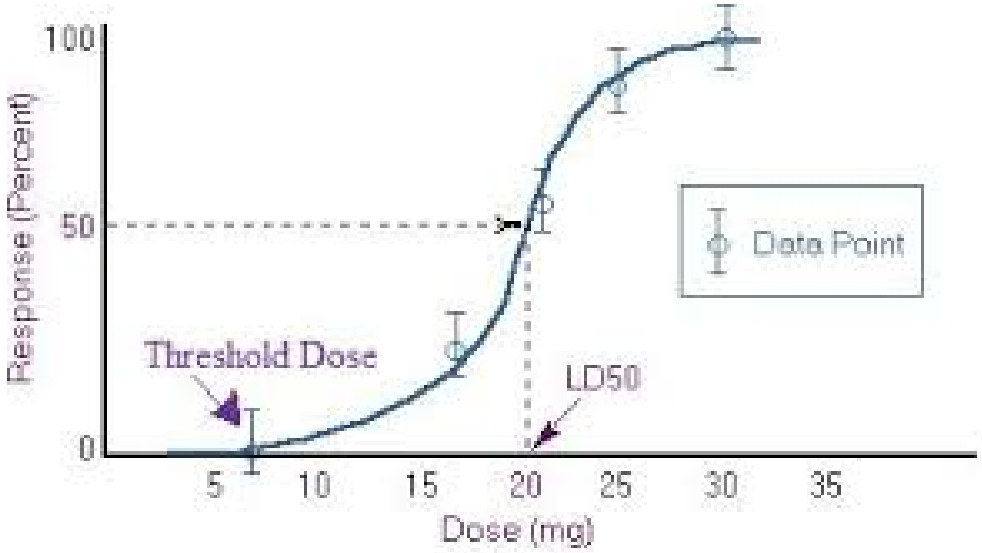
Dose Time Relationship

- Acute toxicity
  - The ability of a substance to do systemic damage as a result of a one time exposure.
    - Example: Hydrogen Sulfide exposure

- Chronic toxicity
  - The harmful systemic effects produced by long-term, low level exposure to chemicals.
    - Example: Asbestos exposure

Asbestos Photo Source: http://1.bp.blogspot.com/-hsVQmj5SsP0/TpVu1W_JCdI/AAAAAAAAACs/sC6H2ZJBzGM/w1200-h630-p-nu/Asbestosis+Mesothelioma.jpg

Dose – Response Curve



- Assumed
  - higher dose = greater effects
- Deleterious effects are expected after reaching a threshold amount
  - Exception: Carcinogen Rule
    - For Carcinogens, **there is no safe thresholds**
- Lethal Dose 50 (LD50)
  - The most common measure of acute toxicity
  - The dose level at which 50% of the test population will die
- LD0: There are no resultant deaths

The exposure standard for lead in children has been lowered over the years because even small amounts can result in:

- Childhood cancers, such as leukemia
- Impaired cognitive development
- Impaired formation of bone mineral
- Reduced rate of growth

Let's try a few questions….

Blood lead levels are a public health concern, specifically for children. Until 2012, children were identified as having a blood lead "level of concern" if test results were 10 or more micrograms of lead per deciliter of blood. CDC is no longer using the term "level of concern" and is instead using the reference value to identify children who have been exposed to lead and require case management.

Experts now use a reference level of 5 micrograms per deciliter to identify children with elevated blood lead levels. This new level is based on the US population of children aged 1 to 5 years who are in the highest 2.5% of children tested for lead in their blood. This reference value is based on the 97th percentile of the National Health and Nutrition Examination Survey's (NHANES's) blood lead distribution in children. The new lower value means more children will likely be identified as having lead exposure, allowing parents, doctors, public health officials, and communities to take action earlier to reduce the child's future exposure to lead.

Which of the following is this an example of?

How evidence-based biological claims can influence legislation enacted to protect the health of the public

How children remain the most vulnerable in our society

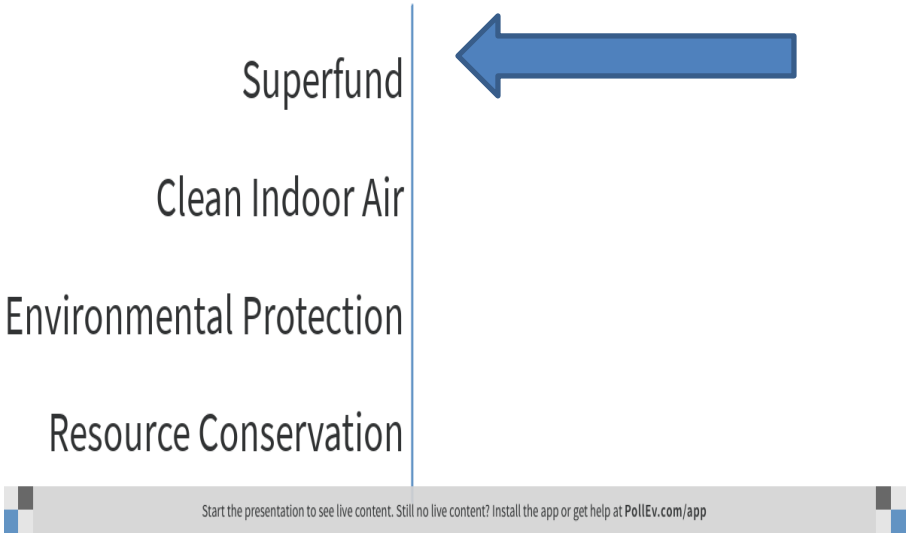
An overcautious approach

How political agendas can influence legislation

Laws and Policies

Policy	Purpose
Clean Air Act	Provided for the establishment of NAAQS by regulating six classes of air pollutants (lead was added later) or criteria air pollutants, regulated vehicle emissions, and established protocols for regulating other air pollutants (hazardous air pollutants).
Toxic Substances Control Act (TSCA)	Mandated manufacturers of chemicals to develop safety and health data on chemicals and mixtures and required the EPA to regulate substances and mixtures that may pose risk of injury to health or the environment.
Clean Water Act	Renamed in 1977 from the Federal Water Pollution Control Act. Established national standards for waterways and set limits on pollutant discharges.
Comprehensive Environmental Response Compensational and Liability Act (CERCLA)	Created with the intent of providing cleanup of existing inactive and abandoned hazardous waste sites through the creation of superfunds. Was strengthened by the Superfund Amendments and Reauthorization Act of 1986.
Federal Noise Control Act of 1972	Act to abate noise in the ambient environment and communities through investigation of sources, controlling noise pollution, and enacting policies.
Nuclear Waste Policy Act	Created in 1982 and delegated responsibility for high-level radioactive waste management to the federal government and designated the US Department of Energy as the agency to coordinate efforts to site, construct, and operate permanent repositories for nuclear waste products.
Federal Water Pollution Control Act in 1972	Original legislation that later was renamed the Clean Water Act of 1977. Established national standards for the nation's waterways and set limits on allowed pollutant discharges.
Safe Drinking Water Acts	Regulated the public drinking water systems. Allowed the EPA to set maximum contaminant levels for water pollutants in drinking water.
Comprehensive Air Quality Act of 1967	First attempt to develop a regional approach for the control of air pollution through the designation of Air Quality Control Regions. Retained oversight of air quality at the level of the states. The Clean Air Act of 1970 ultimately would move power from the level of the states to the level of the federal government, specifically the EPA.
Resource Conservation and Recovery Act	Similar to CERCLA but prevents hazardous waste problems at active sites. Identifies hazardous waste under the criteria of ignitability, corrosivity, reactivity, and toxicity, and tracks from generation, transportation, treatment, storage, and disposal in a cradle-to-grave system. It also mandated accurate record keeping of all these steps of hazardous waste management.
Community Right-to-Know Act	Required private and public facilities to report publicly their waste production for hazardous wastes.
Hazardous Materials Transportation Act	Provided guidance on the transportation of hazardous materials and placed authority within the Department of Transportation. States most abide by these federal regulations but can place more stringent provisions. It covers any materials that are capable of creating an unreasonable risk to health.

In 1980, the United States Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which is commonly called:



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The Clean Air Act directs the Environmental Protection Agency (EPA) to establish national _____ air quality standards?

pollution

ambient

urrounding

clean

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  - Trust your gut
  - Don’t over think!