ZOONOSES AND YOU

EDUCATION, CONTROL, AND PREVENTION

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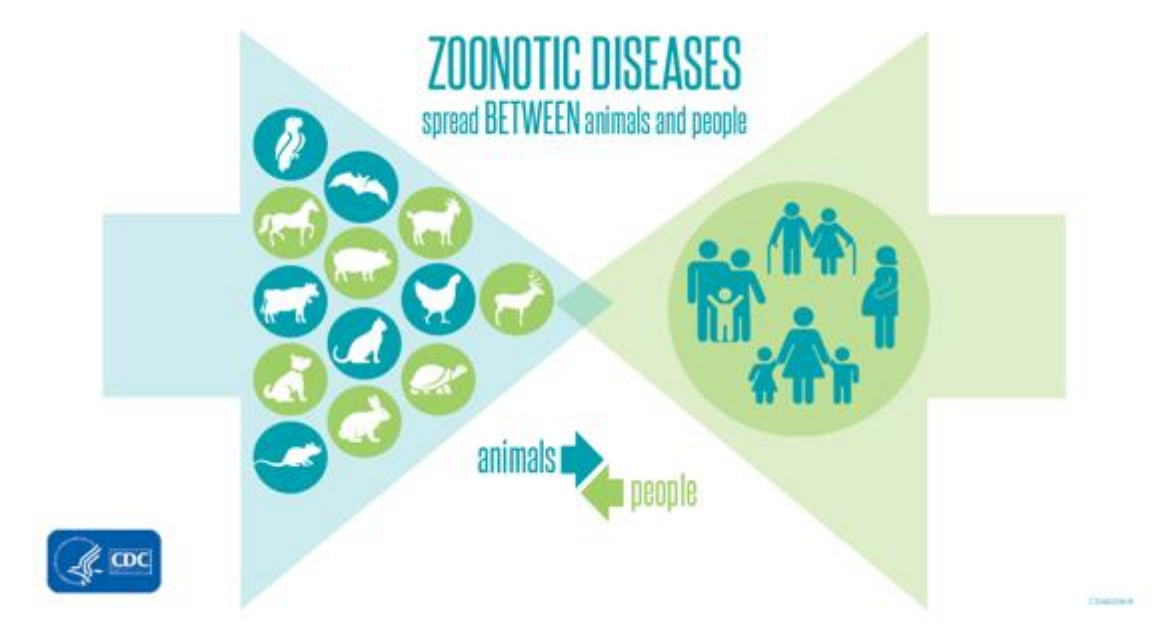
WHAT ARE ZOONOSES?

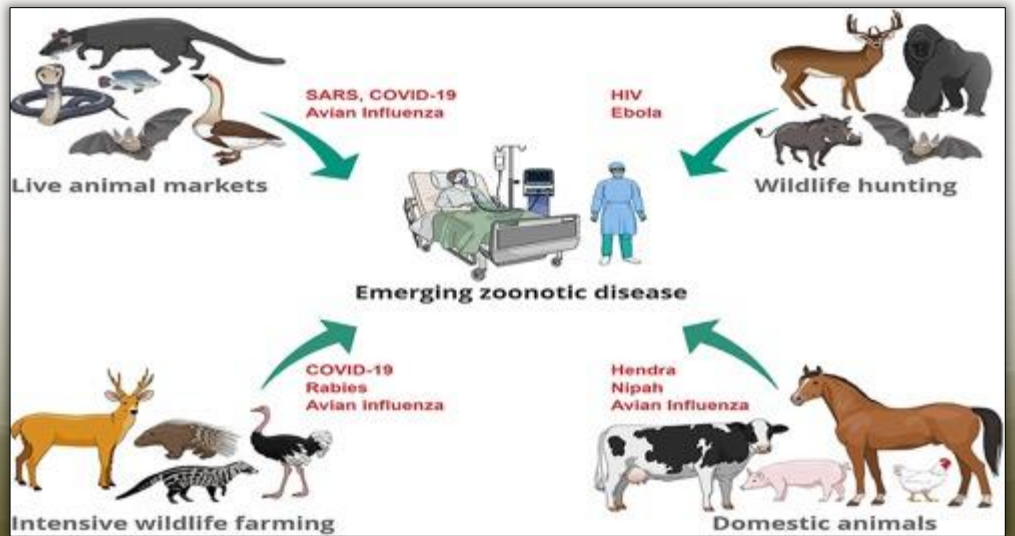
- Zoonoses (zoonotic diseases) – spread between animals and humans
- CDC – most emerging diseases are zoonotic or vector-borne(75%)
  - 6 out of 10 existing diseases are zoonotic



Drivers for emergence of Zoonotic disease

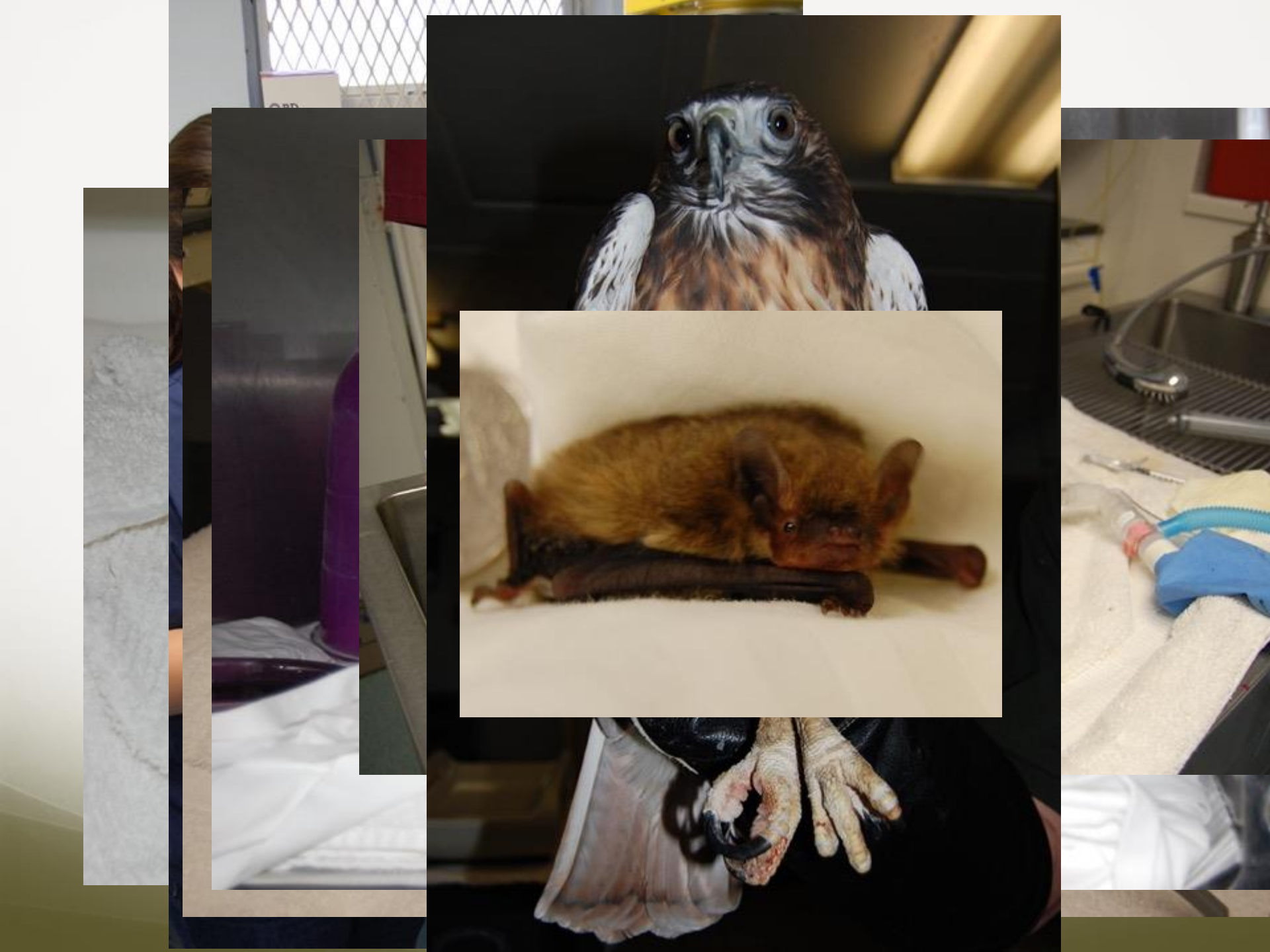
- Shared ecologies
- Socioeconomic development and altered ecosystems
- Wildlife trade
- Demands of human growth and urbanization on livestock trade
- Antibiotic Use

- INCREASED INTERFACE BETWEEN HUMANS AND ANIMALS



Source: Drivers of Emerging Zoonotic Infectious Diseases – Yamada, Kahn, et al

BECAUSE OF OUR CONTACT WITH WILDLIFE AS POSSIBLE DISEASE RESERVOIRS, WE NEED TO BE INFORMED ABOUT POTENTIAL DISEASE SITUATIONS – FOR OUR OWN SAFETY AND FOR GENERAL PUBLIC SAFETY



ELEMENTS OF TRANSMISSION

- DISEASES REQUIRE SEVERAL ELEMENTS TO BE SATISFIED FOR TRANSMISSION
  - Source
  - Host susceptibility
  - Route of transmission

- SPREAD OF ZOONOSES IS MITIGATED BY UNDERSTANDING AND CONTROLLING THESE ELEMENTS

SOURCE OF INFECTION

- Animal sources
- Environmental sources
- Vector-borne
- Food-borne
- Water-borne

SOURCE OF INFECTION

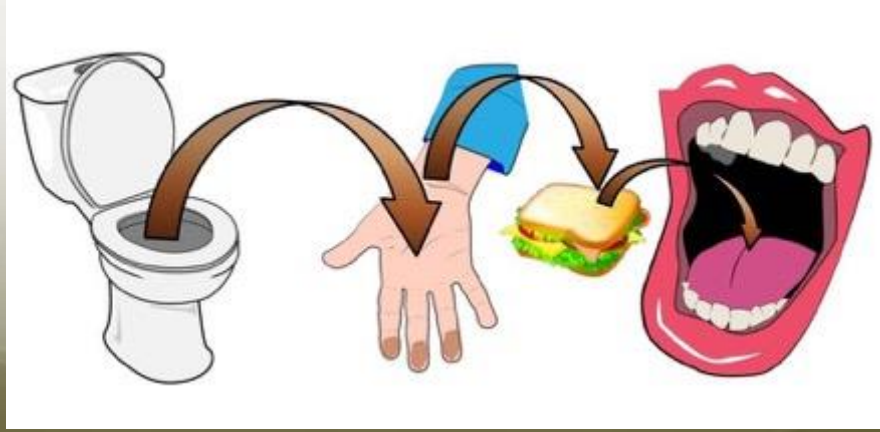
- Animal sources
  - Clinically ill animals
  - Subclinical carriers
  - Healthy animals that harbor micro-organisms that are harmful to humans
- Environmental sources
  - Fomites – inanimate objects that can transmit disease
  - Includes contaminated walls, floors, exam table, carriers, bedding, bio-medical waste, etc.
- Vector-borne
  - Bites from ticks, fleas, mosquitoes, etc.
  - Rodents and other pests
- Food and water-borne
  - May be affected by animal ”input”

HOST SUSCEPTIBILITY

- Age
  - Children and seniors most susceptible
- Pregnancy
  - Cell-mediated immunity is suppressed
  - Transmission can occur to fetuses
- Immunocompromise
  - People on chemotherapy
  - Some people with HIV
  - Organ transplant patients on immuno-suppressive drugs
- Close contact with animals

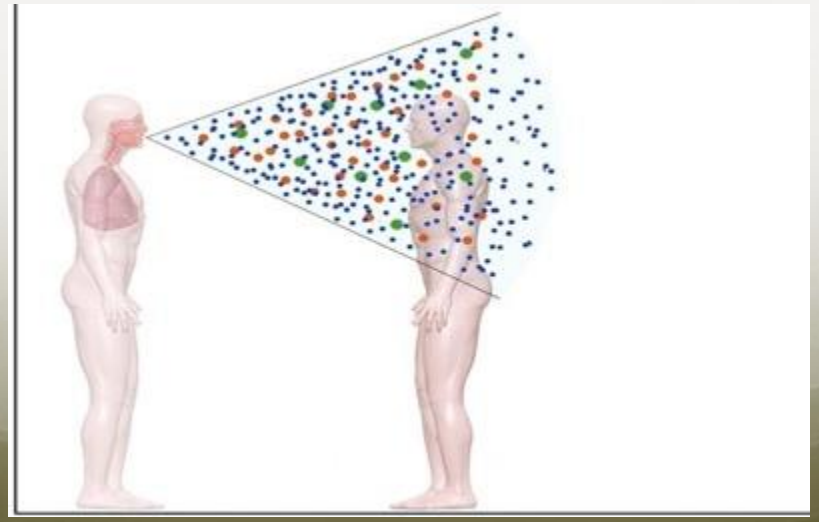
ROUTES OF TRANSMISSION

- Contact
  - Fecal-oral route – direct animal handling or fomites
    - Usually hand-to-mouth
  - Mucous membrane, cutaneous, or percutaneous route
    - Transmission from cuts on hands, splashing of infectious material onto mucous membranes, or occasionally from direct contact on intact skin



ROUTES OF TRANSMISSION

- Aerosol
  - Pathogens travel through air
  - Large droplets may become deposited on mucous membranes – produced by coughing, sneezing, vocalizing, lancing abscesses
  - Smaller particles produced through sweeping, vacuuming, high-pressure spraying



ROUTES OF TRANSMISSION

- Vectors/ Reservoirs
  - Vectors – an animal, usually an insect, that transmits disease between animals or from animals to humans
  - Reservoirs – an animal species or environmental location where a zoonotic disease naturally resides

Ex: West Nile Virus

PREVENTION OF ZOONOSES

- **Frequent and proper hand-washing**
  - Hand hygiene is the SINGLE most important preventative measure
  - Mechanically removes organic material
  - Reduces the number of organisms on the skin
  - Anti-microbial soap kills or inhibits growth of bacteria
  - Liquid or foam soap reduces chances for cross-contamination
  - Moisturizing soap prevents cracking that disrupts skin barrier

PREVENTION OF ZOONOSES

- Recommended hand-washing technique:
  - Wet hands thoroughly w/ running water
  - Dispense soap into palms
  - Rub and scrub hands together for 20 seconds
  - Rinse soap off
  - Dry hands with disposable towel
  - Turn off faucet with disposable towel

Wet hands with water

PREVENTION OF ZOONOSES

- Alcohol-based rubs
  - Can be convenient especially when there is not running water
  - Not effective when organic waste is present or there is visible soiling
  - Place alcohol-based rub in palms
  - Apply to all surfaces of hands
  - Rub until dry

PROTECTIVE CLOTHING

Varying levels – depends on route of contamination, level of risk

- Gloves and sleeves
- Facial and respiratory tract protection
- Protective outerwear

PROTECTIVE CLOTHING

- Gloves and sleeves
  - Provide barrier protection
  - Protects against contamination of blood, feces, vomit, exudates, other bodily fluids
  - Wear when doing necropsies, any wound treatment, or handling lab samples
  - When cleaning cages, handling contaminated equipment, or handling dirty laundry
  - Heavy gloves protect against bites

PROTECTIVE CLOTHING

- Gloves and sleeves
  - Change gloves in-between patients or groups of patients, between dirty and clean procedures, and if gloves become damaged
  - When removing gloves avoid hand contact w/ contaminated surface
  - Wash hands after removing gloves

PROTECTIVE CLOTHING

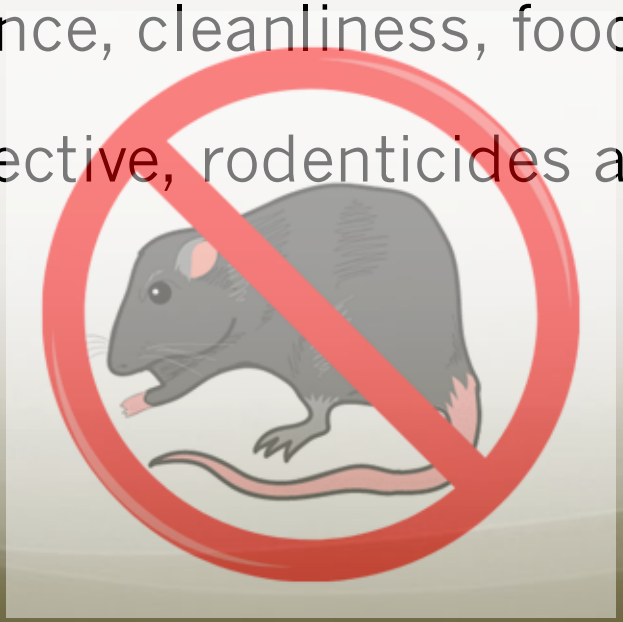
- Facial and respiratory tract protection
  - Facial protection protects mucous membranes from contact with splashing or spraying
  - May use during lancing of abscesses, flushing wounds, necropsies
  - Includes face shields or goggles
  - Particulate respirators – for some aerosolized particles

PROTECTIVE CLOTHING

- Protective outerwear
  - Use when there is a possibility of gross contamination of clothes
  - Includes coveralls, lab coats, and gowns
  - Gowns should always be worn with gloves and should be removed before the gloves
  - Protective outerwear should not be worn outside the infective environment

VECTOR EXPOSURE

- Reducing exposure to disease vectors decreases chances of infection
  - Vectors include fleas, ticks, mosquitoes, biting flies, rodents
- Make hospital area unattractive to rodents by blocking entrance, cleanliness, food pick-up
- Snap traps effective, rodenticides are problematic



VECTOR EXPOSURE

- Make grounds inhospitable to breeding mosquitos by reducing standing water
- Avoid working at times or in areas with large mosquito load
- Use flea, tick, mite preventatives on patients
- Use insect repellent when appropriate, wear protective clothing

CONTACT WITH ANIMALS

- Handle animals only when necessary
  - Do multiple tasks at once to reduce handling sessions
- Use appropriate restraint or sedation
- Observe animals prior to handling
- Wear appropriate protective gear when handling
- Vaccinate at-risk employees for rabies

APPROPRIATE CLEANING

- Dispose of wastes appropriately
- Recognize a dirty cage as a cage with possible fomites
- Use soapy water to remove organic wastes
- When able use **15 minute contact time** for disinfection
- Pay special attention to high-contact surfaces – cage handles, door knobs, faucet handles, sinks

APPROPRIATE CLEANING

- Spray surfaces lightly with water before scrubbing
  - Minimizes aerosolization
- Wear facial protection when using high-pressure washers
- Immediately contain spills with absorbent material

APPROPRIATE CLEANING

- Dispose of extremely soiled laundry
- Dry laundry complete!
- Use gloves when handling medical samples or waste
- Use safe recapping and needle removal techniques

KNOW RISK

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- Warn eling enclo
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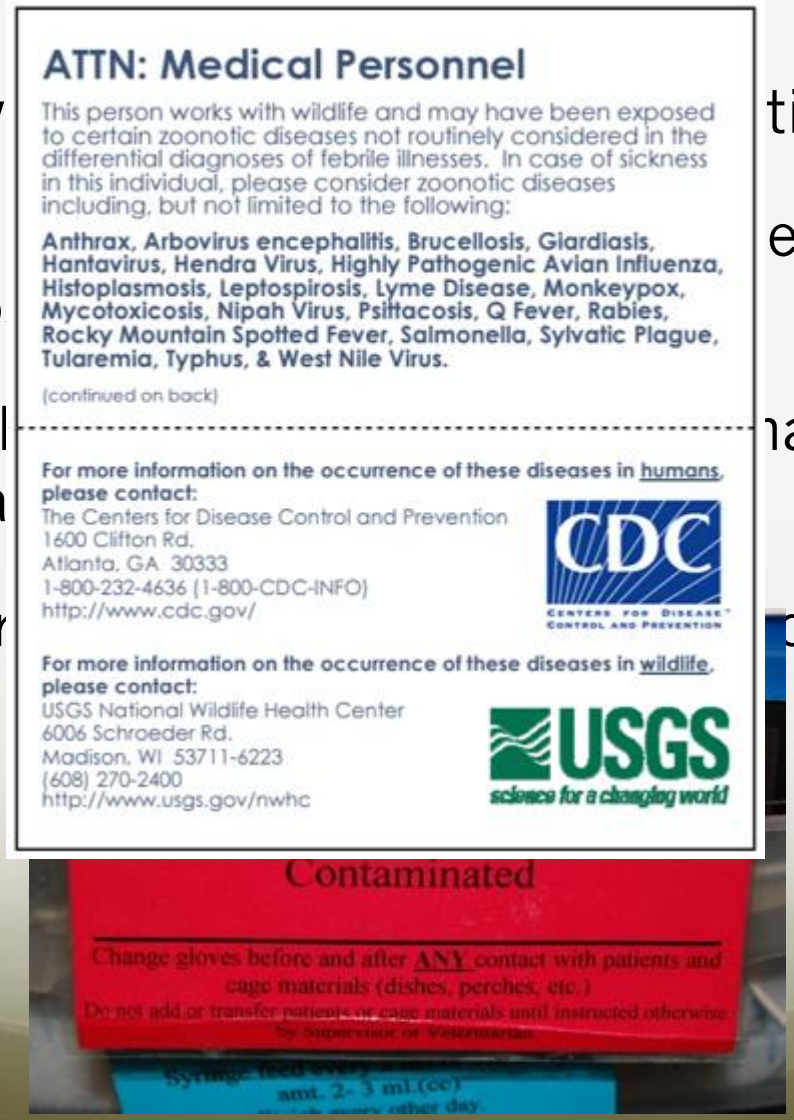
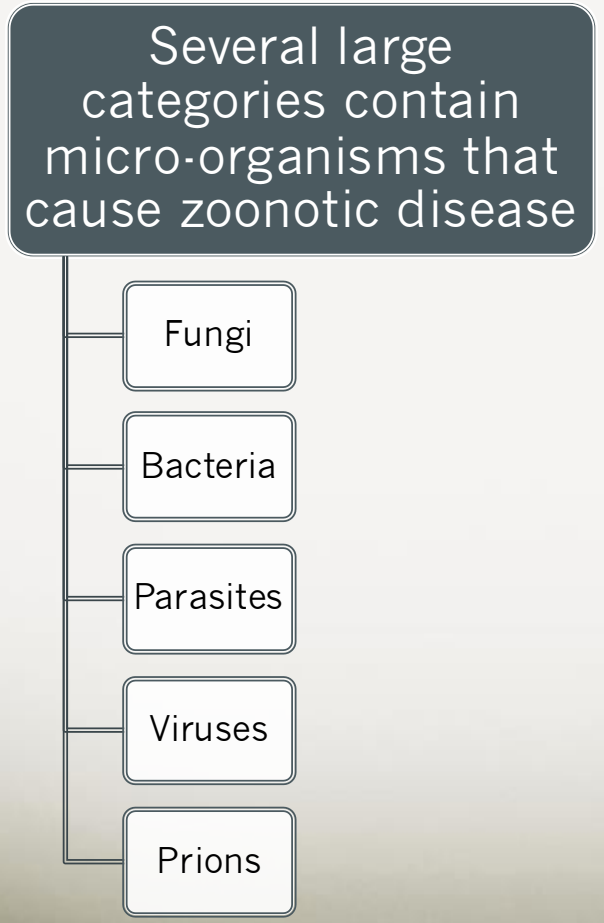
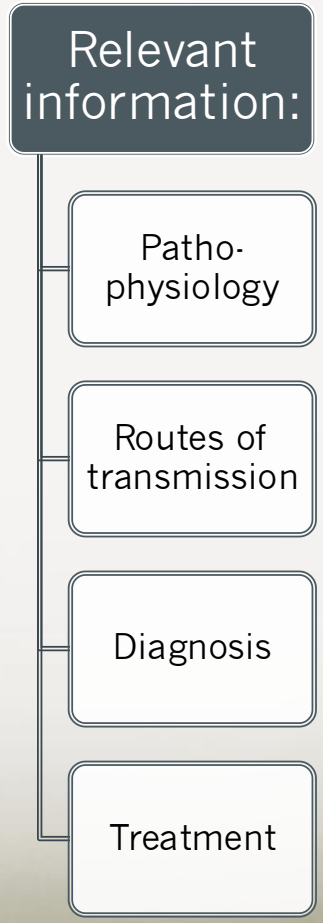
- Repor diately



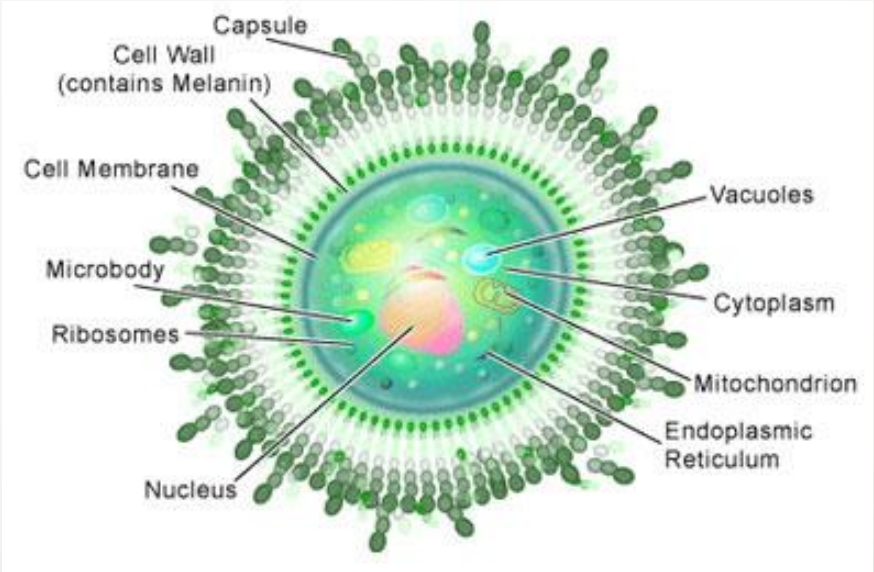
Zoonotic Diseases





CRYPTOCOCCUS

- *Cryptococcus neoformans* – opportunistic fungal infection
- Found in old pigeon droppings
- Polysaccharide capsule makes fungus resistant to body's defenses
- Can remain viable in droppings for up to 2 years
- Human infection - associated with immune suppression

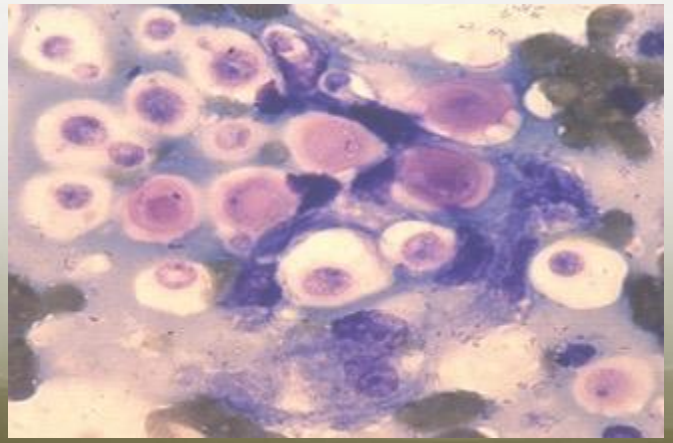


CRYPTOCOCCUS

- Enters the body through inhalation of yeast spores
- Rare - lung nodules and masses and pneumonia in immunocompetent people
- Can cause meningitis or disseminated disease in compromised humans
- 80-90% of disease occurs in AIDS patients

CRYPTOCOCCUS

- Know your risk!
- Keep bird droppings from accumulating
- Particulate respirators for cleaning pigeon droppings
- Treatment – long-term, systemic anti-fungals
  - Debridement of lesions

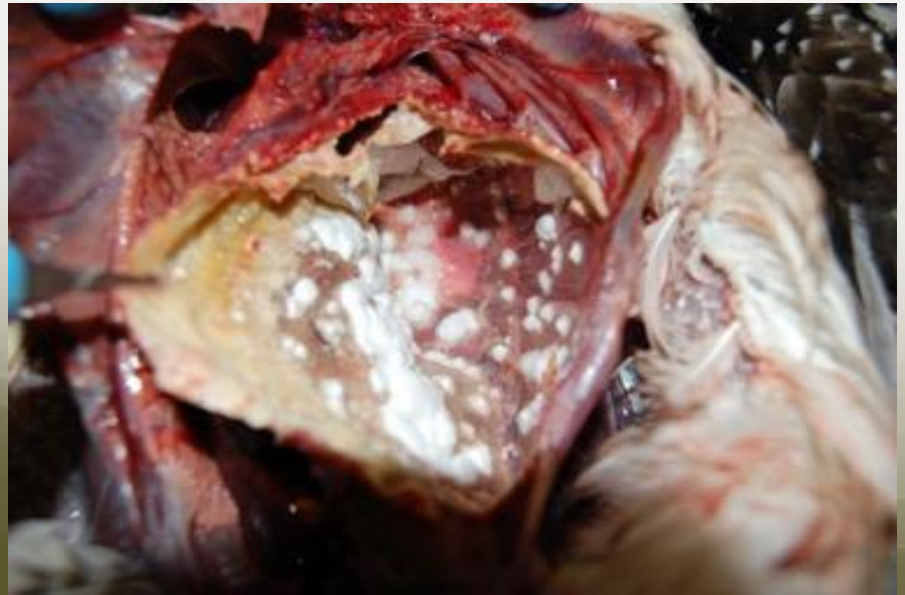


ASPERGILLUS

- *Aspergillus fumigatus* – opportunistic fungal pathogen
  - Ubiquitous
- Normally innocuous when inhaled
- Rarely – allergic bronchitis
- W/out inhibition by immune system can flourish
- In immunocompromised animals (esp birds) = severe disseminated disease
- Humans - cancer patients, transplant patients, and AIDS patients
- Systems affected: respiratory, brain, skin, kidneys, and eyes
- Diagnosis and treatment are difficult

ASPERGILLUS

- For vets/ wildlife workers - exposure most likely to occur during necropsy
- Respirators should be worn, spray disinfectant to wet down fungus and keep spores down



ENTERIC BACTERIA

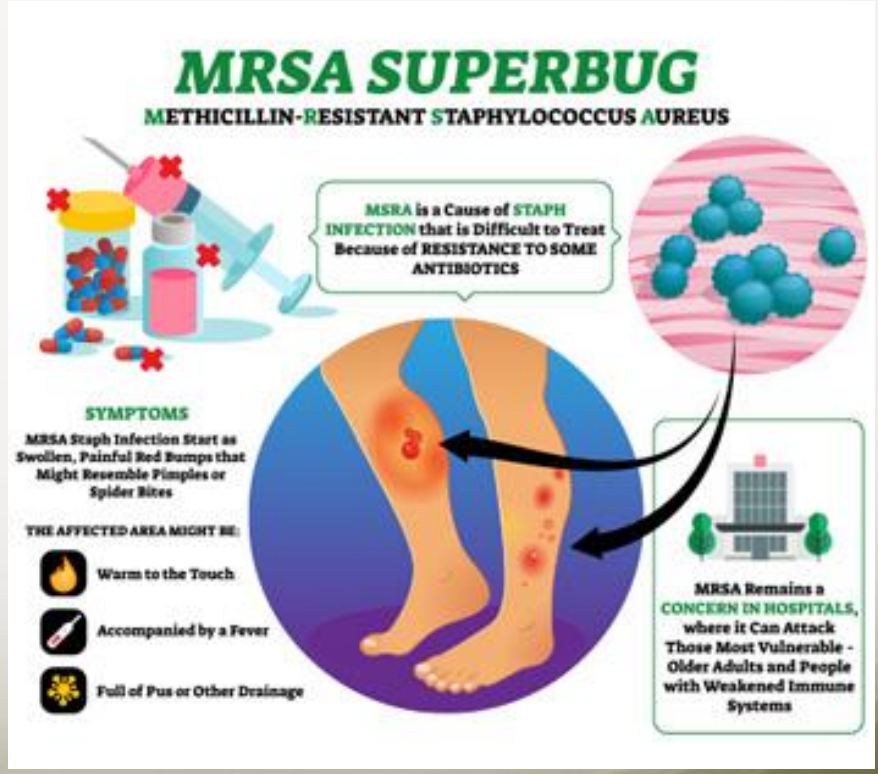
- Common culprits: Salmonella, Shigella, Campylobacter, E.coli
- Most common avian pathogens: *Salmonella* spp, *Campylobacter*
- *Salmonella* common in many avian species
- Outbreaks are common in backyard poultry
- Urbanized wild birds found to harbor higher numbers of pathogenic Salmonella
- High prevalence of *Campylobacter* in wild birds foraging near livestock
- Transmission: fecal-oral, food-borne
- Wildlife can contaminate fruits and vegetables, eggs are commonly contaminated

ENTERIC BACTERIA

- Symptoms: Diarrhea, abdominal cramps, fever
- Severe cases can cause severe dehydration, sepsis, organ damage, death
- Most severe in young, old, immuno-compromised humans
- Prevention = Hygiene! Fecal-oral transmission
- REPORTABLE – (some)

MRSA

- Methicillin-resistant *Staph. Aureus*
- *Staph. aureus* is normally present on human skin
- Antibiotic use = MDR
- MRSA is able to affect people w/ a normal immune system
  - Through apparently minor wounds
- Causes severe, potentially life-threatening infection

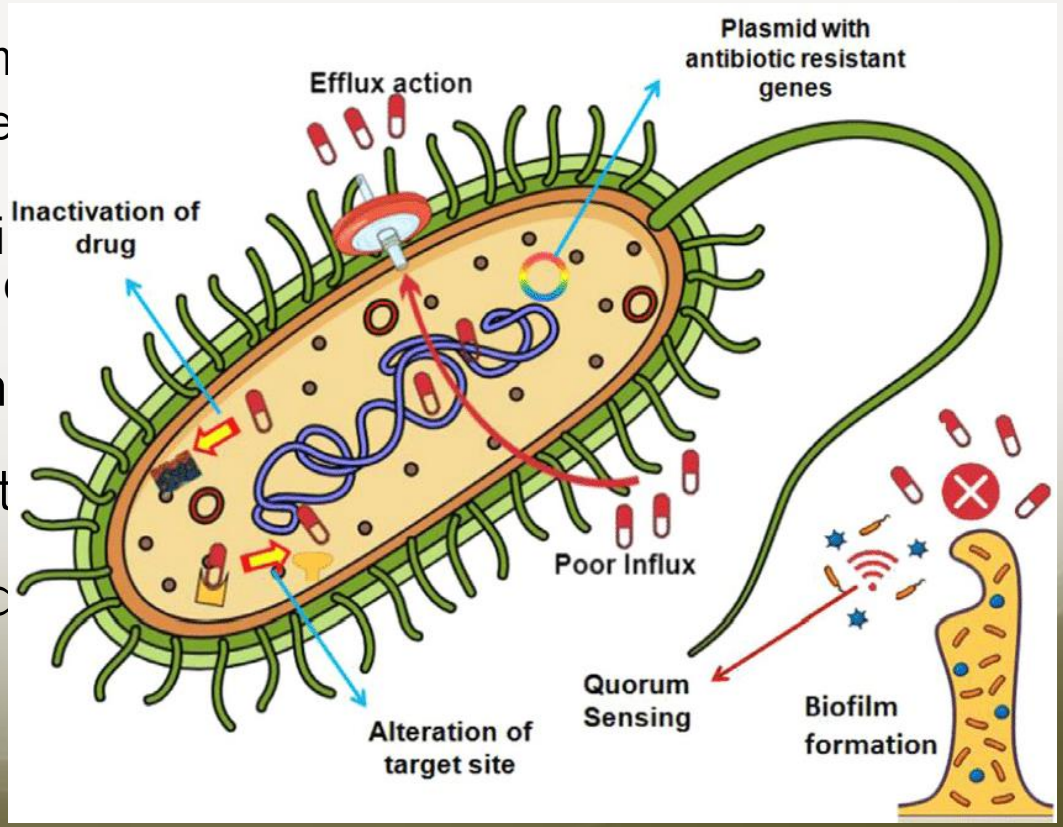


MRSA

- Can be passed between humans and animals
- Prevention – hygiene!
- Wash and disinfect hands often
- Wear gloves and protect any open wounds
- See a doctor if any wound becomes red, develops pus, or you develop a fever
- REPORTABLE!

MDR Organisms

- Evolved through antibiotic overuse
- Adaptations include:
  1. Antibiotic inactivation – proteins that inactivate or degraded the antibiotic
  2. Multidrug efflux pum
  3. Modification of targe antibiotics act upon
  4. Structural modificati bacterial to withstan
- Huge emerging issue in
- Often an issue in hospit
- Good antibiotic stewarc



CHLAMYDIOSIS

- *Chlamydiaceae* spp. – small intra-cellular bacteria
- Disease is known as parrot fever, psittacosis, ornithosis, chlamydiosis
- Humans are most often infected through psittacines and poultry
- Infected birds can show a variety of signs or be clinically normal carriers
  - Respiratory or GI signs
    - Conjunctivitis, ocular/ nasal discharge, dyspnea, lethargy, green stools, diarrhea

CHLAMYDIOSIS

- Most common - *Chlamydia psittaci,* however many more recognized
- Chlamydiosis in raptors: can be infected by *C. psittaci*, but *C. buteonis* recently recognized in raptors
- One study showed ~ 4% prevalence in raptors presented to wildlife centers
- Zoonotic potential unknown but suspected

CHLAMYDIOSIS

- Aerosol transmission – directly from birds, through aerosolization of dried feces
- Fecal-oral route – can persist in dried feces for months
- Disease in humans usually causes mild, flu-like symptoms
  - In old, young, or immune-deficient humans leads to pneumonia
  - Left untreated, can spread to brain, liver, heart valves
  - Treatment with antibiotics usually successful
- Prevention includes screening of suspect birds, appropriate sanitation
- REPORTABLE!

SARCOPTIC MANGE

- Causative agent – *Sarcoptes scabei,* a mange mite
  - Mites burrow into skin, causing itching and secondary skin infection
- Can be passed to humans from a variety of susceptible mammals
- Signs include itching, redness, scabbing, characteristic smell
- May lead to weight loss, general illness

SARCOPTIC MANGE

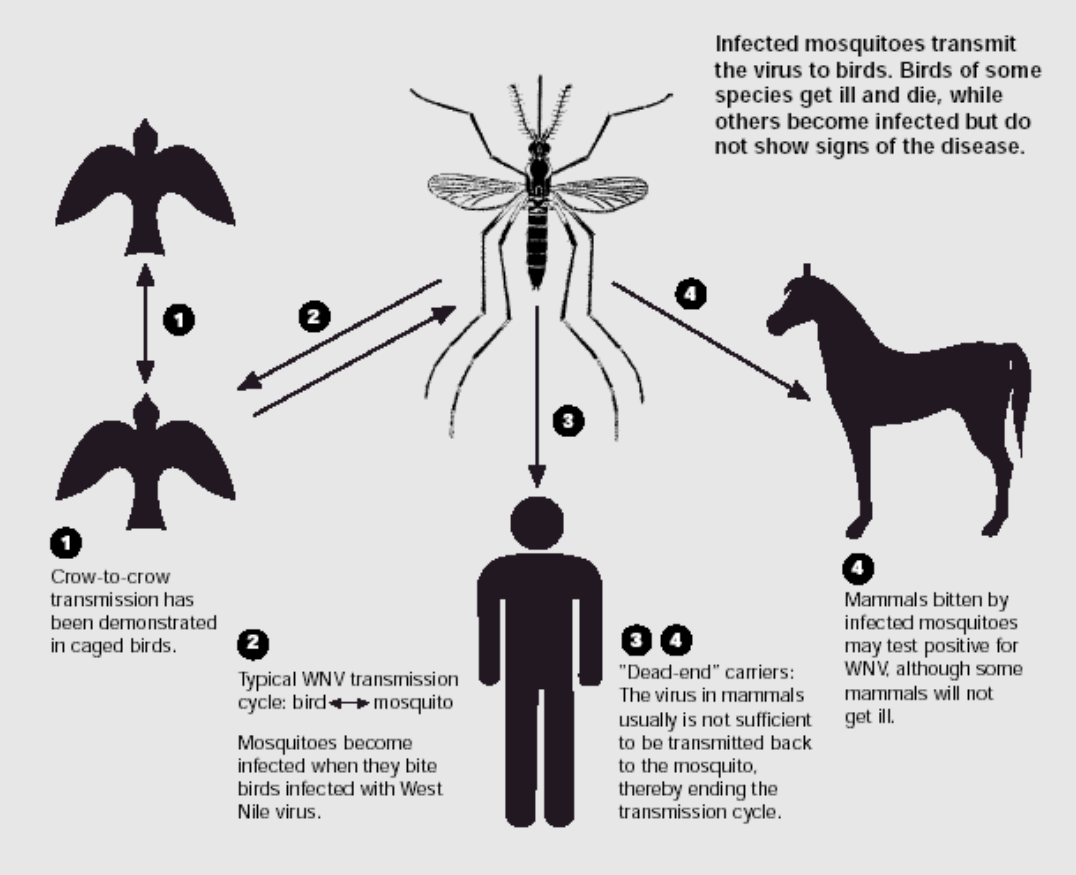
- Humans develop red bumps, itchiness
- Diagnosis – skin scrapes, response to tx
- Treatment consists of topical or systemic miticides
  - Isooxazolines have proven very effective
- Environment needs to be disinfected
- Prevention – isolation of infected animals, using protective clothing when handling

WEST NILE VIRUS

- Caused by a flavivirus
- Various bird species usually serve as reservoirs
- Transmission mainly through mosquitoes – virus completes life-cycle in mosquitoes
- Virus transmitted to human through mosquito bite

WEST NILE VIRUS

- Prevention: Avoid mosquito bites – wear protective clothing, repellant



WEST NILE VIRUS

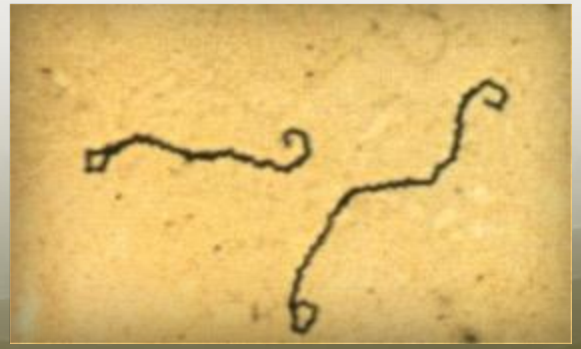
- 80% of infected humans have no symptoms
  - About 20% develop West Nile Fever, w/ fever, aches, fatigue, occasionally skin rash and swollen lymph nodes
  - Less than 1% develop severe encephalitis
- Young, old, immuno-compromised humans most likely to develop severe disease
- Other important flaviviruses include: Yellow fever, Dengue, Japanese encephalitis, Zika virus

LEPTOSPIROSIS

- Causative agent – *Leptospira* various species and serova - bacteria
- Various species carry specific serovars that are not harmful to them
- Carriers include raccoons, rodents, cows, foxes, dogs
- Bacteria persist in kidney tubules, transmitted through urine or contaminated soil or water
- Can enter orally, through mucous membranes, or through damaged or intact skin

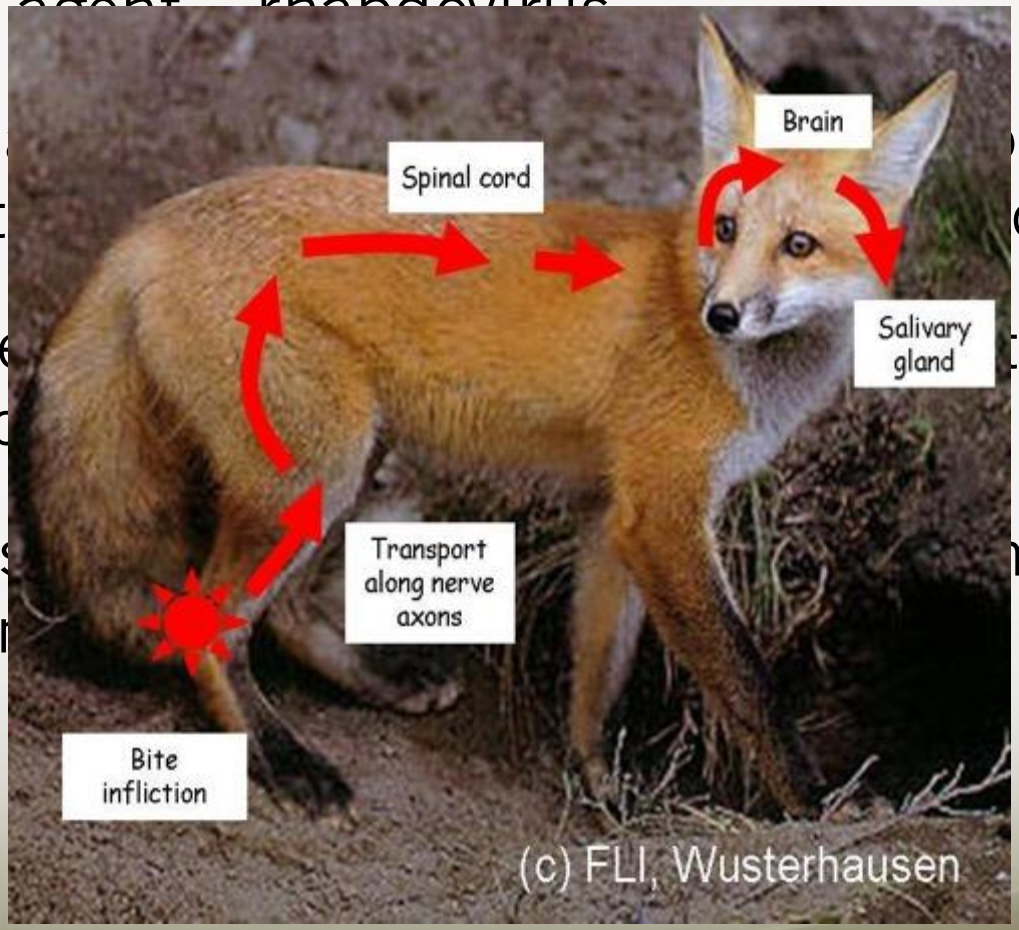
LEPTOSPIROSIS

- Human infection begins with flu-like symptoms
- Can progress to kidney or liver failure, meningitis, or pulmonary disease
- Treatment w/ appropriate antibiotics usually successful
- Prevention – appropriate sanitation and hygiene, identifying suspect animals
- REPORTABLE! In NC



RABIES

- Causative agent – rhabdovirus
- Virus has a [illegible] while it travels t[illegible] cates
- Transmitte[illegible] te although c[illegible]
- Symptoms[illegible] ness, aggressio[illegible]



RABIES

- 100% fatal except for 5 human cases – 4 involved pre-or post-exposure injections
- Most likely any warm-blooded mammal or marsupial can be infected
- High-risk species include raccoons, foxes, bats, skunks, feral cats
- Low-risk species include squirrels and other rodents, rabbits, domestic dogs, opossums

RABIES

- Diagnosis in animals – post-mortem examination of brain
- Post-exposure vaccines are effective only before symptoms begin
- Prevention – recognition of risk, vaccination of employees at risk, prompt reporting of bites, testing of suspect animals
- REPORTABLE!

AVIAN INFLUENZA

- Caused by Type A influenza viruses
- Two broad pathotypes: Low-path (LP) and High-path (HP)
  - LP causes mild or now illness in most birds and is not zoonotic
- Significant serotypes are H5 and H7
  - LP H5 and H7 have the potential to mutate to HP
- Wild aquatic birds are a natural reservoir for all AIV
- HPAI can have close to 100% mortality rates in domestic birds (chickens, ducks, turkeys), as well as in raptors

AVIAN INFLUENZA

- HPAI H5 … disease in humans
  - Huma … by contact with infecte
  - HPAI H … rson to person
- It is reco … ntact w/ poultry
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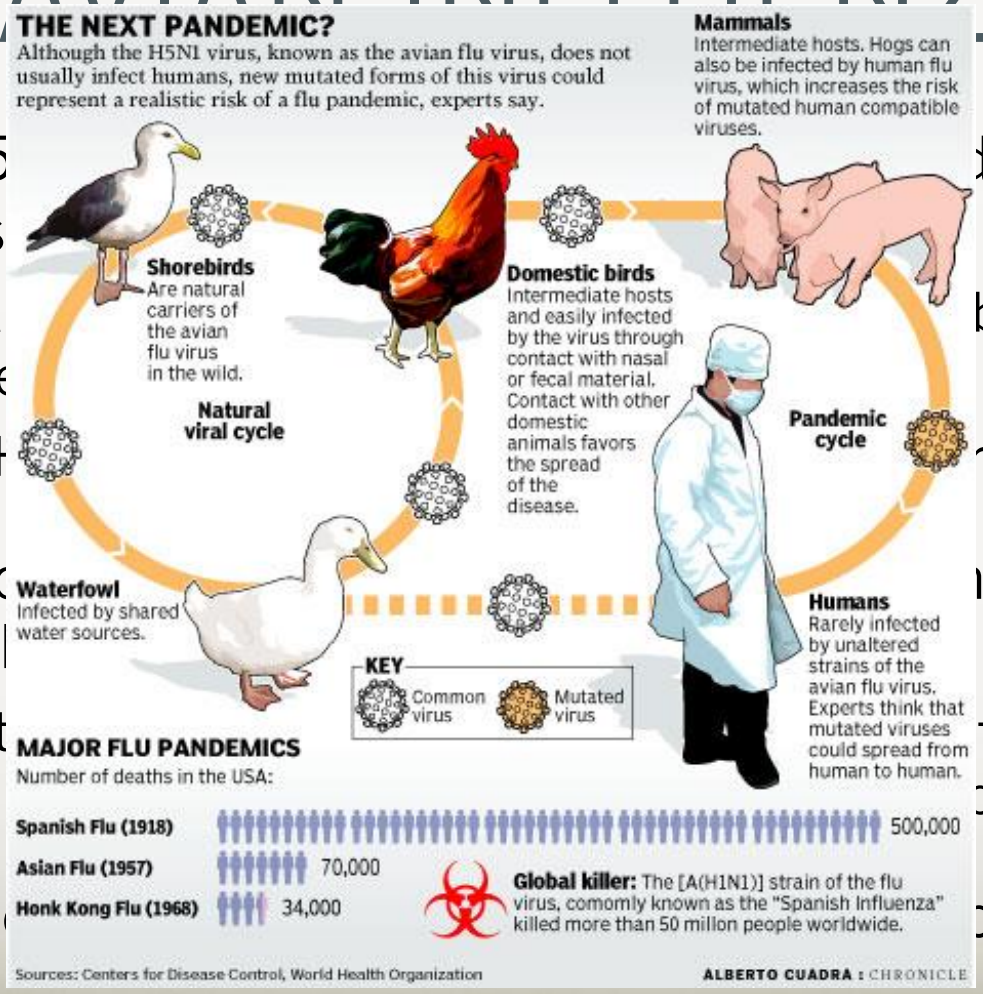

Highly Pathogenic Avian Influenza (HPAI)

- History – first noted in US in 2015 – self-limiting
- Traveled through migratory fly-ways
- Early 2022 – detected in SC and NC
- Rapidly spread – currently detected throughout NA, into central and SA, Asia and Europe

Highly Pathogenic Avian Influenza (HPAI)

- Clinical signs:
  - Waterfowl often subclinical carriers
  - Sudden death
  - Purple discoloration/ swelling
  - Upper respiratory signs
  - Neurological signs – lack of coordination, seizures, circling, tremoring
  - Diarrhea

Highly Pathogenic Avian Influenza (HPAI)

- HPAI- serious threat to wildlife patients
- Vultures, bald eagles, GHOW common suspects
- Rehab centers adapted triage, quarantine protocols
- Emerging threat to wild and domestic mammals
- Using responsible testing and reporting, wildlife centers have served as early sentinels for the disease

CONCLUSION

- People working with wildlife need to be educated about zoonoses, and can serve as sentinels
- With knowledge we can recognize the potential for zoonotic transmission
- Common-sense steps can minimize risk of infection
- Early recognition of disease by veterinarians help detect outbreaks sooner

CONCLUSION

- "The convergence of people, animals, and our environment has created a new dynamic in which the health of each group is inextricably interconnected. The challenges associated with this dynamic are demanding, profound, and unprecedented." -from AVMA One Health Initiative Report

SOURCES

- Compendium of Veterinary Standard Precautions for Zoonotic Disease Prevention in Veterinary Personnel
  - Nat. Assoc. of State Public Health Veterinarians
- CDC on-line information
- Veterinary Information Network