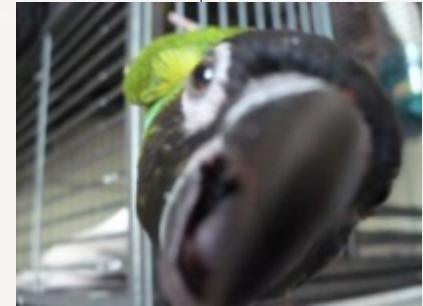




ZOONOSES AND YOU

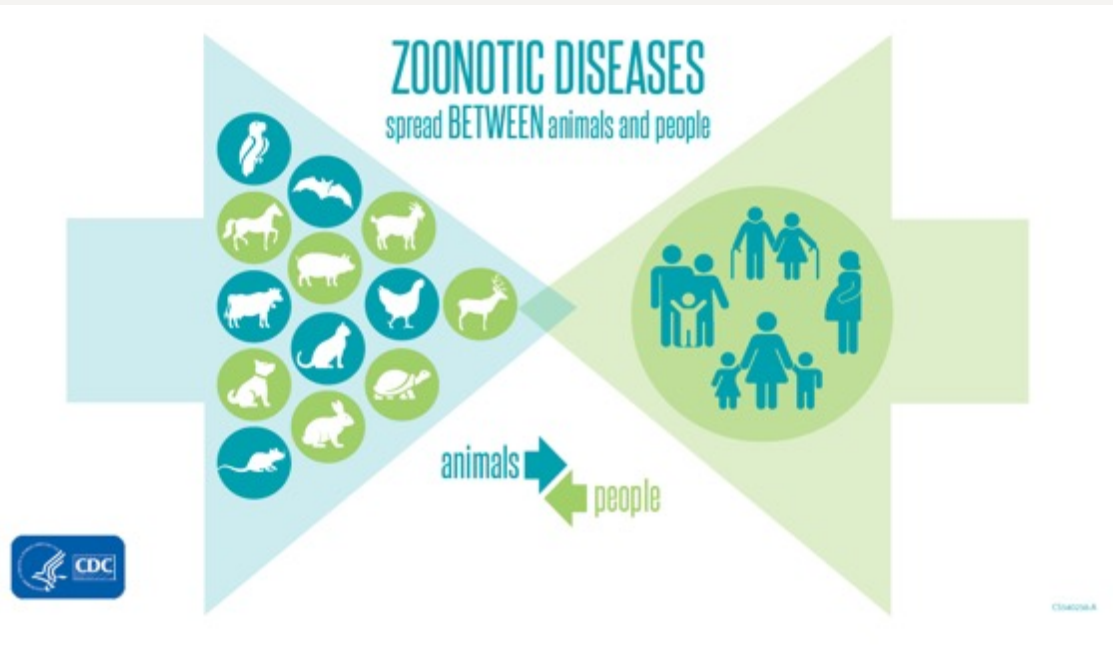


EDUCATION, CONTROL, AND PREVENTION
Antonia Gardner, DVM



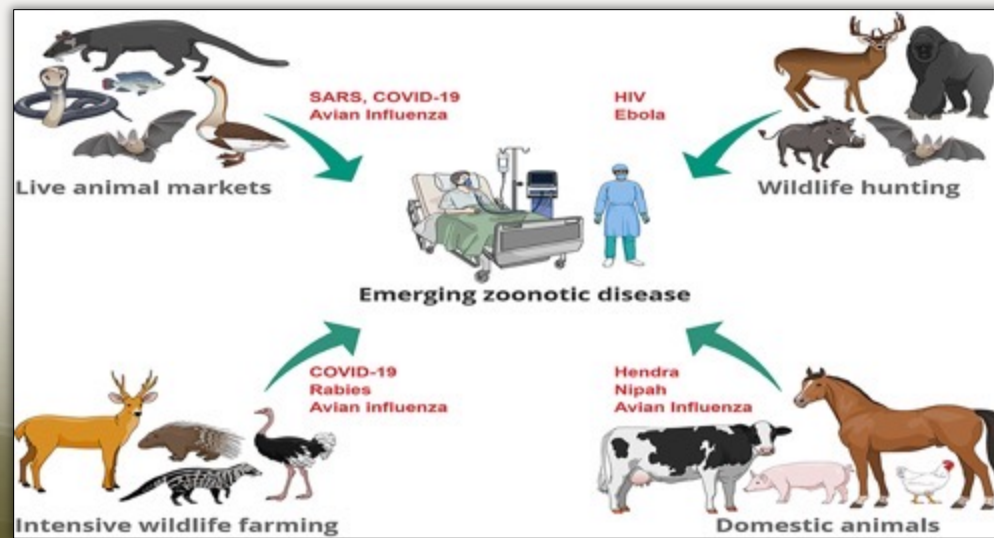
WHAT ARE ZOOONOSES?

- 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



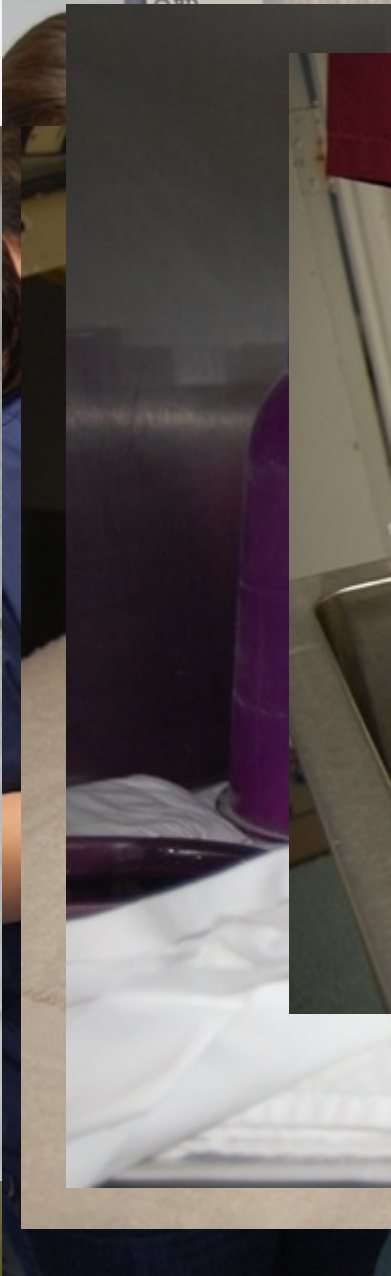
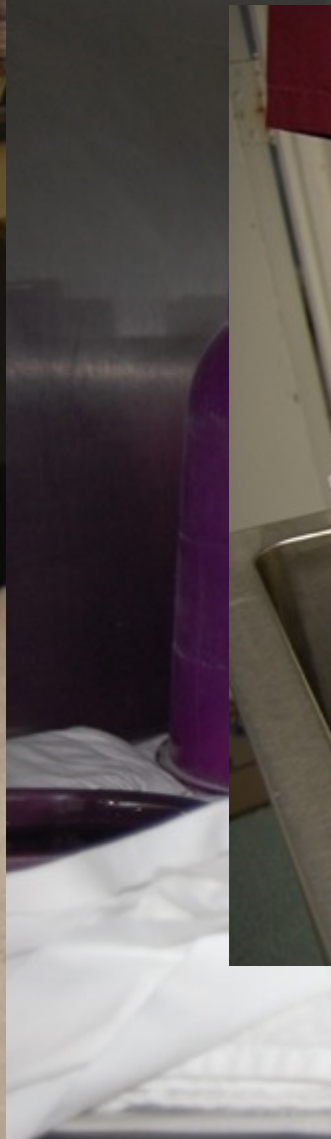
Drivers for emergence of Zoonotic disease

- 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
- WE CAN CONTROL THE SPREAD OF ZOOZOSES 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

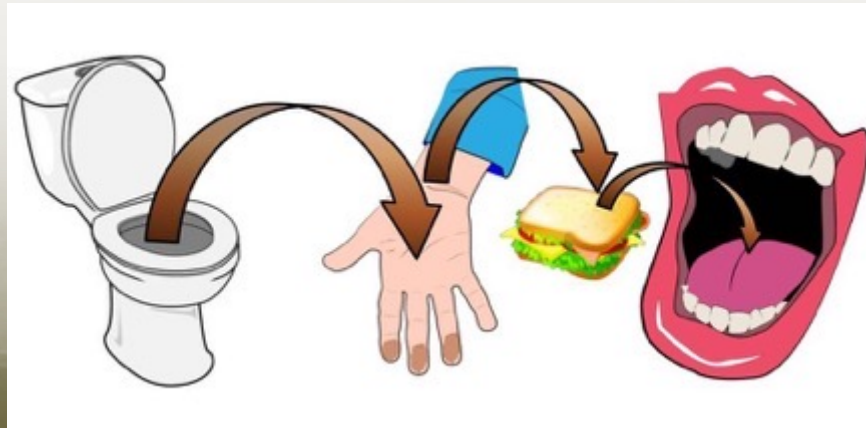
- Bites from ticks, fleas, mosquitoes, etc.
- Rodents and other pests

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

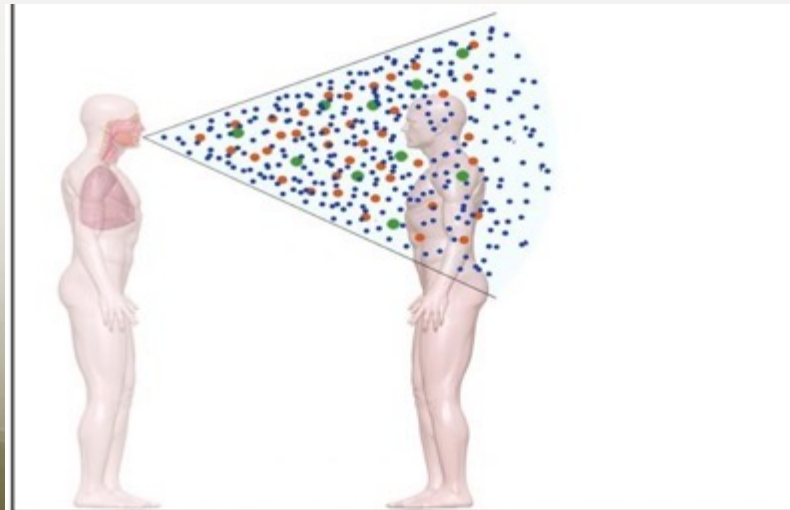
ROUTES OF TRANSMISSION

- 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 ZOOONOSES

- **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 ZOOZOSES

- 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 ZOOONOSES

- 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
 - Use when contact with blood, feces, vomit, exudates, other bodily fluids is likely
 - Wear when doing necropsies, any wound treatment, or handling lab samples
 - Use 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
 - At times of high risk wearers need protection from inhalation of small particles and infection of the respiratory tract
 - Particulate respirators are necessary to protect from aerosol 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
- Laundry is not really clean until it is completely dried
- Use gloves when handling medical samples or waste
- Use safe recapping and needle removal techniques



KNOW RISK

- Know
- Warn enclosure
- If sick
- Report

ATTN: Medical Personnel

This person works with wildlife and may have been exposed to certain zoonotic diseases not routinely considered in the differential diagnoses of febrile illnesses. In case of sickness in this individual, please consider zoonotic diseases including, but not limited to the following:

Anthrax, Arbovirus encephalitis, Brucellosis, Giardiasis, Hantavirus, Hendra Virus, Highly Pathogenic Avian Influenza, Histoplasmosis, Leptospirosis, Lyme Disease, Monkeypox, Mycotoxicosis, Nipah Virus, Psittacosis, Q Fever, Rabies, Rocky Mountain Spotted Fever, Salmonella, Sylvatic Plague, Tularemia, Typhus, & West Nile Virus.

(continued on back)

For more information on the occurrence of these diseases in humans, please contact:

The Centers for Disease Control and Prevention
1600 Clifton Rd.
Atlanta, GA 30333
1-800-232-4636 (1-800-CDC-INFO)
<http://www.cdc.gov/>



For more information on the occurrence of these diseases in wildlife, please contact:

USGS National Wildlife Health Center
6006 Schroeder Rd.
Madison, WI 53711-6223
(608) 270-2400
<http://www.usgs.gov/nwhc>



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Contaminated

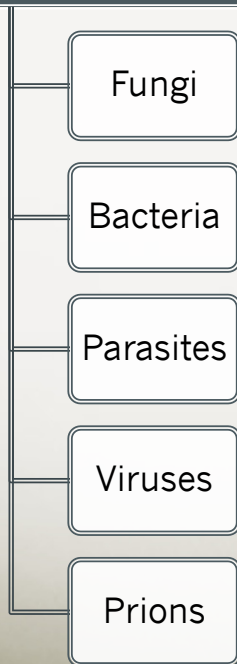
Change gloves before and after ANY contact with patients and cage materials (dishes, perches, etc.)

Do not add or transfer patients or cage materials until instructed otherwise by Supervisor or Veterinarian

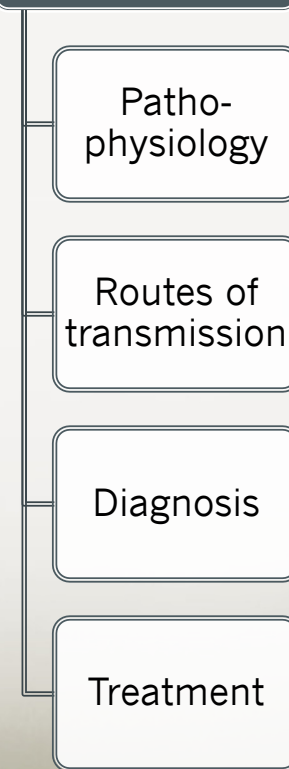
Syringe feed every 2-3 hours
amt. 2-3 ml(cc)

Zoonotic Diseases

Several large categories contain micro-organisms that cause zoonotic disease

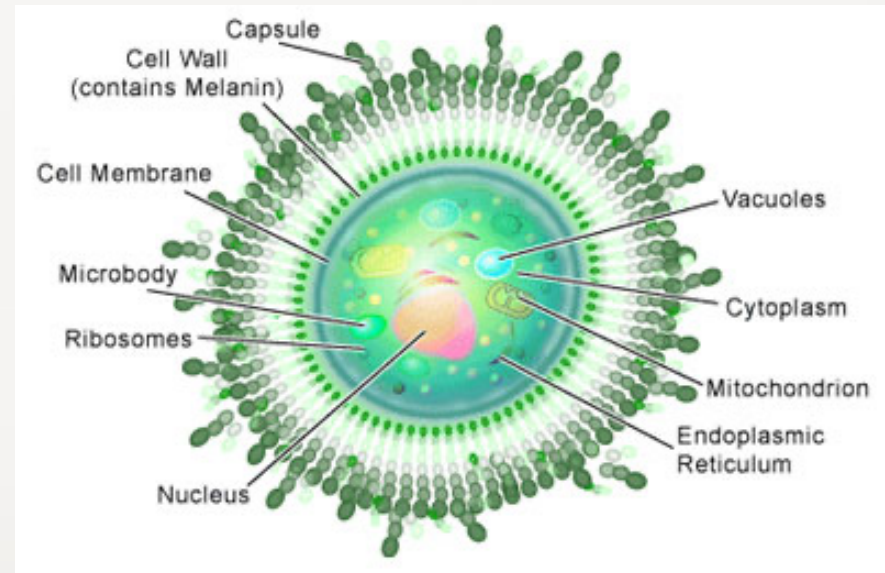


Relevant information:



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
- Generally causes disease in people with defective immunity



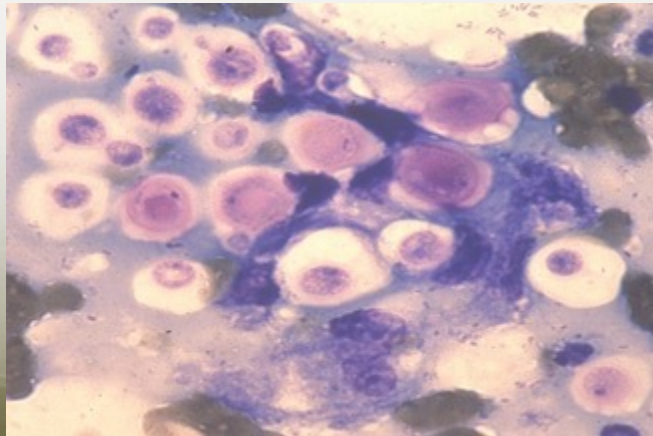
CRYPTOCOCCUS

- Enters the body through inhalation of yeast spores
- Causes 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 pigeon droppings from accumulating
- Particulate respirators should be used when cleaning old pigeon droppings
- Treatment – long-term, systemic anti-fungals

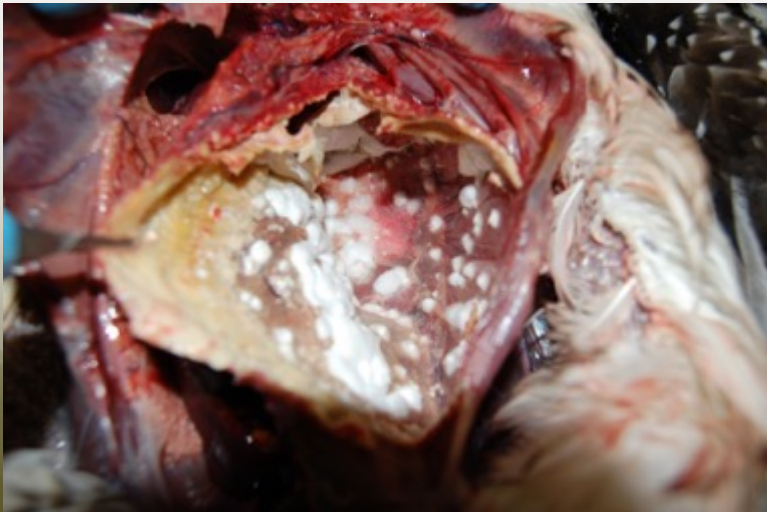


ASPERGILLUS

- *Aspergillus fumigatus* – opportunistic fungal pathogen
 - Ubiquitous - present everywhere
- Normally inhaling the fungal conidia is not harmful
- Can rarely cause allergic issues in respiratory tract
- However, when immune system is abnormal the fungus can grow
 - In immunocompromised animals, especially birds, we see severe, disseminated disease
 - In cancer patients, transplant patients, and AIDS patients signs are similar
 - Systems affected include respiratory, brain, skin, kidneys, and eyes
 - Diagnosis and treatment are difficult

ASPERGILLUS

- Exposure most likely to occur during necropsy
- Respirators should be worn, spray disinfectant to wet down fungus and keep spores down



ENTERIC BACTERIA

- Most common bacteria causing enteric disease include 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

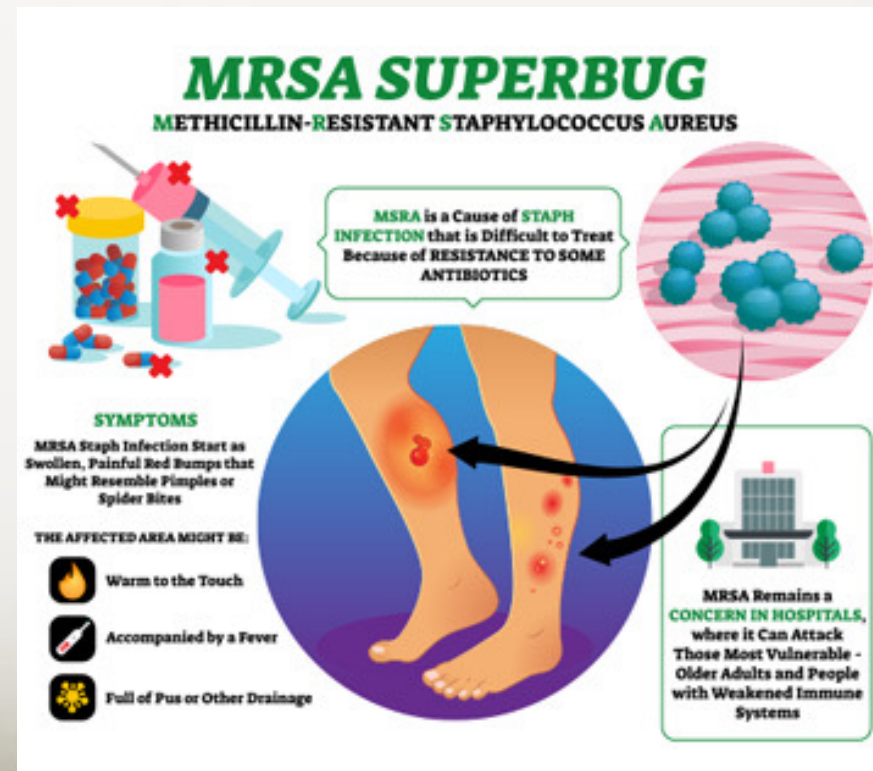
ENTERIC BACTERIA

- 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
- Through antibiotic overuse some strains have developed multiple drug resistance
- This strain can infect people with weak immune systems but also enter through a wound on a healthy person
- Causes severe, potentially life-threatening infection



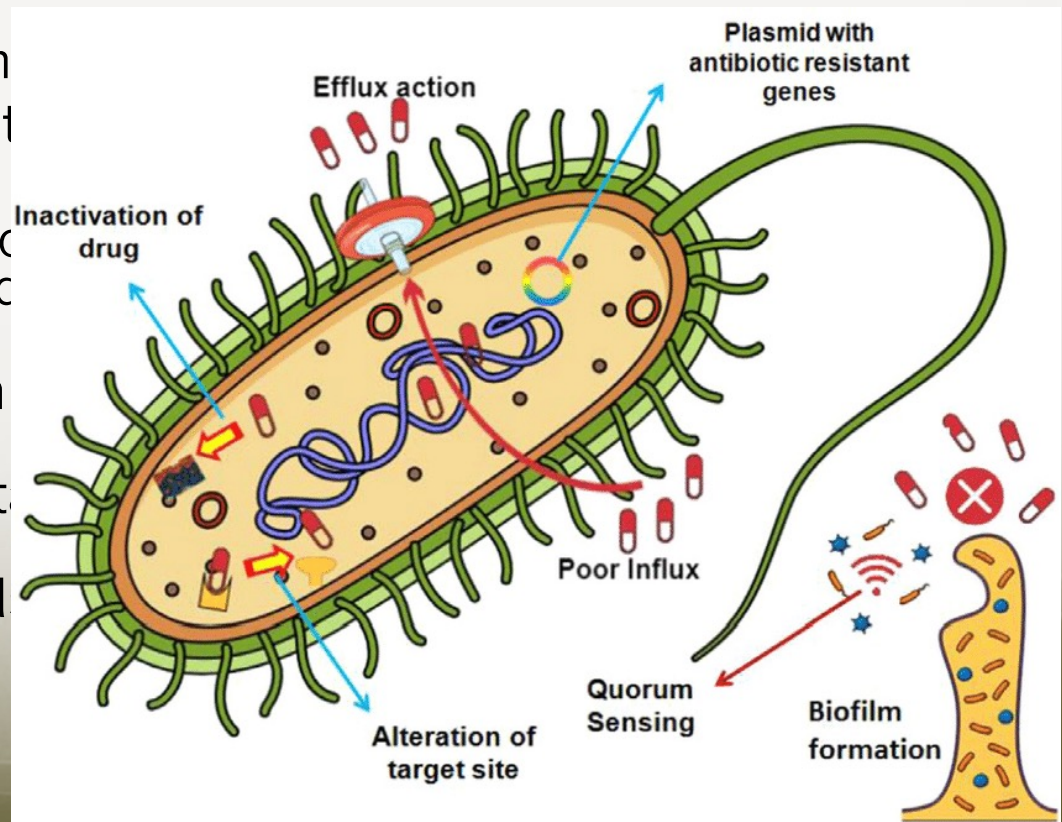
MRSA

- 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 pump
 3. Modification of target act upon
 4. Structural modification bacterial to withstand
- Huge emerging issue in
- Often an issue in hospit
- Good antibiotic steward



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 scabiei*, 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
 - Isoxazolines have proven very effective
- Environment needs to be disinfected
- Prevention – isolation of infected animals, using protective clothing when handling



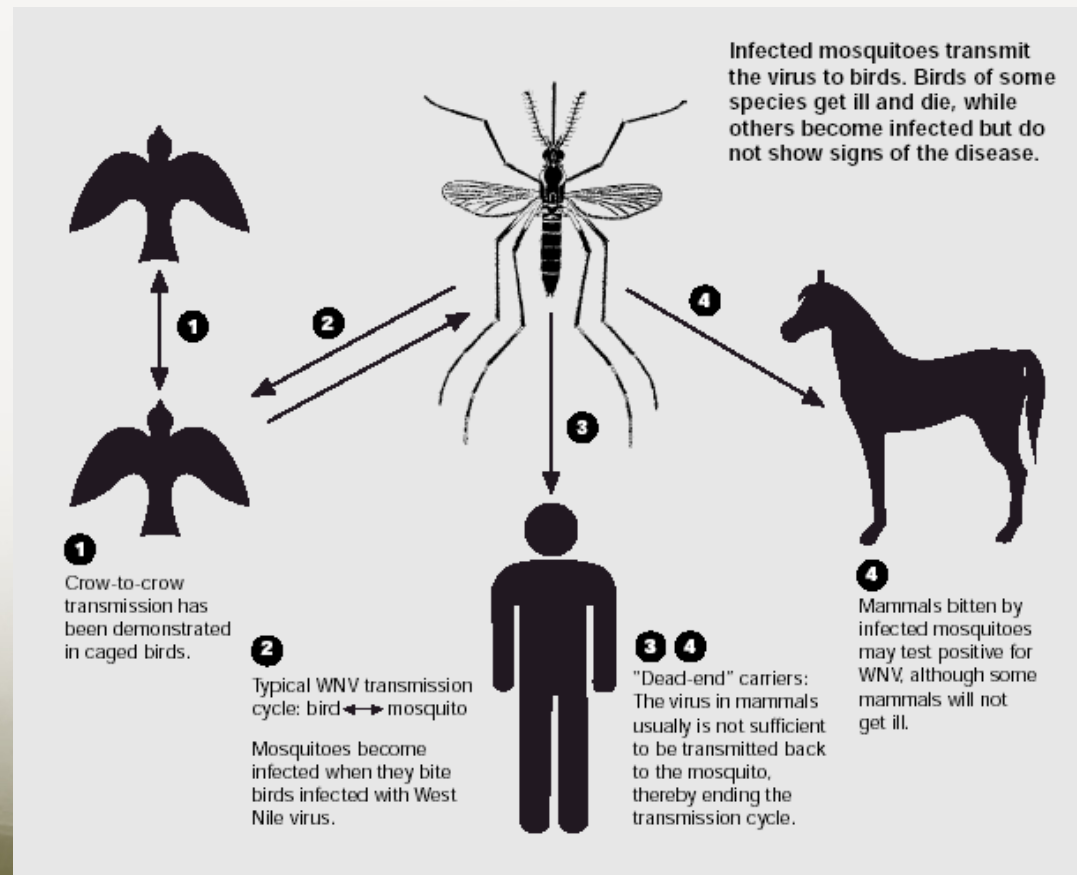
WEST NILE VIRUS

- 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, repellent



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

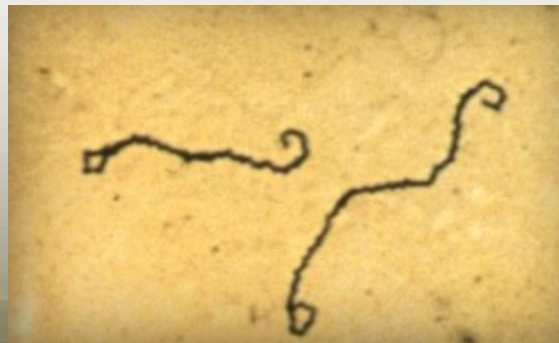
LEPTOSPIROSIS

- 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



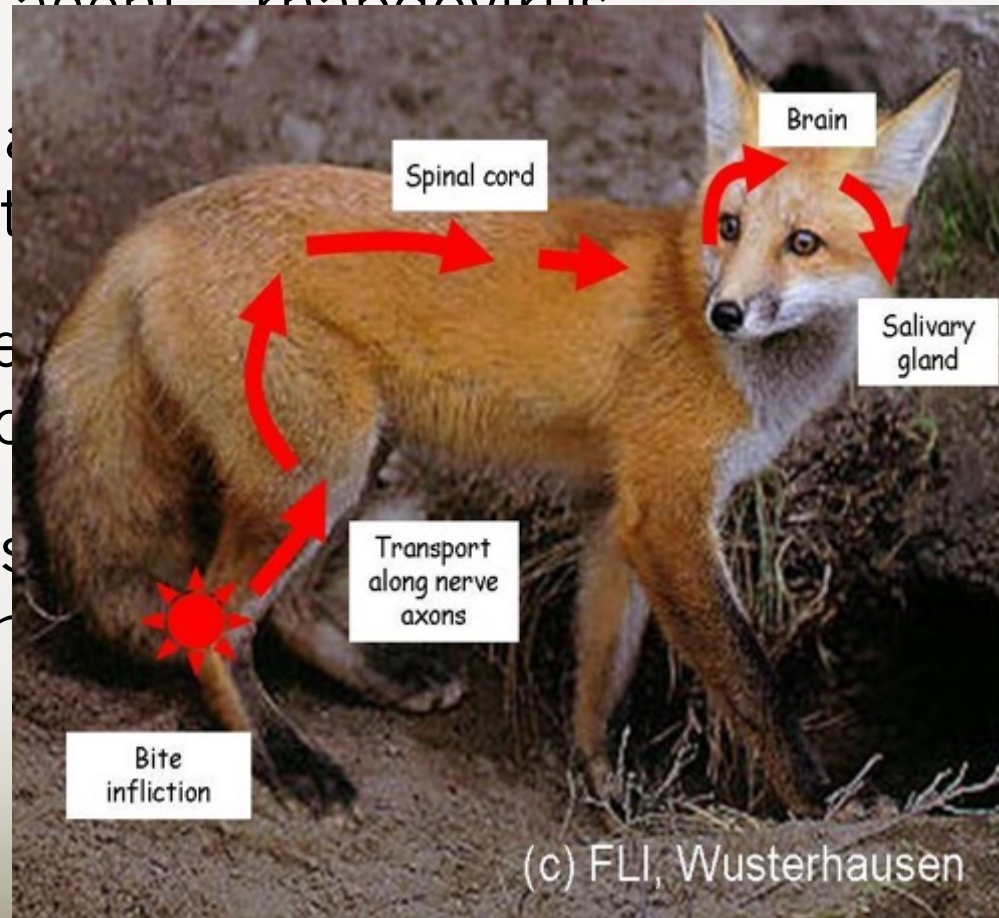
LEPTOSPIROSIS

- 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 long incubation period while it travels to the brain
- Transmitted by bite, although contact with saliva
- Symptoms include aggression, paralysis, and death



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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 no 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

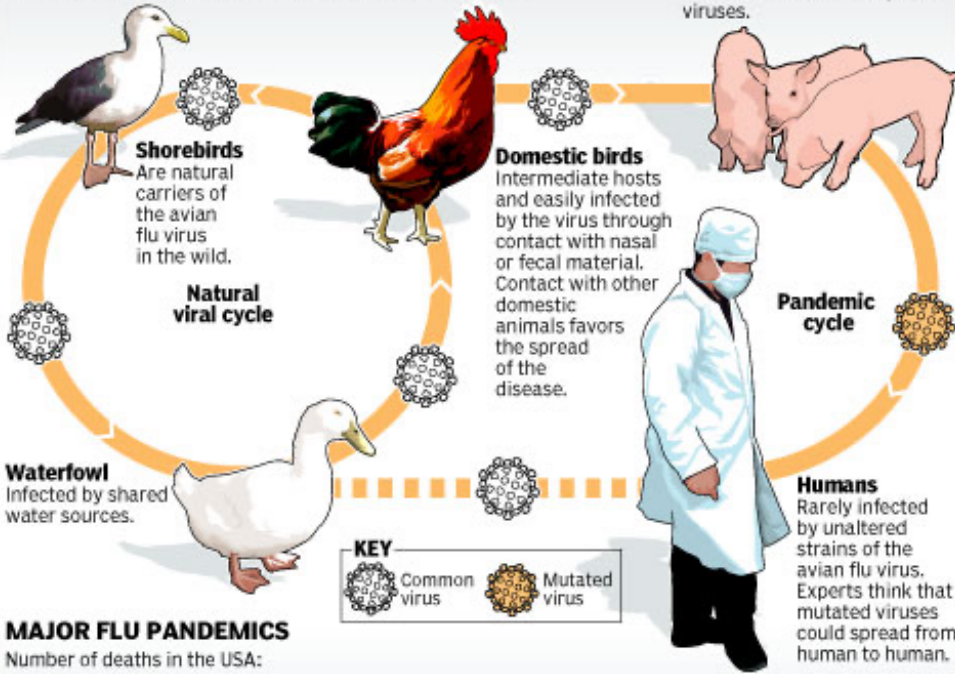
AVIAN INFLUENZA

THE NEXT PANDEMIC?

Although the H5N1 virus, known as the avian flu virus, does not usually infect humans, new mutated forms of this virus could represent a realistic risk of a flu pandemic, experts say.

Mammals

Intermediate hosts. Hogs can also be infected by human flu virus, which increases the risk of mutated human compatible viruses.



MAJOR FLU PANDEMICS

Number of deaths in the USA:



Sources: Centers for Disease Control, World Health Organization

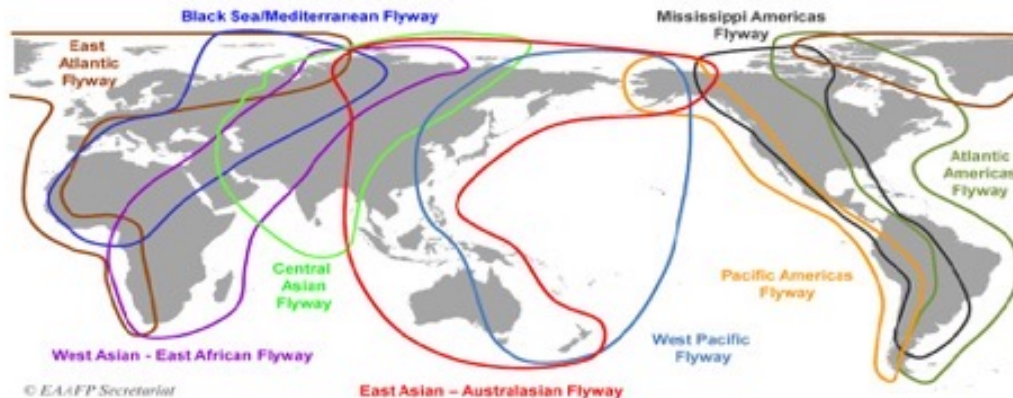
ALBERTO CUADRA : CHRONICLE

- HPAI H5N1 in humans
- Human-to-human transmission
- HPAI H5N1 in humans
- It is recommended to avoid contact with sick poultry
- Scientists believe that a pandemic could be triggered by a mutated virus
- PPE recommended for contact with infected birds

disease in humans by contact with infected birds. Transmission from person to person is rare. Contact with infected birds is a major concern.

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

