Barnyard Zoonoses
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Zoonoses: Any infectious disease that can be transmitted (vectored) from animals, both wild and domestic, to humans.

Bacterial

CAT SCRATCH DISEASE
Cause: Gram negative Bartonella henselae
Host Animals: Asymptomatic cats
Transmission: Cat scratches, rarely fleas
Clinical Symptoms: 1-2 weeks after inoculation, usually on the hand, a red papule develops followed by tender regional lymphadenopathy
Diagnosis: Serologic testing but cross reactivity exists, if available PCR, histology with stellate abscess and/or granuloma and organisms on Warthin-Starry silver stain or tissue Gram stain. Fastidious to culture. Immunohistochemistry is available but low sensitivity.
Treatment: Spontaneously resolves in 2-4 months, antibiotics have been anecdotal including azithromycin, trimethoprim-sulfamethoxazole, ciprofloxacin

BACILLARY ANGIOMATOSIS
Cause: Gram negative Bartonella henselae and Bartonella quintana
Host Animals: Asymptomatic cats with Bartonella henselae
Transmission: Cat scratches, bites, or by cat flea
Clinical Symptoms: Most common in immunocompromised, especially AIDS, as single or multiple red papules and subcutaneous nodules with normal or dusky overlying skin. Cutaneous lesions are a marker for possible internal involvement.
Diagnosis: Histology is a vascular proliferation with neutrophils and granular aggregates of organisms highlighted by Warthin-Starry
Treatment: Erythromycin; the anti-angiogenic effect may be more important than the antimicrobial effect.

ERYSIPELOID
Cause: Non-spore forming Gram positive rod, Erysipelothrix rhusiopathiae
Host Animals: Associated with exposure to fish, marine animals, swine, or poultry.
Commonly seen in fisherman.
Transmission: Minor skin wounds
Clinical Symptoms: 1-7 days after exposure a red to violaceous macule develops with disproportionate pain, usually on the hands or fingers. Rarely septicemia, septic arthritis, or endocarditis may occur. Lymphangitis and/or lymphadenopathy occur in about one-third.
Diagnosis: May not be demonstrated in tissue. Culture may be misinterpreted as alpha hemolytic streptococci. PCR.
**Treatment:** Untreated, resolution occurs in 3-4 weeks but treatment may hasten healing, reduce systemic complications, and reduce relapse. Penicillin or amoxicillin for 7-10 days for skin limited disease.

**TULAREMIA** (Rabbit fever, Deer fly fever, Ohara’s disease)
**Cause:** Gram negative coccobacilli, *Francisella tularensis*
**Host Animals:** Rabbits (most), cats, hamsters
**Transmission:** Ingest contaminated meat or water, inhaled in dust, handling infected animals, inoculated with a bite or scratch of an infected animal or bite of an arthropod vector. The infectious dose is very low and thus a potential bioterrorism agent.
**Clinical Symptoms:** Seven patterns- 1) Ulceroglandular (most), 2) Glandular (primary site unknown), 3) Oculoglandular (conjunctival inoculation), 4) Oropharyngeal (ingestion), 5) Typhoidal (ingestion), 6) Pneumonic (inhalational), 7) Septicemic. Ulceroglandular form characterized by flu-like symptoms, papule at inoculation site that eventually becomes pustular then ulcerates in a few days with or without eschar. Typically regional lymphadenopathy +/- fluctuance and rupture
**Diagnosis:** Serology. PCR. Routine culture often negative due to fastidious and slow growth; also a risk to lab personnel.
**Prevention:** Live attenuated vaccine was available in US to at-risk personnel but with suboptimal respiratory protection. Alternate vaccines are in preclinical testing.
**Treatment:** Streptomycin is the drug of choice but gentamicin has been used and tetracyclines are more practical. Beta lactams are ineffective.

**ANTHRAX**
**Cause:** Spore forming Gram positive *Bacillus anthracis*
**Host Animals:** Herbivores such as bison, deer, cattle, sheep, and goats
**Transmission:** GI, inhalational, or cutaneous that is usually associated with handling sick animals or contaminated wool, hair, or animal hides. Recent reports in Europe of subcutaneous anthrax associated with intravenous drug use.
**Clinical Symptoms:** 1- 12 days after inoculation a painless papule develops a vesicle and finally an ulcer with black eschar. Mild to moderate fever, headaches, malaise and regional adenopathy often accompany the illness.
**Diagnosis:** Culture of unroofed blister/eschar or ulcer base; a risk to lab personnel
**Treatment:** Ciprofloxacin, doxycycline

**MYCOBACTERIA**
**Cause:** *Mycobacterium marinum*
**Host Animals:** Ulcers, fin erosion, weight loss, and unusual coloration are signs of disease in fish but fish may show no external signs.
**Transmission:** Infection follows trauma and exposure to an aquarium, salt water, or marine animals, such as fish and turtles.
**Clinical Symptoms:** An erythematous or bluish papule develops 2-16 weeks after inoculation, usually on the finger or hand. Subsequent lesions develop along the lymphatic drainage (sporotrichoid).
**Diagnosis:** Culture takes 4 to 6 weeks. Biopsy may show acid fast organisms. PCR is not widely available and does not provide susceptibilities.
**Treatment:** Often self limited. Tetracyclines or clarithromycin are appropriate with continued treatment for 4-6 weeks after resolution.

**Bites**

**Cause:** Infection is typically a mixture of organisms reflecting the oral flora of the biting animal. *Pasteurella multocida* (cats) and *Pasteurella canis* (dogs) being most common but also anaerobes, *Streptococci*, human skin flora and rarely *Capnocytophaga canimorsus* (formerly Dysgonic fermenter-2).

**Host Animals:** Normal oral flora of cats and dogs

**Transmission:** Dogs bites are more common in the ER but cat bites are more likely to lead to clinical infection.

**Clinical Symptoms:** Cellulitis, lymphangitis or abscess. *Pasteurella* is the most common cause of infection in the first 24 hours after the bite. After 24 hours Staph and Strep are more likely. *Capnocytophaga canimorsus* can cause fulminant sepsis in patients with asplenia or the immunocompromised.

**Diagnosis:** Aerobic and anaerobic culture if clinically infected. Rabies diagnosis can be made by skin biopsy from the posterior neck involving scalp follicles in a symptomatic patient through direct fluorescent antibody staining of the fresh-frozen tissue.

**Treatment:** Tetanus and rabies immunization should be considered, wound irrigation, amoxicillin/clavulanate. Evidence supports prophylactic antibiotics only for animal bites to the hand and human bites.

**MRSA**

**Cause:** Methicillin resistant *Staphylococcus aureus*

**Host Animals:** Dogs, cats, rabbits, horses, and pigs are all known carriers. Animals can be asymptomatic or have clinical infection. A high prevalence of human nasal MRSA colonization has been reported in those in contact with pigs in the Netherlands.

**Transmission:** Between humans and animals, transmission can occur in both directions,

**Treatment:** Human infection may not be eradicated until the animal is also treated.

**Viral**

**COWPOX** *(Catpox)*

**Cause:** Orthopoxvirus

**Host Animals:** Rodents, cows, and cats in Europe

**Transmission:** Contact

**Clinical Symptoms:** Umbilicated vesicles with surrounding erythematous edema that forms central necrosis evolving into ulceration with black eschar. Lymphadenopathy

**Treatment:** Regress with scarring after 6-8 wks. Attenuated disease occurs in those with smallpox vaccination in the last decade.

**ORF** *(Ecthyma contagiosum)*

**Cause:** Parapoxvirus

**Host Animals:** Sheep and goats have pustular encrustation on the lips, nostrils, oral mucous membranes and occasionally urogenital sites.
Transmission: Contact with infected animal or fomites
Clinical Symptoms: Usually develop a single lesion on the hand 2-6 days after inoculation. Six stages each lasting one week
   1) Erythematous maculopapular
   2) Targetoid
   3) Acute weeping nodule
   4) Dry crusted nodule
   5) Papillomatous
   6) Regressive
Treatment: Spontaneous regression in up to 6wks

MILKERS NODULE (pseudocowpox)
Cause: Poxvirus: Paravaccinia
Host Animals: Cattle have circinate or horseshoe-shaped crusted erosions around the nose or papules and erosions on the teats.
Transmission: Contact
Clinical Symptoms: Mostly on hands and arms after an incubation of 4 days to 3 weeks. Same six stages as orf.
Treatment: Self limited (5-7 weeks)

DEER ASSOCIATED PARAPOXVIRUS
Cause: Unique parapoxvirus
Host Animals: Eastern US deer
Transmission: Contact
Clinical Symptoms: Similar incubation, course and presentation as orf or milkers nodule
Treatment: Self limited (5-7 weeks)

Fungal

TINEA
   - *Trichophyton mentagrophytes*: Mice, rodents
   - *Trichophyton equinum*: Horses
   - *Trichophyton erinacei*: Hedgehogs
   - *Trichophyton verrucosum*: Cattle
   - *Microsporum canis*: Cats, dogs
   - *Microsporum nanum*: Soil/Pigs
In humans, zoophilic dermatophytes result in more inflammatory lesions than anthropophilic dermatophytes.
Tinea barbae: Common causes include *T mentagrophytes var. mentagrophytes* and *T verrucosum*
Tinea capitis: Zoophilic disease includes *M canis* which can often be identified by green fluorescence with Wood’s light. Griseofulvin is more effective than terbinafine for tinea capitis caused by *M canis.*

SPOROTRICHOSIS
Cause: *Sporothrix schenckii*
Host Animals: Cats and less often birds, dogs, horses, and rats
Transmission: Cats with sporotrichosis skin lesions can transmit infection to humans even without penetrating injury. Transmission by other animals has occurred without visible infection, implying that they were carriers of the fungus. 
Clinical Symptoms: Papule or nodule at site of puncture with subsequent nodules along the lymphatic drainage.
Treatment: Itraconazole, potassium iodide

Ectoparasites

FLEAS
Cause: *Ctenocephalides canis* and *C. felis*
Host Animals: Dog and cats may have no visible disease. Eczematous dermatitis can be seen on the hind legs and abdomen of dogs and crusted papules on the lower back and neck of cats. Fleas will bite humans if the pet isn’t available.
Clinical Symptoms: Bites are present in groups, often on the legs. Some people do not react to flea bites.
Treatment: Bites in humans are treated symptomatically. Flea control requires veterinarian evaluation and treatment of the pet(s) with flea dips/powders/sprays and treatment of the environment with flea bombs/sprays.

SCABIES
Cause: *Sarcoptes* and *Notoedres*
Host Animals: Intense pruritus with hair loss, secondary bacterial infections and lichenification in relatively hairless parts of the body (abdomen, ears, and limbs). The mites are relatively host specific.
*S. scabiei* var *canis*: dogs, also cats, pigs, foxes, rabbits, and guinea pigs
*Notoedres cati*: cats, also dogs, rabbits, foxes, rodents, bats, and raccoons
*S. scabiei* var *suis*: pigs, also dogs and rabbits
*S. scabiei* var *bovis*: cattle
*S. scabiei* var *equi*: horses
*S. scabiei* var *ovis*: sheep, also goats and camels
*S. scabiei* var *caprae*: goats, also cattle, sheep, and dogs
Transmission: Contact
Clinical Symptoms: 20-30% of in-contact humans are “attractive” to these mites. Pruritic erythematous papules in areas of contact (lower chest, abdomen, and forearms). Burrows are absent and scrapings are negative.
Treatment: Treatment of pet with lime sulfur baths or ivermectin

NON-BURROWING MITES
Cause: *Cheyletiella*
Host Animals: *Cheyletiella yasguri* (dogs), *C blakei* (cats), *C parasitovorax* (rabbits and cats). Some animals are asymptomatic carriers. Others have dry, scaly dermatitis that resembles dandruff with pruritus on the back, shoulders and ears.
Transmission: Contact, holding the pet or sharing a bed
**Clinical Symptoms:** Non-burrowing mite. Pruritic, erythematous papular eruption over the arms, chest, abdomen and thighs. 30-40% of human contacts are susceptible

**Treatment:** Treatment of the source animal and cleaning of the environment

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**Parasites**

**CUTANEOUS LARVA MIGANS**

**Cause:** *Ancylostoma braziliense* (intestinal hookworm)

**Host Animals:** Dog and cat

**Transmission:** Larvae penetrate the skin at the beach, in crawl spaces, or sandboxes contaminated by animal feces.

**Clinical Symptoms:** Migrates at a few millimeters per day resulting in pruritic, erythematous serpiginous tracts.

**Treatment:** Self limited but relief of symptoms may require treatment with oral or topical thiabendazole or oral ivermectin

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**Selected References**

**General**


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**Bartonella**


**Erysipeloid**


**Tularemia**


**Anthrax**


**Mycobacteria**


**Bites**


**MRSA**


**Parapoxvirus**


Cowpox


Levin NK. Emedicine: Cowpox Infection. Available at: http://www.emedicine.com/derm/TOPIC87.HTM


Tinea


Sporotrichosis


Scabies


Fleas


Cutaneous Larva Migrans