



KUISCID

KOÇ UNIVERSITY - İŞBANK
CENTER FOR INFECTIOUS DISEASES

SEMINAR ON PET-RELATED AND
EMERGING ZOO NOTIC INFECTIONS

DATE: 23 & 24 OCTOBER 2025



Microbiology of Pets and Companion Animals

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Hong Kong



Cats and Dogs

Rabbits and Rodents

Fish, Reptiles and Amphibians

Farm Animals

Exotic Animals



Istanbul: The City of Cats



It is estimated that 200,000 cats live in Istanbul

Pets may lower blood pressure, reduce cholesterol and triglyceride levels, and improve feelings of loneliness, while increasing opportunities for exercise, outdoor activities, and socialization.

The "pet therapy"

Improved symptoms of depression and a significant decrease in blood pressure

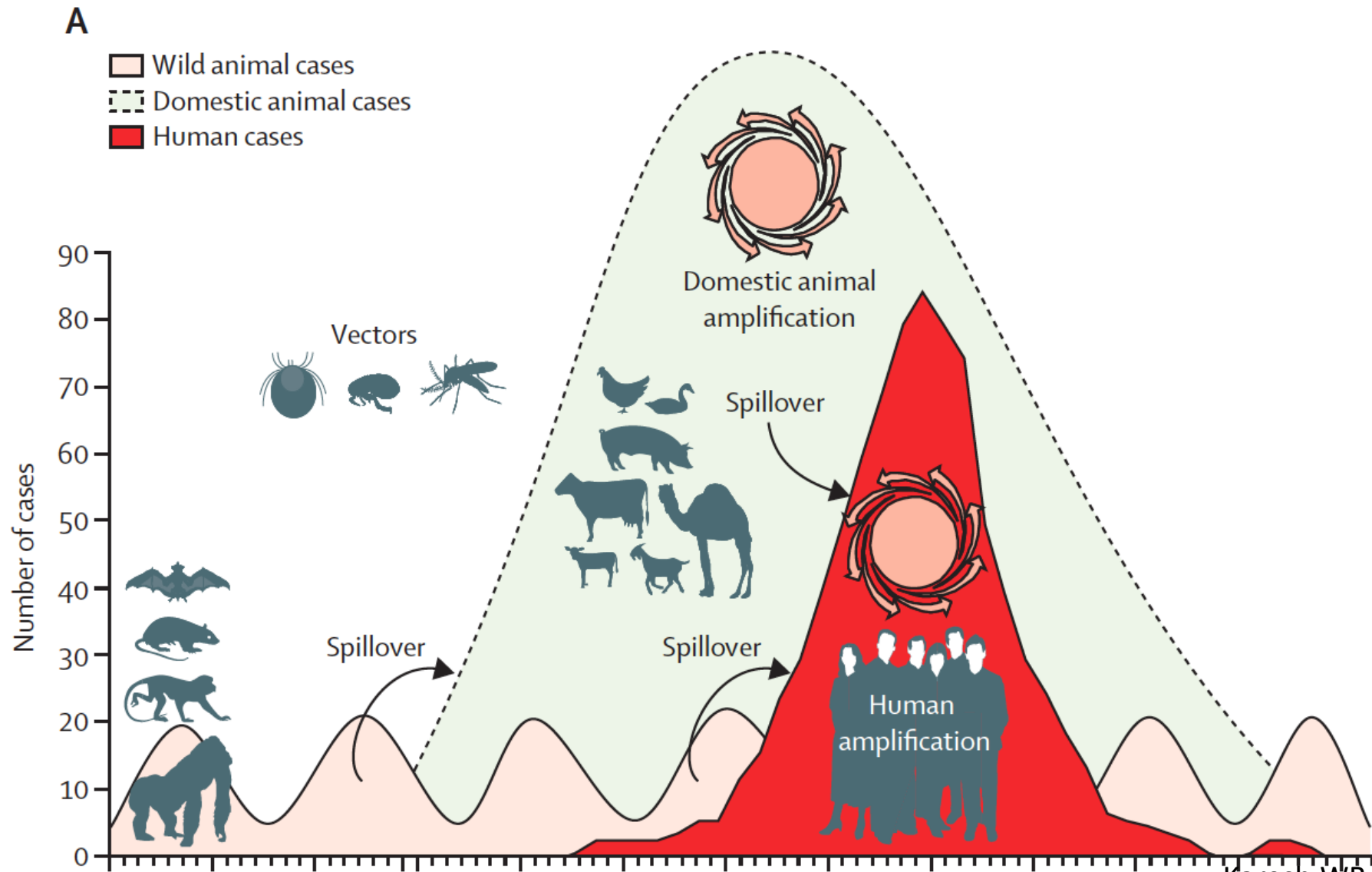


The Cat of Hagiasofia (Ayasofya)





ONE HEALTH: vectors, wild and domestic animals, humans, plants



Karesh WB, Lancet 2012



Transmission Routes

Infectious saliva: that contaminate bite wounds, skin abrasions, or mucous membranes

Hand-to-mouth: cysts, or oocysts (eggs) from feces of an infected animal

Aerosol from body fluids (eg, respiratory secretions, placenta)

Tick or flea bites when these vectors are carried into the home by pets

Direct contact with an infected cat



Transmission through Saliva

Organism	Human symptoms	Feline symptoms
Bartonella henselae	Cat scratch disease	Asymptomatic even with bacteremia
Pasteurella	Skin and soft-tissue infections, septic arthritis, osteomyelitis	Asymptomatic
Rabies	Acute progressive encephalitis	Stages: prodromal, furious, and paralytic
Capnocytophaga	Skin and soft-tissue infections, sepsis, meningitis, endocarditis	Asymptomatic
Cowpox	Painful, hemorrhagic pustules or black eschars	Ulcerated, crusted focal skin lesions; systemic illness possible



Cat Scratch Disease

80% in children (2-14 years)

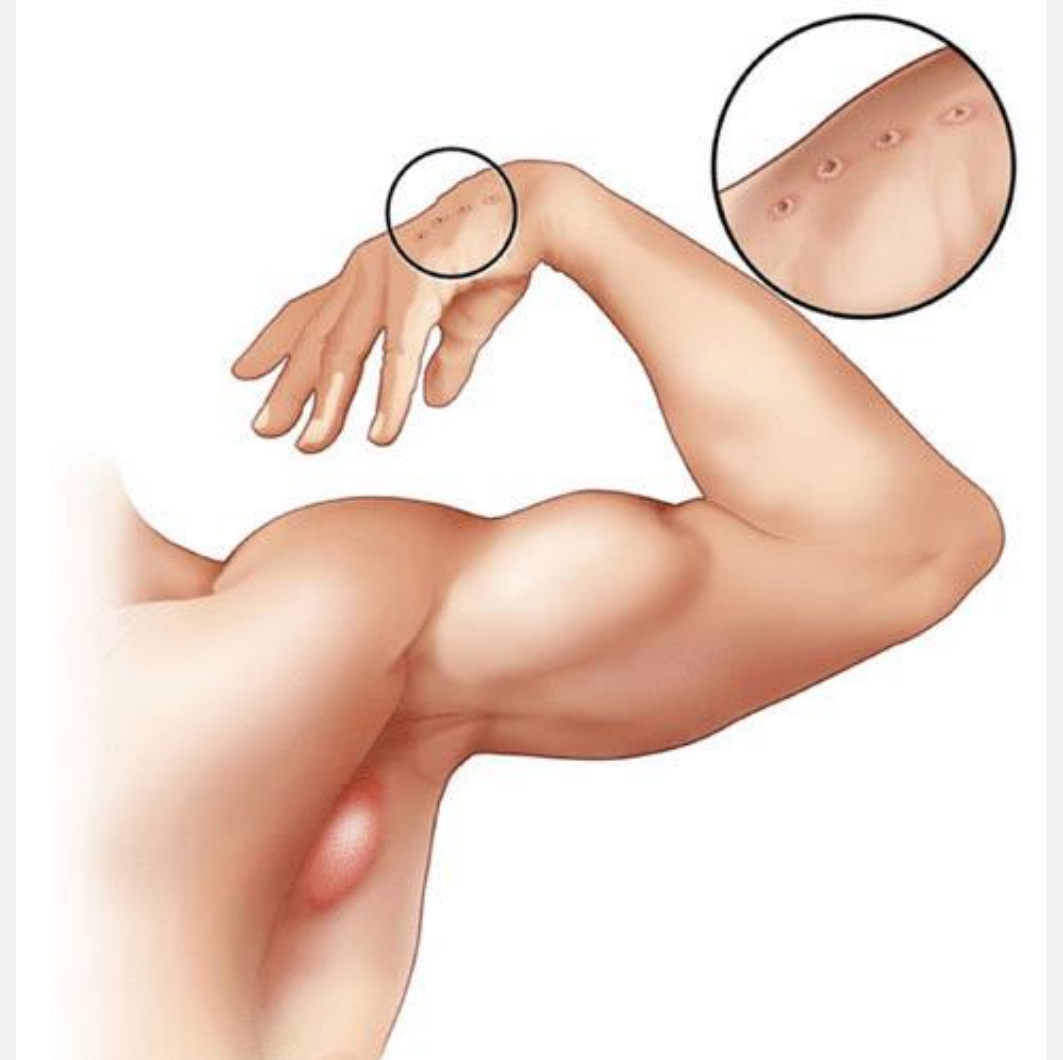
Serology among cats:

10-40% in USA

28% in Istanbul (Sığircı, et al. 2013)

Human CSD most often presents as a localized cutaneous and lymph node disorder near the site of organism inoculation.

Rarely, the organisms disseminate and infect the liver, spleen, eye, osteomyelitis or central nervous system.





A Case Presentation

A previously healthy 3 year old boy

Admission to ER: fever, abdominal pain, weight loss, and night sweats over the last 15 days.

History: Born in Ethiopia and moved to Turkey six months ago. No history of traveling to rural areas, tuberculosis contact, consumption of unpasteurized dairy products, fly bites, or tick bites. They had kittens at home. Childhood immunizations had been completed.

Physical examination: left **cervical and bilateral inguinal** LAP. Diffuse abdominal tenderness.

TST (-), Acid-fast bacilli and *M. tuberculosis complex* PCR (-) in the consecutive 3 fasting gastric fluids. The thick smear: no Leishmania and Plasmodium trophozoites.

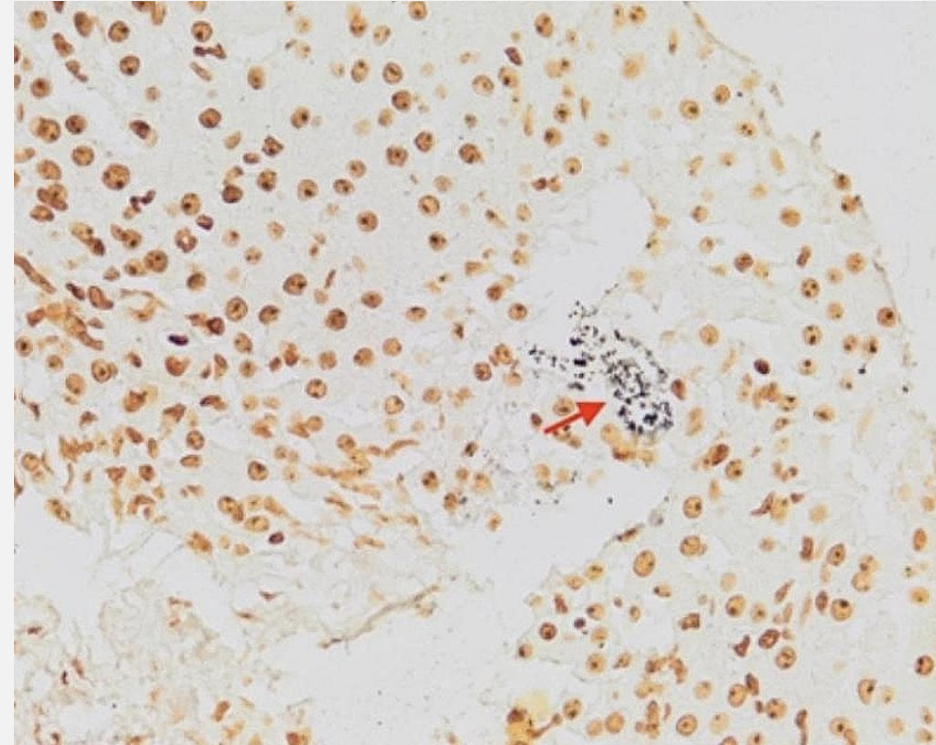
Serologic tests for EBV, CMV, *Brucella spp*, *Francisella tularensis*, *Coxiella burnetti*, *Bartonella henselae*, and *Echinococcus granulosus* were performed.

Bartonella IgM and IgG, which were detected positive at titers of 1/100 and > 1/320, respectively. *Coxiella burnetti* IgM was positive, while IgG test was negative

Aslan Tuncay S, et al. Unusual presentation of cat scratch disease: case report. Eur J Clin Microbiol Infect Dis. 2024



An unusual presentation of cat scratch disease



A light micrograph of Warthin-Starry silver-stained *B. henselae* bacteria. With Warthin-Starry stain, they appear as small, black-curved organisms either in clusters

Aslan Tuncay S, et al. Unusual presentation of cat scratch disease: case report. Eur J Clin Microbiol Infect Dis. 2024



Cat Bites: Mixed Aerobic and Anaerobic Bacterial Infections

Approximately 400,000 infected cat bite wounds annually in USA

The hand 63%, upper extremity 23%, lower extremities 9%

Females 72%, with a median age of 39 years.

Presentation to ER is usually associated with a nonpurulent but infected wound (42%), while 39% have purulent wounds and 19% have abscesses.

The wounds grow 2-13 isolates, with 63% having both aerobic and anaerobic bacteria

<i>P. multocida</i> and <i>Pasteurella</i> species	75%
Streptococci	46%
Staphylococci	35%
<i>Neisseria</i>	19%
<i>Corynebacterium</i>	28%
<i>Moraxella</i>	35%
<i>Bacteroides</i> (esp. <i>B. tectus</i>)	28%
<i>Fusobacterium</i>	33%
<i>Porphyromonas</i>	30%



Pasteurella multocida Infections

Cats are the source of infection in 60 to 80 percent of human *P. multocida* infections.

P. multocida are commensals in the upper respiratory tracts of >90 percent of felines and are the major pathogen causing infection as a result of a cat bite.

Both healthy (eg, cats and dogs) and diseased (eg, rabbits) wild and domestic animals are the main reservoirs.

Pasteurella infection is most often secondary to a bite or scratch from a cat, or a lick

Pasteurella can cause serious soft-tissue infections and less commonly septic arthritis, osteomyelitis, sepsis, and meningitis particularly in infants and other immunocompromised hosts.



Cases of *Pasteurella multocida* infections in renal transplant patients

	Age (years)	Sex	Site of infection	Exposure	Comorbidities	Immunosuppression	Treatment	Outcome
Our patient	66	Male	Systemic	Probably cat licking wounds	Diabetes, AVR, obesity	Tacrolimus, mycophenolate, prednisone	Meropenem plus vancomycin	Died
Satta et al, 2012 ⁵⁷	38	Male	Endocarditis, cellulitis	Two cats, contact with dogs	Marfan's syndrome, AVR	Tacrolimus, steroids	Ertapenem then ceftriaxone sodium	Full recovery
Schmulewitz et al, 2008 ⁵⁸	31	Female	Left maxillary sinus	Dog licking face	Systemic lupus erythematosus	Sirolimus, mycophenolate, prednisolone	Amoxicillin/ clavulanic acid then doxycycline	Clinically improved
Ali et al, 2007 ⁶⁰	67	Male	Perinephritic abscess	Cat scratch	Goodpasture's syndrome	Mycophenolate, ciclosporin, prednisone	Piperacillin/ tazobactam plus ciprofloxacin then ceftriaxone sodium plus ciprofloxacin	Full recovery
Steiner et al, 1987 ⁵⁹	9	Female	Psoas muscle abscess	Cat and dog	Meningomyelocele, neurogenic bladder	Azathioprine, prednisone	Ampicillin plus gentamicin sulphate then penicillin	Gait abnormality

AVR=aortic valve replacement.

Christenson ES, Ahmed HM, Durand CM. *Pasteurella multocida* infection in solid organ transplantation. Lancet Infect Dis. 2015



Pet hygiene and maintenance

- Wash hands carefully after handling pets
- Keep pets healthy by feeding them food that is not contaminated or spoiled, and seek veterinary help at the first signs of illness
- Avoid contact with animals that have diarrhoea
- Avoid cleaning birdcages, birdfeeders, litter boxes, and handling animal faeces; use of disposable gloves and a standard surgical mask is advised if avoidance is not possible
- Wear gloves to clean aquariums or have someone else in the household do the cleaning
- Prevent contact of pet oral secretions with open wounds and catheters

Pet selection

- Consider waiting to acquire a new pet until a time when the patient is on stable immunosuppression (at least 6–12 months after transplantation)
- Avoid stray animals
- Avoid contact with non-human primates
- Avoid animal bites and scratches (do not pet stray animals)
- Consider the type of pet and specific risks for infections:
 - Reptiles (snakes, iguanas, lizards, and turtles) have a high risk of salmonella infection and should be avoided
 - Rodents have a risk of transmitting lymphocytic choriomeningitis virus
 - Young cats have risk of transmitting *Bartonella henselae*
 - Cats have a risk of transmitting *Toxoplasma gondii*
 - Puppies, kittens, and chicks have a risk of transmitting campylobacter infections

Adapted with permission from Avery and Michaels (Avery RK, Michaels MG, Practice AIDC. Strategies for safe living after solid organ transplantation. *Am J Transplant* 2013; **13**: 304–10).

General guidelines for pet ownership in immunosuppressed individuals

Christenson ES, Ahmed HM, Durand CM. *Pasteurella multocida* infection in solid organ transplantation. *Lancet Infect Dis*. 2015



Rabies surveillance in US during 2023

Boutelle C, et al. J Am Vet Med Assoc. 2025

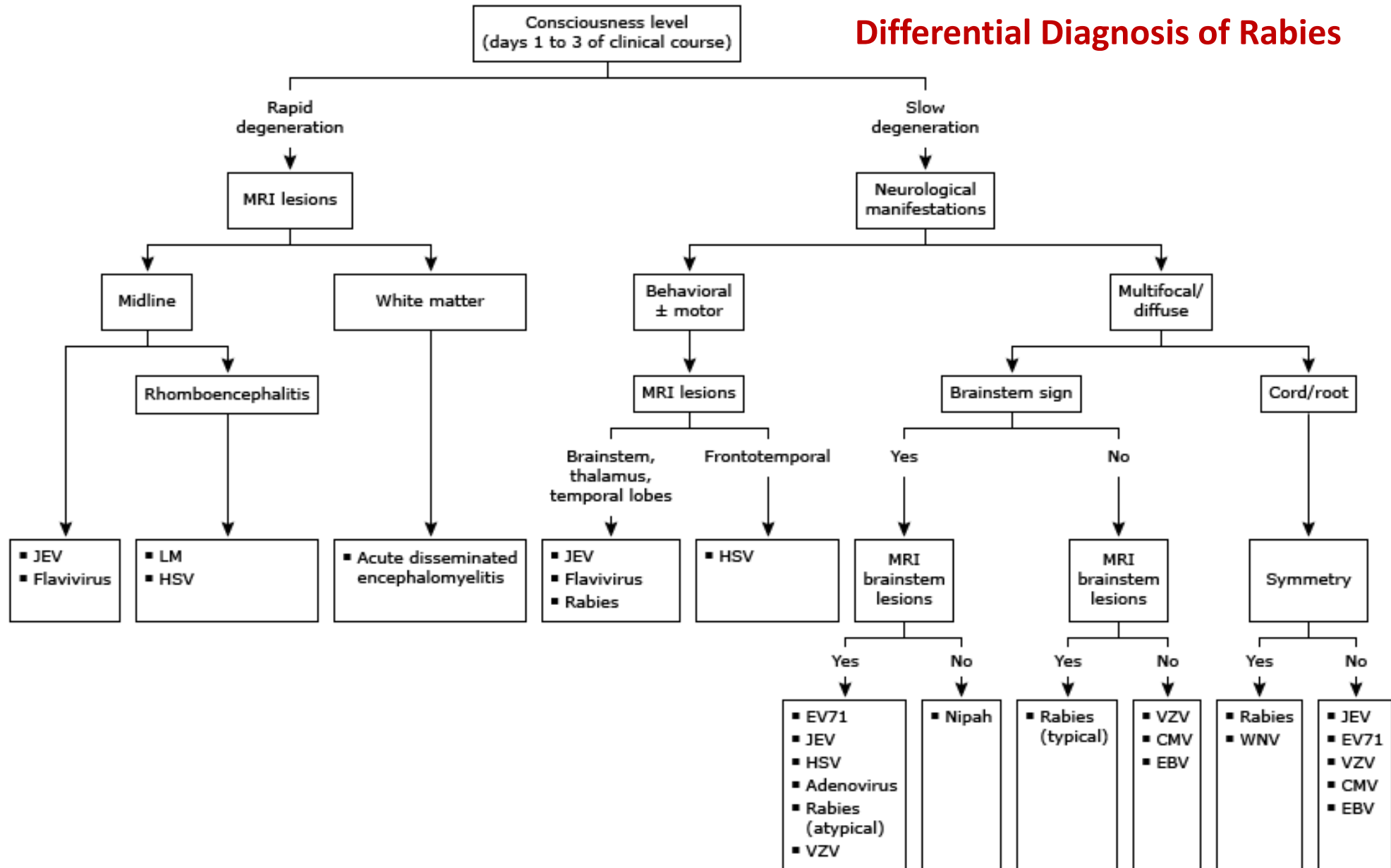
2023				2018–2022			
				No. of rabid animals		Percentage of samples tested with positive result	
Animals	No. of rabid animals	No. of animals tested with positive or negative result	Percentage of samples with positive result	Mean	95% CI	Mean	95% CI
Domestic animals							
Cats	222	17,989	1.2	242	218–267	1.3	1.1–1.5
Cattle	36	706	5.1	39	36–43	4.7	3.7–5.8
Dogs	33*	24,685	0.1*	50	38–63	0.2	0.2–0.3
Horses and donkeys	8*	546	1.5*	16	12–20	2.5	1.9–3.1
Sheep and goats	9	519	1.7	8	5–12	1.4	0.8–2.1
Wildlife							
Bats	1,298	23,911	5.4	1,376	1,230–1,522	5.6	5.3–5.8
Foxes	299	1,534	19.5	328	295–361	19.2	17.8–20.6
Raccoons	1,085	10,120	10.7	1,298	1,073–1,524	10.8	9.9–11.7
Skunks	642*	3,173	20.2*	823	695–952	23.0	21.5–24.5
Total							
Domestic animals	309*	44,605	0.7*	358	330–386	0.8	0.8–0.9
Wildlife	3,451	42,453	8.1	3,914	3,392–4,436	8.5	8.0–9.1
All animals	3,760	87,058	4.3*	4,272	3,730–4,814	4.8	4.5–5.2

Cat rabies in Brazil: a growing One Health concern de Lima JS, et al. *Front Public Health* 2023

Rabies in Cats-An Emerging Public Health Issue. Fehlner-Gardiner C, et al. *Viruses* 2024

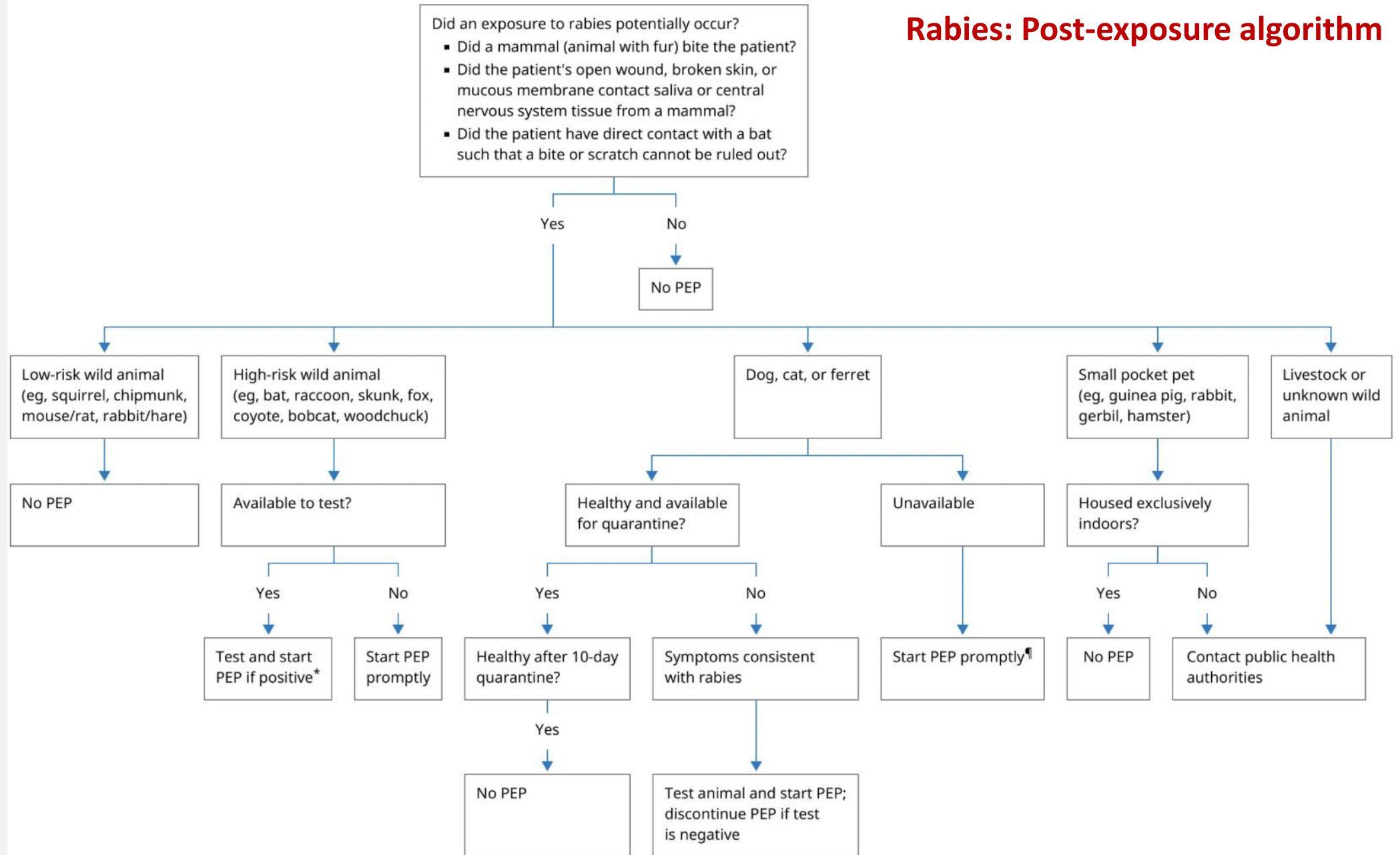


Differential Diagnosis of Rabies





Rabies: Post-exposure algorithm





Human rabies despite post-exposure prophylaxis

Systematic review (1980-2022): 52 articles, 122 breakthrough infections.

Median time from exposure to symptom onset was 20 days (IQR 16–24) (n=86).

Most (77%; 89/115) received PEP within 2 days of an exposure.

Severe wounds were common 69% (80/116).

Deviations from core practices were reported in 56% (68/122)

Other possible causes for breakthrough infections included errors in the administration of rabies IG, delays in seeking healthcare and comorbidities or immunosuppression.

Cold-chain integrity and potency of PEP rarely assessed 7% (8/122)

Timely and appropriate administration of PEP is crucial to prevent rabies, and although people with high-risk exposures or immunosuppression can develop rabies despite adherence to core practices, this occurrence remains exceedingly rare.

Whitehouse ER, et al. Human rabies despite post-exposure prophylaxis: a systematic review of fatal breakthrough infections after zoonotic exposures. Lancet Infect Dis. 2023



Capnocytophaga canimorsus

A commensal microorganism present in oral flora of dogs and cats. It can cause severe infections such as purpura fulminans, especially in splenectomised patients. It is a fastidious gram-negative organism, often difficult to isolate. The use of direct blood smear examination may show the bacilli.

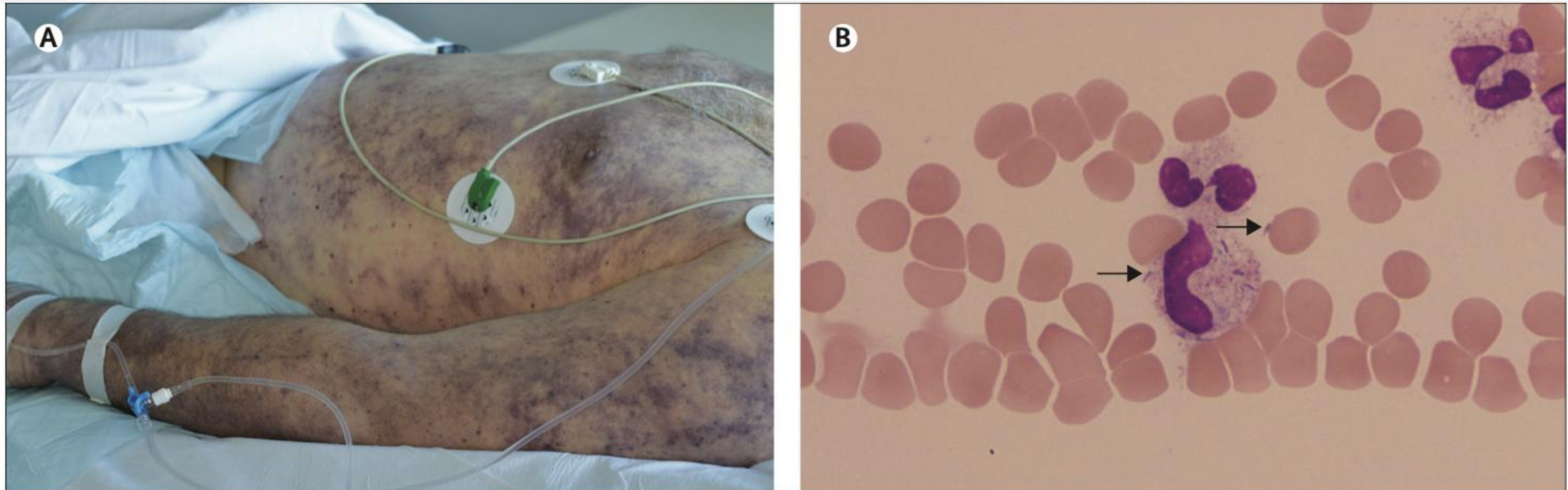
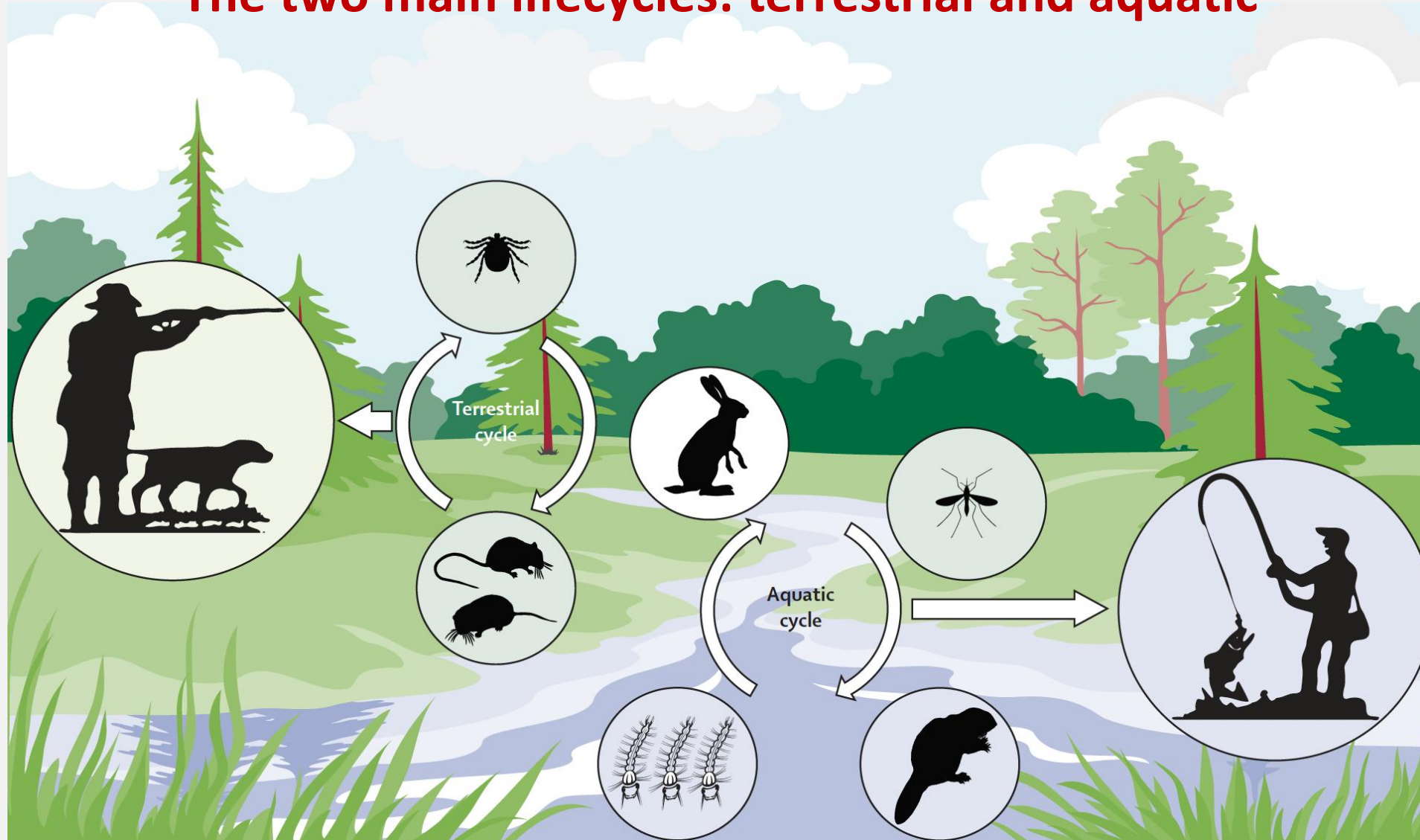


Figure: (A) Livedoid mottling and fulminans purpura on patient's trunk and abdomen. (B) Peripheral blood smear revealing extracellular and phagocytosed bacilli (May-Grünwald-Giemsa stain, ×1000 magnification).

Taquin H, et al. Fatal infection caused by *Capnocytophaga canimorsus*.
Lancet Infect Dis. 2017



Francisella tularensis: The two main lifecycles: terrestrial and aquatic





Epidemiological and clinical aspects of the tularaemia cases in European countries

	Most predominant environment for lifecycle	Most predominant modes of transmission	Most predominant modes of clinical forms	Known endemic areas
Austria ^{53,85}	Terrestrial	Direct contact with animal reservoirs, through tick bites	Ulceroglandular and glandular	Lower Austria, Burgenland, Vienna, Styria, and Upper Austria
Bulgaria ⁴³	Aquatic	Consumption of contaminated water	Oropharyngeal	Sofia and Pernik provinces
Czech Republic ⁵⁸	Terrestrial	Direct contact with animal reservoirs, through tick bites	Ulceroglandular and glandular	Moravia
Finland ⁵⁹	Aquatic	Mosquito bites	Ulceroglandular and glandular, oropharyngeal	Oulu
France ⁵⁰	Terrestrial	Direct contact with animal reservoirs, through tick bites	Ulceroglandular and glandular	Eastern, central, and southwestern parts of the country
Germany ^{54,86}	Terrestrial	Direct contact with animal reservoirs, through tick bites	Ulceroglandular and glandular	Bavaria, Hesse, Baden-Wuerttemberg, Thuringia, and Lower Saxony
Hungary ⁵⁵	Terrestrial	Direct contact with animal reservoirs, through tick bites	Ulceroglandular and glandular	Csongrád, Békés, Hajdú-Bihar, Győr-Moson-Sopron, Heves, and Jász-Nagykun-Szolnok
Italy ⁸⁷	Terrestrial	Direct contact with animal reservoirs, through tick bites	Ulceroglandular and glandular	Lombardy, and Tuscany
Kosovo ⁴²	Aquatic	Consumption of contaminated water	Oropharyngeal	Rural areas in the whole country
Norway ^{22,41,88}	Aquatic	Consumption of contaminated water	Oropharyngeal	Central and northern parts of the country
Serbia ⁸⁹	Aquatic	Consumption of contaminated water	Oropharyngeal	Nišava, Zajecar, Pirot, Pčinja, Toplica, Rasina, and Belgrade districts
Slovakia ⁴⁴	Terrestrial	Direct contact with animal reservoirs, through tick bites	Ulceroglandular and glandular	Western part of the country
Spain ^{44,60,90}	Terrestrial and aquatic	Direct contact with animal reservoirs, through tick bites, catching crayfish	Ulceroglandular and glandular, typhoidal	Valladolid, Palencia, Leon, and Cuenca provinces
Sweden ^{28,83}	Aquatic	Mosquito bites	Ulceroglandular and glandular	Northern and central parts of the country
Turkey ⁹¹	Aquatic	Consumption of contaminated water	Oropharyngeal	Central Anatolia



Tularemia From A Cat Bite

Tularemia Proximal Interphalangeal Joint Septic Arthritis: A Case Report.

Clary SJ, Brubacher JW, Kubat RC. JBJS Case Connect. 2022

Tularemia Hand Infection From a Cat Bite-A Case Report.

Whitsell NW, Becker H.. J Hand Surg Glob Online. 2020





Cowpox

Table 2. Source of human cowpox (54 cases 1969–93)

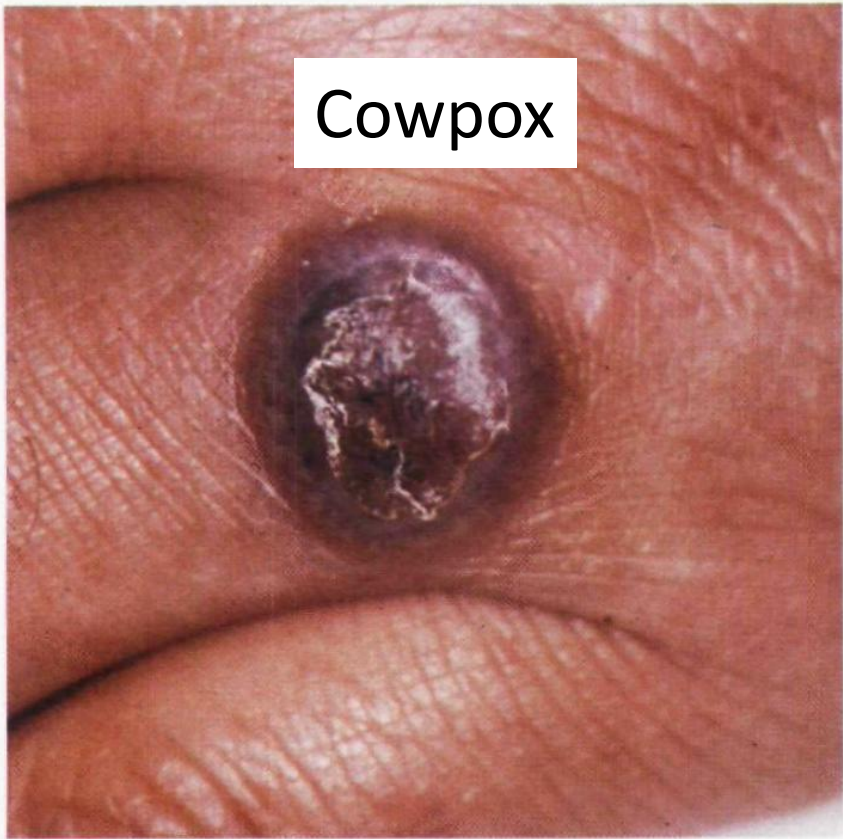
Source	Total		1969–77		1978–84*		1985–93†	
	M	F	M	F	M	F	M	F
Unknown	12	14	2‡	5‡	4‡	5‡	6	4
Bovine	3	0	3	0	0	0	0	0
Occupational§	3	2	1	1	0	0	2	1
Feline	6	8	0	0	0	0	6	8
Feline?¶	1	3	0	0	0	0	1	3
Rodent?¶	1	1	0	0	0	0	1	1
Total	26	28	6	6	4	5	16	17
	54		12		9		33	

Despite its name, domestic cats, not cattle, are the most commonly reported source of human cowpox infection; wild rodents are thought to be the principal reservoir of infection.

In cats, ulcerated, crusted focal skin lesions can occur, sometimes with mild systemic illness and concurrent oral lesions; young or immunosuppressed animals may develop severe systemic illness.

Transmission of cowpox from a domestic cat to a human was first reported in 1985 (Lancet)

Baxby D, Bennett M, Getty B. Human cowpox 1969-93: a review based on 54 cases. Br J Dermatol. 1994



Cowpox

Figure 7. Parapox infection, showing a crusting lesion similar to that of cowpox illustrated in Figure 2. (From a colour transparency kindly supplied by Dr M.S.Lewis-Jones.)



Anthrax

Figure 9. Anthrax, showing the hard black eschar and inflammation. (From a colour transparency kindly supplied by Dr R.T.D.Emond, Emond RTD *Infectious Diseases*. Recom Verlag, 1981. Reproduced with permission.)³⁰

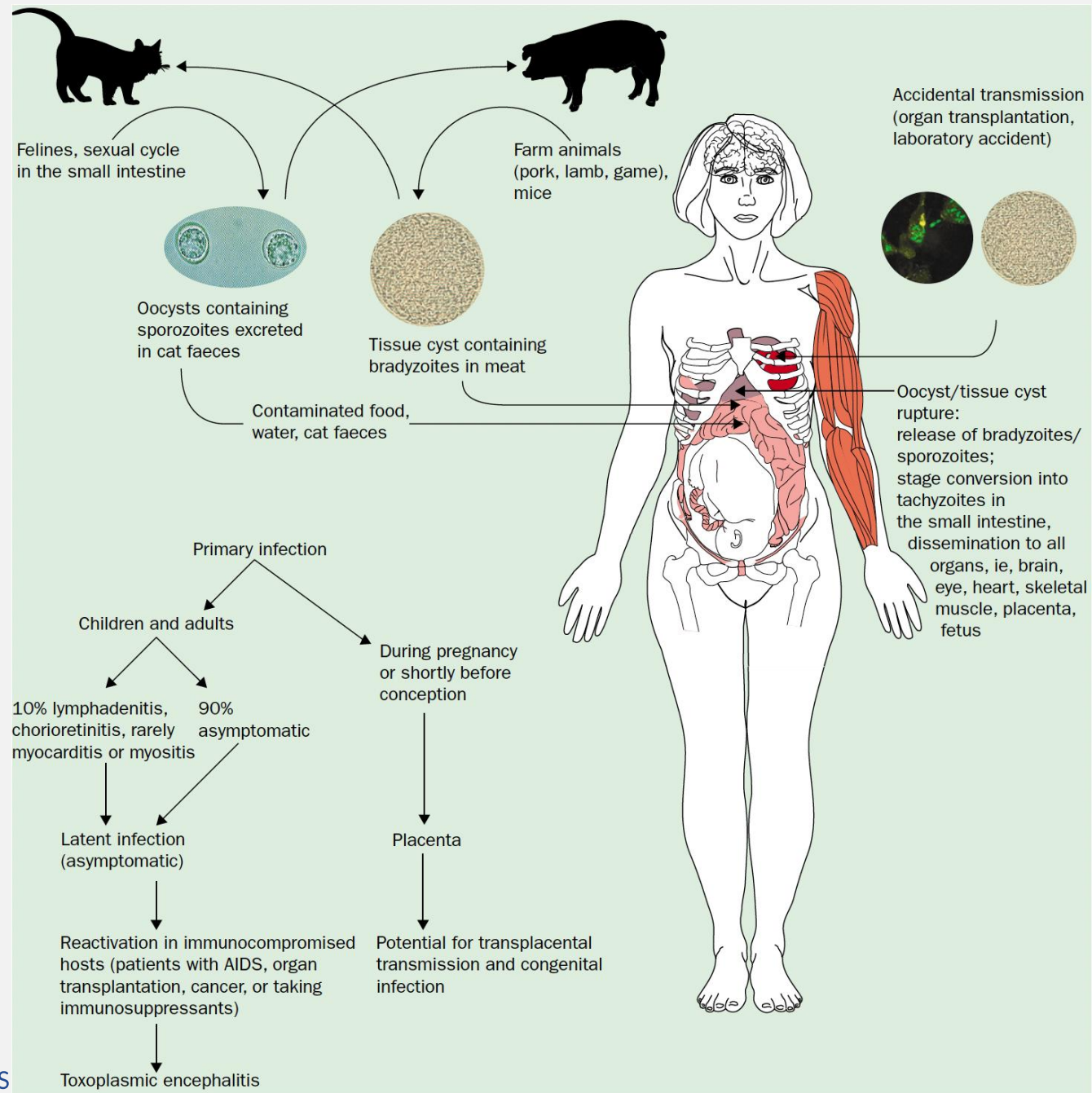
Cowpox is an uncommon and probably underdiagnosed infection that may mimic anthrax with its painful, hemorrhagic pustules or black eschars.



Fecal Transmission among Cats

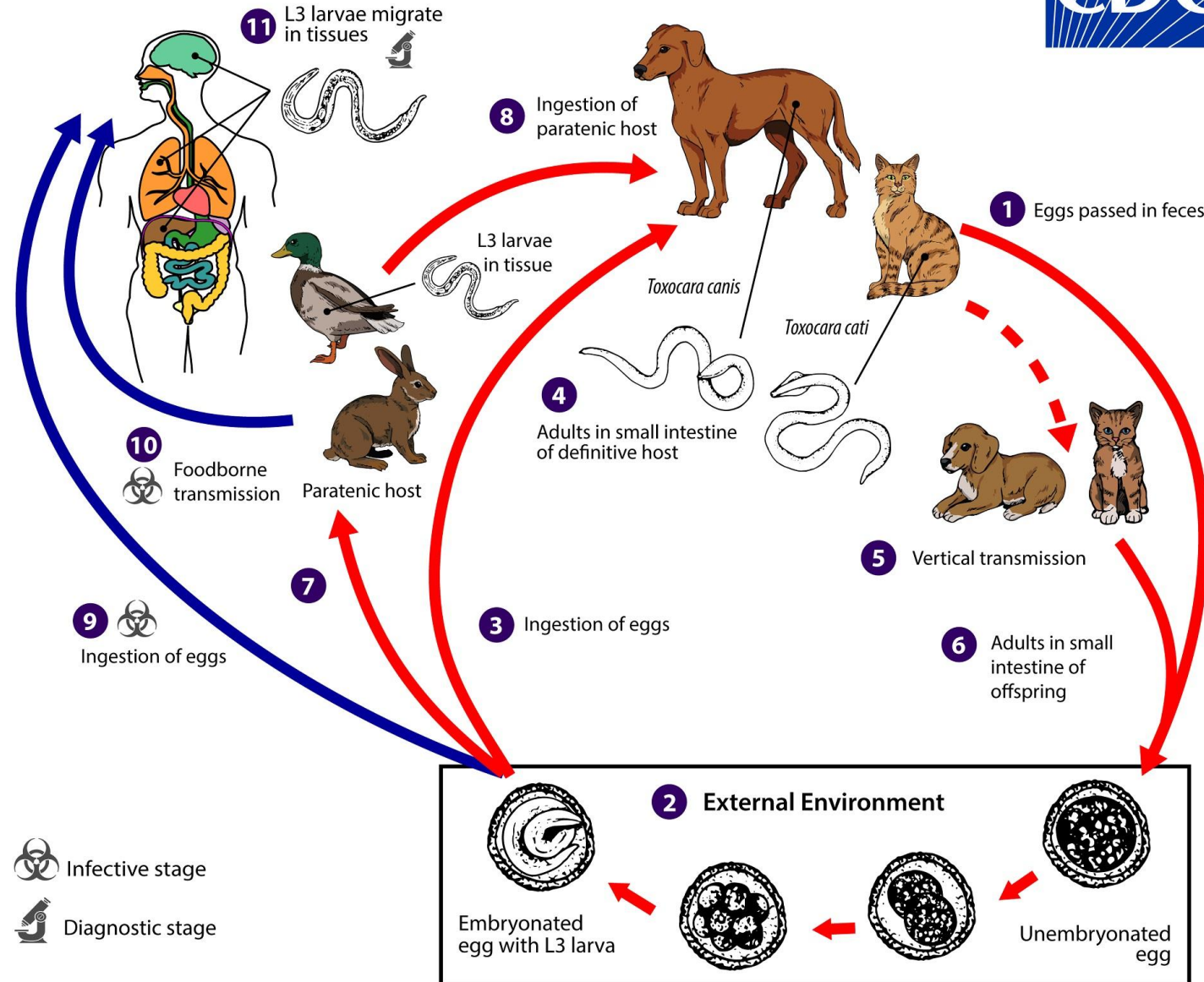
Organism	Human symptoms	Feline symptoms
<i>Toxoplasma gondii</i>	Lymphadenopathy, cerebral, congenital infection	Asymptomatic, may be associated with co-infection with feline leukemia virus or feline immuno- deficiency virus
<i>Toxocara cati</i>	Visceral larva migrans and ocular larva migrans	Asymptomatic
<i>Ancylostoma caninum</i>	Cutaneous larva migrans	Hookworm
<i>Echinococcus granulosus</i>	Hydatid cysts, echinococcosis	Hydatid cysts, echinococcosis
<i>Dipylidium caninum</i>	Asymptomatic to abdominal pain, diarrhea, pruritus ani, and urticaria	Tapeworm
Salmonella, Campylobacter Cryptosporidium Giardia Multidrug-resistant bacteria	Asymptomatic or gastroenteritis	Asymptomatic or gastroenteritis





Life cycle of T gondii and clinical manifestations of toxoplasmosis

Montoya JG, Liesenfeld O.
Toxoplasmosis. Lancet. 2004







A 19-YEAR-OLD MAN PRESENTED TO THE DERMATOLOGY CLINIC WITH A 3-week history of an asymptomatic rash on his neck. He worked as a beach lifeguard in southern California and reported no recent international travel. On physical examination, two erythematous, raised, serpiginous eruptions were seen on the neck — one on the posterior surface (Panel A) and another on the right lateral surface (Panel B). A punch biopsy showed nonspecific inflammation. A potassium hydroxide scraping was negative for fungal elements. On the basis of the patient's occupation and the serpiginous morphologic characteristics of the rash, a diagnosis of cutaneous larva migrans was made. Cutaneous larva migrans results from skin exposure to soil or sand contaminated by the larvae of cat or dog hookworms. In the United States, the infection is usually seen in international travelers, but it may be locally acquired in warmer parts of the country. The rash most often occurs on the feet and ankles, but this patient's neck involvement was thought to be related to his habit of lying in the sand. Cutaneous larva migrans is typically very itchy. The classic appearance results from the larvae traveling through the epidermis and causing an inflammatory reaction in their wake. After the patient received treatment with a 2-day course of ivermectin, the rash soon resolved.

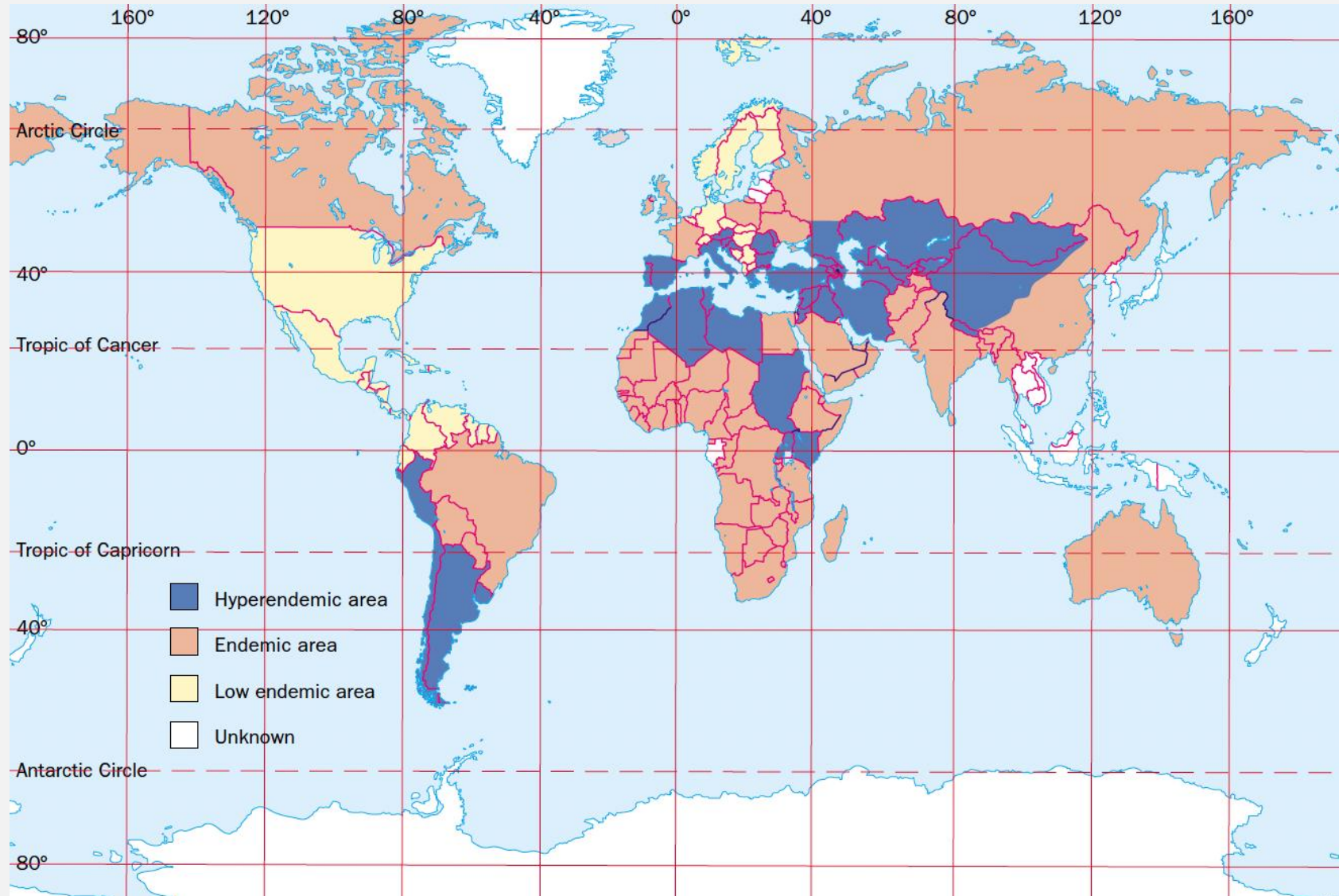
DOI: 10.1056/NEJMicm2414639

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NEJM 20 Feb 2025



Worldwide distribution of Echinococcosis



McManus DP, Zhang W, Li J, Bartley PB. Echinococcosis. Lancet. 2003



A 5-year-old boy with a chronic cough caused by *Echinococcus granulosus*

A 5-year-old migrant boy from Syria with a worsening cough that had started about 6 months earlier. He was hyperpyrexemic and tachypnoeic with sternal recessions and decreased air entry on his right side. Lab: CRP 247 mg/L (normal value <5.0 mg/L) and a leucocytosis (28.4×10^9 per L) without eosinophilia

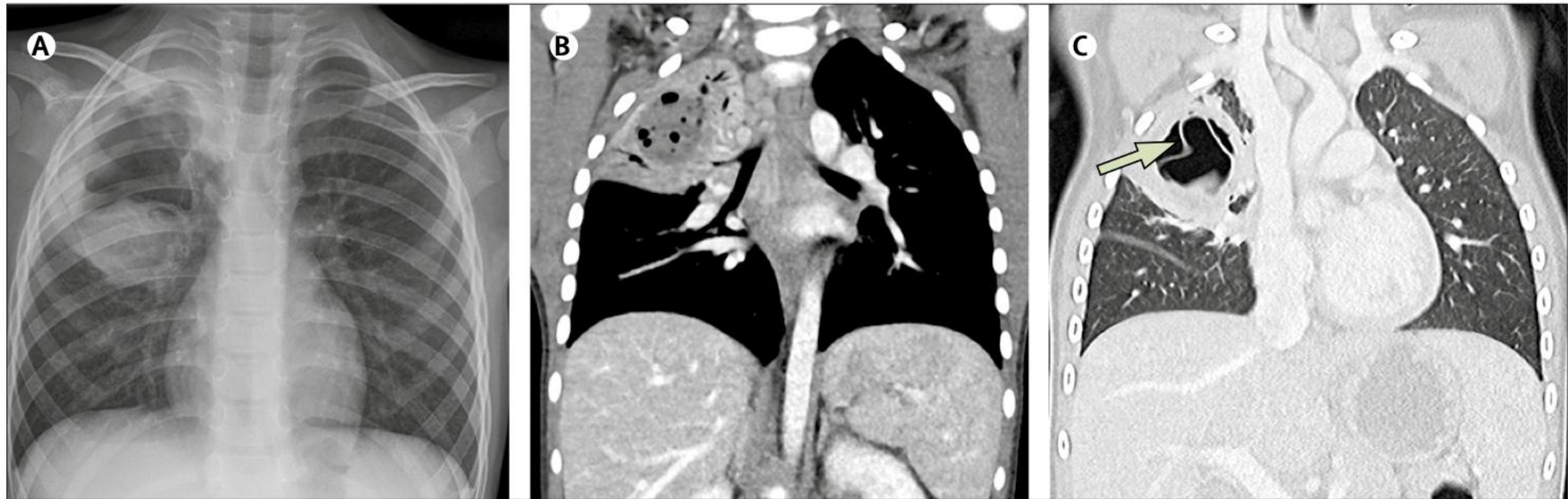


Figure: *Echinococcus granulosus* in a 5-year-old boy

(A) Chest x-ray shows an ill-defined, radiolucent, cavernous lesion of the right upper lobe with a radiopaque mass in its lower aspects and with pneumonic infiltrations to the adjacent lung. (B) Contrast-enhanced CT scan of the chest (coronal reconstruction) shows a large, cystic, fluid-containing mass with a thick, contrast-enhancing wall in the right upper lobe. (C) A corresponding lung window CT scan reconstruction shows marked consolidation of the adjacent lung parenchyma, with curvilinear septa within the lesion—the so-called water-lily sign (arrow).

Nourkami-Tutdibi N, et al. Lancet. 2019



Transmission by Inhalation

Organism	Human symptoms	Feline symptoms
<i>Bordetella bronchiseptica</i>	Asymptomatic to upper respiratory tract infections to pneumonia	Kennel cough
<i>Coxiella burnetii</i>	Q fever, including a self-limited flu-like illness, +/- pneumonia, +/- hepatitis, +/- endocarditis	Asymptomatic; infection may cause abortion or rapid death of newborn kittens
<i>Mycobacterium bovis</i>	Tuberculosis	Tuberculosis
<i>Yersinia pestis</i>	Plague	Similar to human disease



Bordetellosis

Bordetella bronchiseptica gram-negative coccobacillus that causes a pertussis-like illness (whooping cough) in humans, especially children.

It can be found in the respiratory tracts of healthy or clinically ill animals, including laboratory and domestic cats. **In a study of 100 cats with upper respiratory tract disease, 26% had infection with *B. bronchiseptica***

The prevalence is much higher in cats that live in congregated environments such as catteries or shelters.

While a cough is common in dogs infected with *B. bronchiseptica* (kennel cough), it is usually much less prominent in infected cats, which manifest the disease with fever, nasal discharge, sneezing, submandibular lymphadenopathy, and lethargy.

Vaccines are available for the protection of cats against this pathogen.

An attenuated intranasal product has been licensed for use in the United States.

Humans, especially immunocompromised hosts, may infrequently acquire the disease from cats

Goldstein EJC.Abrahamian FM. 2015. Diseases Transmitted by Cats. Microbiol Spectr 3:10.1128/microbiolspec.iol5-0013-2015.



Plague

Plague is caused by *Yersinia pestis*, a Gram-negative coccobacillus.

While cat fleas are considered poor vectors for transmission, domestic and wild cats may contract this disease, usually in the summer months. Cats are exposed through ingestion of an infected rodent or by their fleas.

Cats manifest plague in the same way as humans, with either the bubonic, septicemic, or pneumonic form.

The Centers for Disease Control and Prevention (CDC) has suggested that the risk of cat-associated human plague is likely to increase. There were 17 cases of plague reported in 2006.

Goldstein EJC.Abrahamian FM. 2015. Diseases Transmitted by Cats. Microbiol Spectr 3:10.1128/microbiolspec.iol5-0013-2015.



Tick or flea bites

Organism	Human symptoms	Feline symptoms	Geography
<i>B. burgdorferi</i>	Lyme disease	Lyme disease	Worldwide
<i>Ehrlichia chaffeensis</i> and <i>Anaplasma phagocytophilum</i>	Ehrlichiosis Anaplasmosis	Asymptomatic or similar to human disease	North America Few cases Europe, Africa, Mexico
<i>Babesia microti</i> (US); <i>Babesia divergens</i> (Europe)	Babesiosis	Asymptomatic or similar to human disease	Focal areas of United States and Europe
<i>Yersinia pestis</i>	Plague	Fever, loss of appetite, can have severe illness	Majority in south central United States
<i>Francisella tularensis</i>	Tularemia	Fever, loss of appetite, can have severe illness	Worldwide In the United States (Arkansas, Missouri Oklahoma)
<i>Rickettsia felis</i> or <i>typhi</i>	Rickettsiosis		America continent,
<i>Leishmania</i> spp.	Leishmaniasis		





	Organism	Human symptoms	Feline symptoms
Direct contact	Sporothrix schenckii	Sporotrichosis	Similar to human disease
	Microsporum canis	Dermatophyte; ringworm	Similar to human disease
	Methicillin-resistant Staphylococcus aureus	Asymptomatic; skin and soft tissue infection	Similar to human disease
	Dermatophytes	Dermatophytosis	Similar to human disease
Urine	Leptospira interrogans	Leptosiprosis, subclinical to severe, potentially fatal illness	Similar to human disease



Nosocomial outbreak of disseminated orf infection in a burn unit, Gaziantep, Turkey, October to December 2012

FIGURE 1

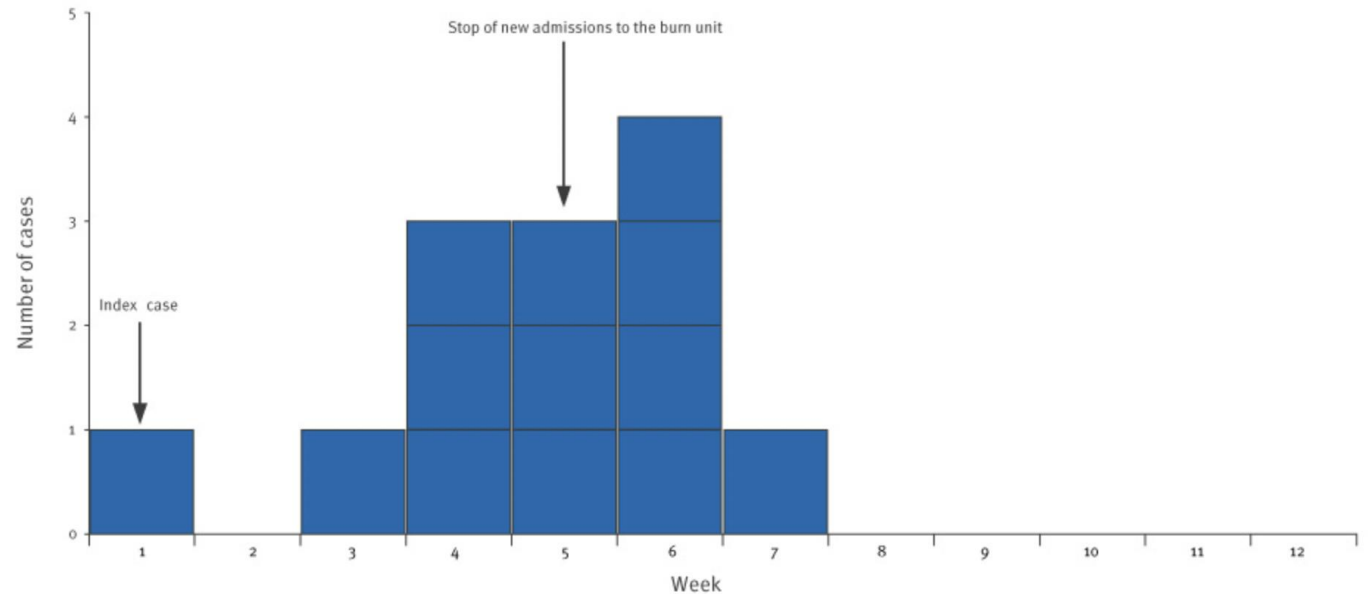
Weeping nodules of orf disease in a patient of a burn unit, Gaziantep, Turkey, November 2012



Originated from a sheep

FIGURE 4

Number of cases of orf disease in a hospital burn unit as a function of time, Gaziantep, Turkey, October 2012–January 2013 (n=13)



Midilli K, Erkiliç A, Kuşkucu M, Analay H, Erkiliç S, Benzonana N, Yildirim MS, Mülayim K, Acar H, Ergonul O. Euro Surveill. 2013



Helicobacteriosis

An increasing number of *Helicobacter* species, including *Helicobacter canis*, *Helicobacter felis*, *Helicobacter bilis*, *Helicobacter cinaedi*, *Helicobacter baculiformis*, and *Helicobacter heilmannii* have been isolated from the gastric mucosa of cats.

Helicobacter bizzozeronii (*H. heilmannii*) has been isolated from a few people with gastritis. In some reports, cats have been associated with disease, and one was considered causally related to human disease.

***Anaerobiospirillum* Diarrhea**

Anaerobiospirillum species are anaerobic spiral bacteria with bipolar tufts of flagella that have been associated with cases of human diarrhea. Two species, *Anaerobiospirillum succiniciproducens* and *Anaerobiospirillum thomasi*, have been isolated from cats with diarrhea

***Yersinia pseudotuberculosis* Gastroenteritis**

Y. pseudotuberculosis is a well-established cause of human diarrheal disease, diffuse abdominal illness sometimes mimicking acute appendicitis, and sepsis.



SOIL-BORNE SPREAD

Histoplasmosis

Histoplasma capsulatum is an imperfect dimorphic fungus that is endemic in the central United States and may be found in other temperate and tropical climates. The free-living mycelial stage of *H. capsulatum* grows in the soil and produces both micro- and macroconidia. Inhalation of microconidia leads to conversion to the yeast phase in the body and subsequent pulmonary infection, which in turn may lead to dissemination. Soil, organically enriched by bird droppings, is the most frequent source of human exposure. Cats are also susceptible to histoplasmosis, and common-source outbreaks involving animals and people have occurred. As with most systemic fungal infections, direct animal-to-animal or animal-to-human spread is unlikely. Cats less than 4 years old and female cats seem to be more prone to developing histoplasmosis. There is no breed predilection. Infected cats that develop disseminated disease usually die but may also develop ulcerated skin lesions. Direct cat-to-human transmission has not been reported. Histoplasmosis in cats can be treated with itraconazole. Human disease may be treated with itraconazole or amphotericin B.



Dogs

Transmission	Organism	Human symptoms	Canine symptoms
Infectious saliva	Rabies	Acute progressive encephalitis	Stages: prodromal, furious, and paralytic
	Pasteurella	Skin and soft-tissue infections, septic arthritis, osteomyelitis	Normal flora of oral cavity
	Capnocytophaga	Skin and soft-tissue infections, sepsis, meningitis	Normal flora of oral cavity
	Brucella	Fever of unknown origin; varied and nonspecific symptoms	Similar to human disease
Fecal	Salmonella Cryptosporidium Giardia	Asymptomatic or gastroenteritis	Asymptomatic or gastroenteritis
	Campylobacter	Abdominal pain and diarrhea	Asymptomatic or gastroenteritis
	Toxocara canis	Visceral larva migrans and ocular larva migrans	Asymptomatic
	Ancylostoma caninum	Cutaneous larva migrans	Asymptomatic
	Echinococcus granulosus	Hydatid cysts, echinococcosis	Hydatid cysts, echinococcosis
	Dipylidium caninum	Asymptomatic to abdominal pain, diarrhea, pruritus ani, and urticaria	Similar to human disease



Vectorborne Diseases among Dogs

Organism	Human symptoms	Canine symptoms	Geographic distribution
<i>B. burgdorferi</i>	Erythema migrans, Lyme disease (multisystem inflammatory disease)	Sudden onset lameness, swollen joints	Worldwide
<i>Rickettsia rickettsii</i>	Rocky Mountain spotted fever, Fever, headache, followed by rash	Similar to human disease	North America
<i>Ehrlichia chaffeensis</i> and <i>Anaplasma phagocytophilum</i>	Ehrlichiosis, Fever with variable symptoms (malaise, myalgias, headache)	Similar to human disease	Focal areas of United States
<i>Babesia microti</i> or <i>B. divergens</i>	Babesiosis, Asymptomatic to severe hemolytic anemia	Similar to human disease	<i>Babesia microti</i> (United States, primarily Northeast); <i>Babesia divergens</i> (Europe)
<i>Francisella tularensis</i>	Tularemia, Abrupt onset fever, chills, HA, single erythematous papuloulcerative lesion with eschar	Fever, loss of appetite	Majority in south central United States
<i>Yersinia pestis</i>	Plague, Abrupt onset fever, chills, HA Acute bubo	Self-limited illness	Worldwide except Australia; in United States, mostly Southwestern states
<i>Dirofilaria immitis</i>	Urticarial skin eruption; "coin lesion" in lung	Heartworm Most asymptomatic Exercise intolerance Hemoptysis	Worldwide; particularly common in the Mediterranean
<i>Leishmania</i>	Asymptomatic to cutaneous, mucocutaneous, or visceral disease	Similar to human disease	Focal areas of world



Transmission	Organism	Human symptoms	Canine symptoms
Aerosol	<i>Bordetella bronchiseptica</i>	Asymptomatic to upper respiratory tract infections to pneumonia	Kennel cough
	<i>Coxiella burnetii</i>	Q fever, including A self-limited flu-like illness, +/- pneumonia, +/- hepatitis, +/- endocarditis	Asymptomatic; infection may cause abortion or rapid death of newborn pups
Urine	<i>Leptospira interrogans</i>	Leptosiprosis, subclinical to severe, potentially fatal illness	Similar to human disease



Horses

Transmission	Organism
Fecal	Salmonella, Campylobacter, Cryptosporidium, Giardia lamblia, Clostridium difficile (but not to human)
Aerosol	Rhodococcus equi, Brucella spp, Coxiella burnetti, Streptococcus zooepidemicus
Mosquito borne	Equine encephalitis, West Nile Fever
Cutaneous	Burkholderia mallei
Saliva	rabies



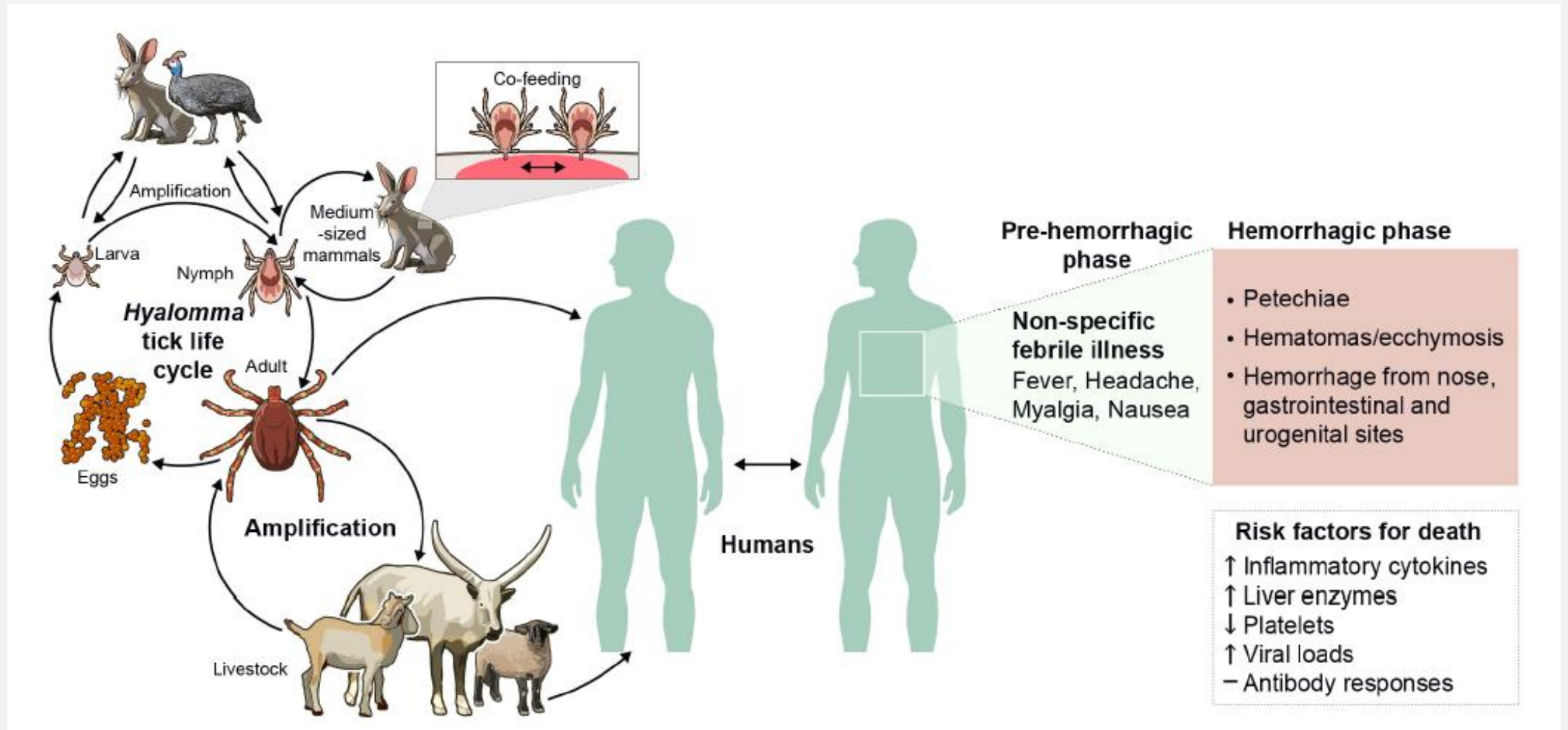
Rabbits

Transmission	Organism
Fecal	Salmonella, <i>Yersinia pseudotuberculosis</i> , Cryptosporidium, Hepatitis E
Aerosol	<i>Pasteurella multocida</i> , <i>Bordatella bronchiseptica</i>
Cutaneous	Trichophyton
Saliva	Rabies, <i>Francisella tularensis</i>



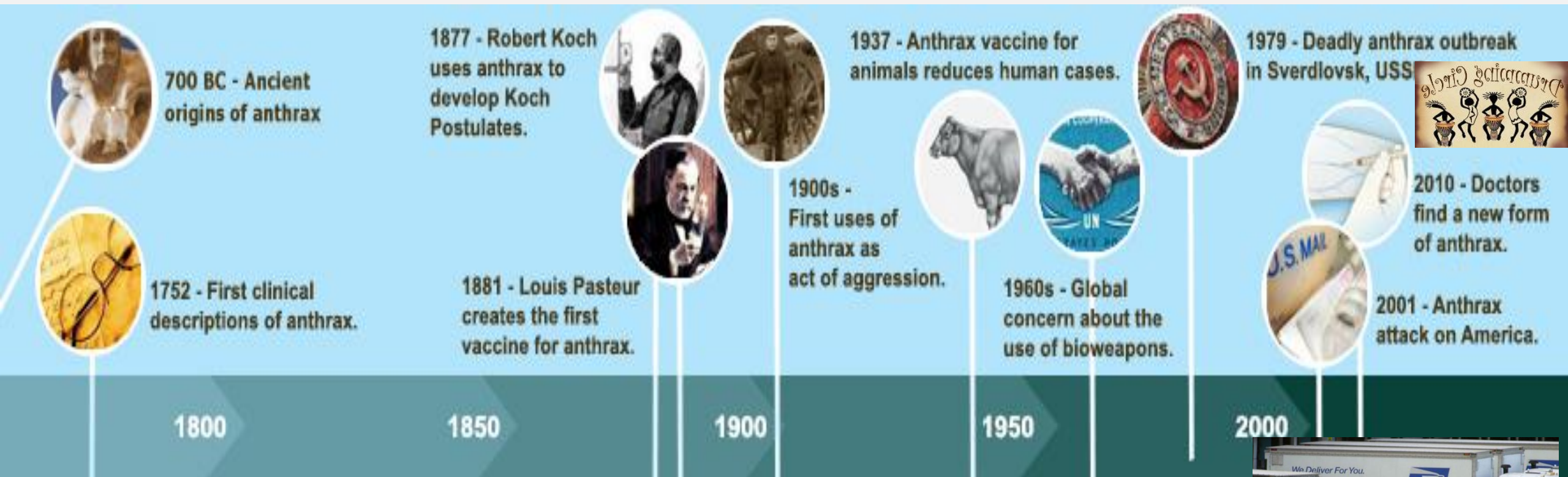
Dog and cat bites: Oral antibiotic regimens for prophylaxis and empiric treatment

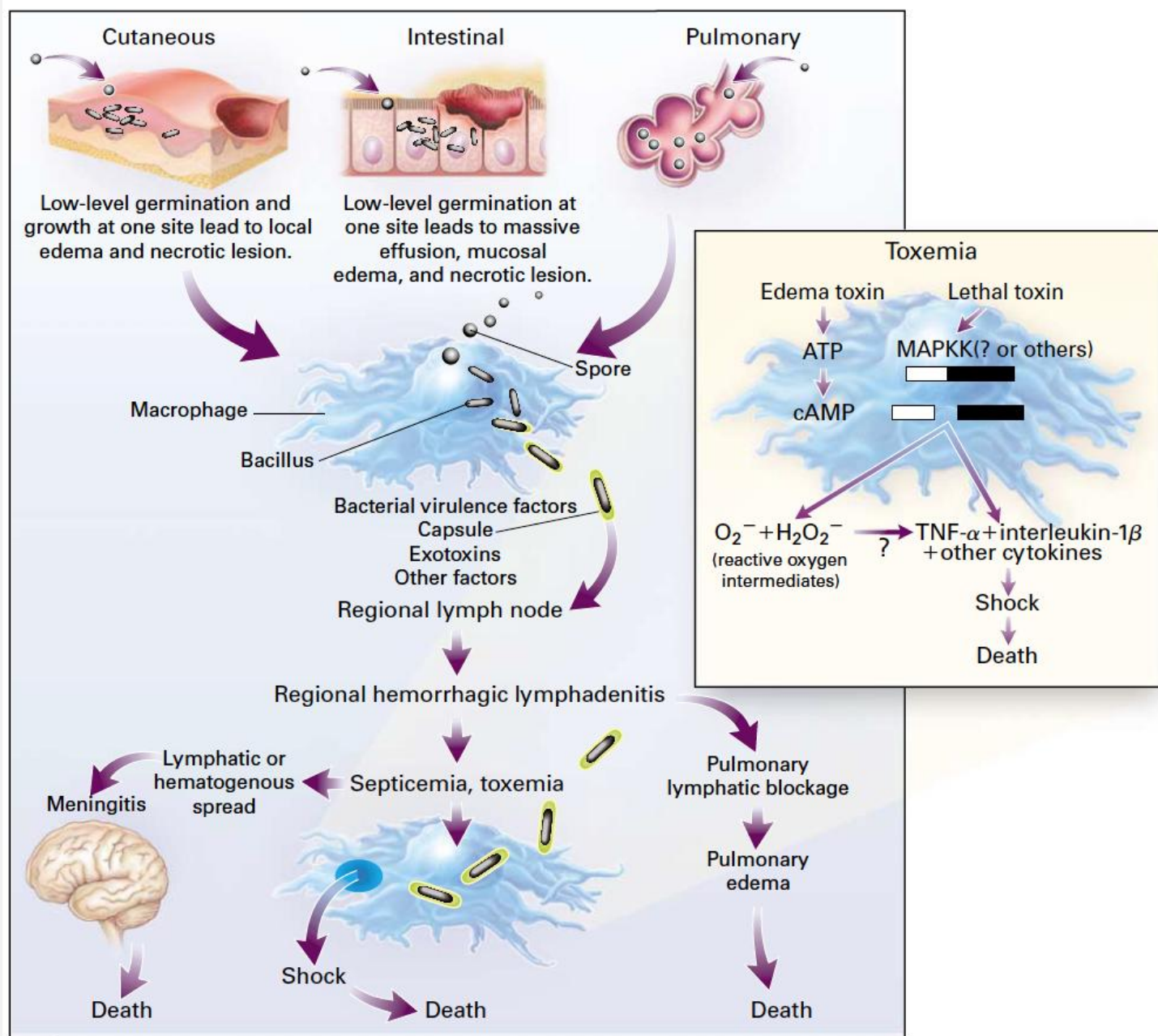
Antibiotic	Adults	Children and infants >28 days old ^[1]
Agent of choice		
Amoxicillin-clavulanate	875/125 mg twice daily	7:1 formulation: 22.5 mg/kg (amoxicillin component) twice daily (maximum 875 mg amoxicillin and 125 mg clavulanate per dose) or 4:1 formulation: 10 mg/kg (amoxicillin component) 3 times daily (maximum 500 mg amoxicillin and 125 mg clavulanate per dose) or 14:1 formulation: Not ideal for this use unless clinician increases the amoxicillin component dose to 45 mg/kg twice daily*
Alternate regimens include:[¶]		
Combination therapy with one of the following agents PLUS a second agent to cover anaerobes:		
Choose one of the following agents with activity against <i>Pasteurella multocida</i>^A and <i>Capnocytophaga</i>:		
Cefuroxime	500 mg twice daily	10 to 15 mg/kg twice daily (maximum 500 mg per dose)
Doxycycline ^{◇ §}	100 mg twice daily	1 to 2 mg/kg twice daily (maximum 100 mg per dose) [¥]
TMP-SMX [◇]	1 double-strength tablet twice daily	4 to 6 mg/kg (trimethoprim component) twice daily (maximum 160 mg trimethoprim per dose)
Levofloxacin [‡]	750 mg daily	Use with caution in children <18 years of age: [†] ▪ ≥6 months old and <50 kg: 8 to 10 mg/kg twice daily (maximum 375 mg per dose) ▪ ≥50 kg: 750 mg once daily
PLUS one of the following agents with anaerobic activity:		
Metronidazole	500 mg 3 times daily	10 mg/kg 3 times daily (maximum 500 mg per dose)
Clindamycin ^{◇, **}	300 to 450 mg 3 times daily	10 mg/kg 3 times daily (maximum 600 mg per dose)
Monotherapy		
Moxifloxacin ^{‡, ¶¶}	400 mg daily	Not recommended; insufficient experience





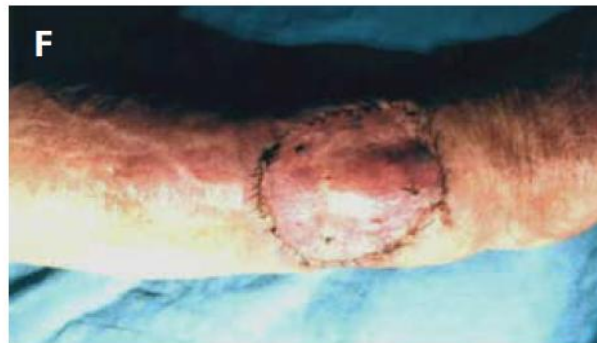
Anthrax in history







Malign Edema



A. 3. day: IV penisilin G

B. 11. day: Penisilin stop

C. 17 day

D. 28.day

E. 34.day: debridement of eschar

F. 44.day: new graft

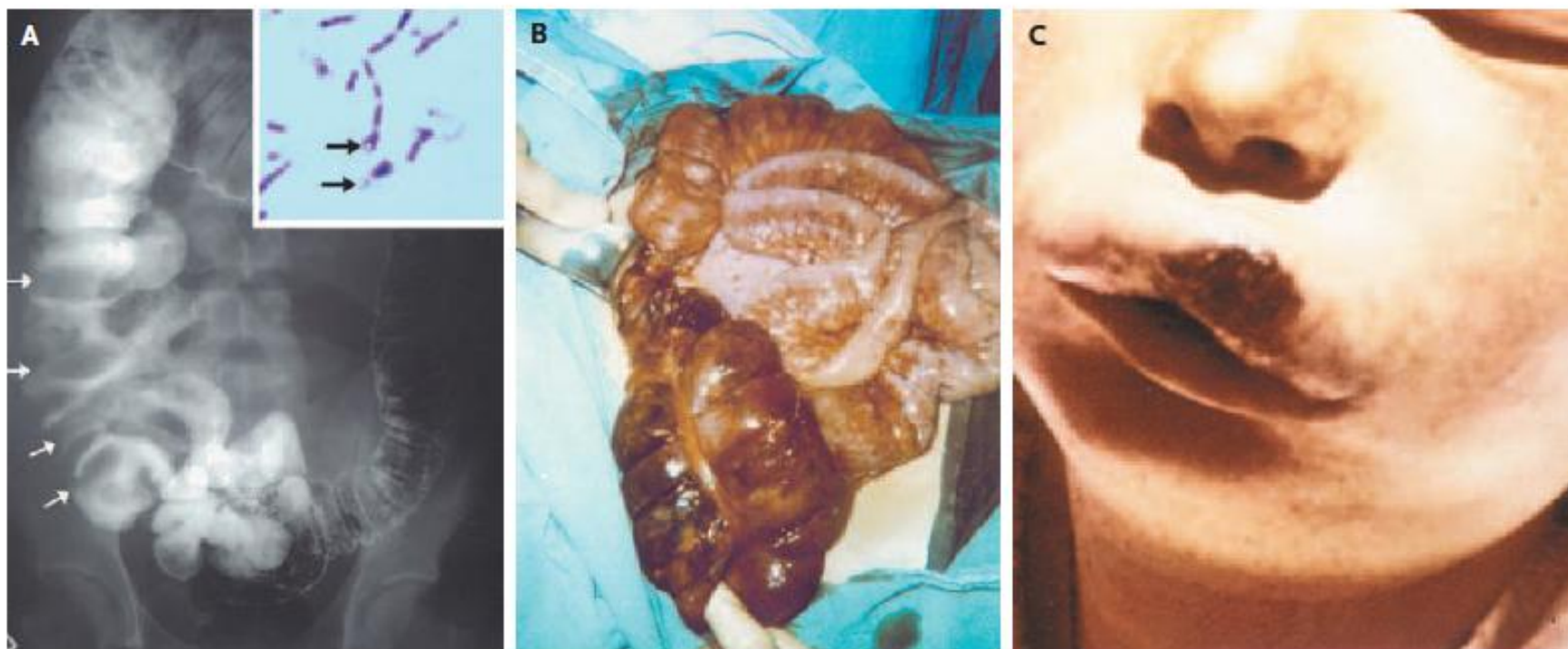
*Anthrax in humans and animals – 4th ed.
World Health Organization 2008*



FIGURE 209-4 Clinical and magnetic resonance imaging (MRI) appearance of cutaneous anthrax. **A**, Cutaneous anthrax with extensive non-tender swelling and erythema in a 7-month-old child in New York in 2001. **B**, MRI demonstrates extensive subcutaneous edema from shoulder to hand. (From Roche KJ, Chang MW, Lazarus H. Cutaneous anthrax infection: images in clinical medicine. N Engl J Med. 2001;345:1611. Copyright © 2001 Massachusetts Medical Society. All rights reserved.)



Anthrax of the Cecum



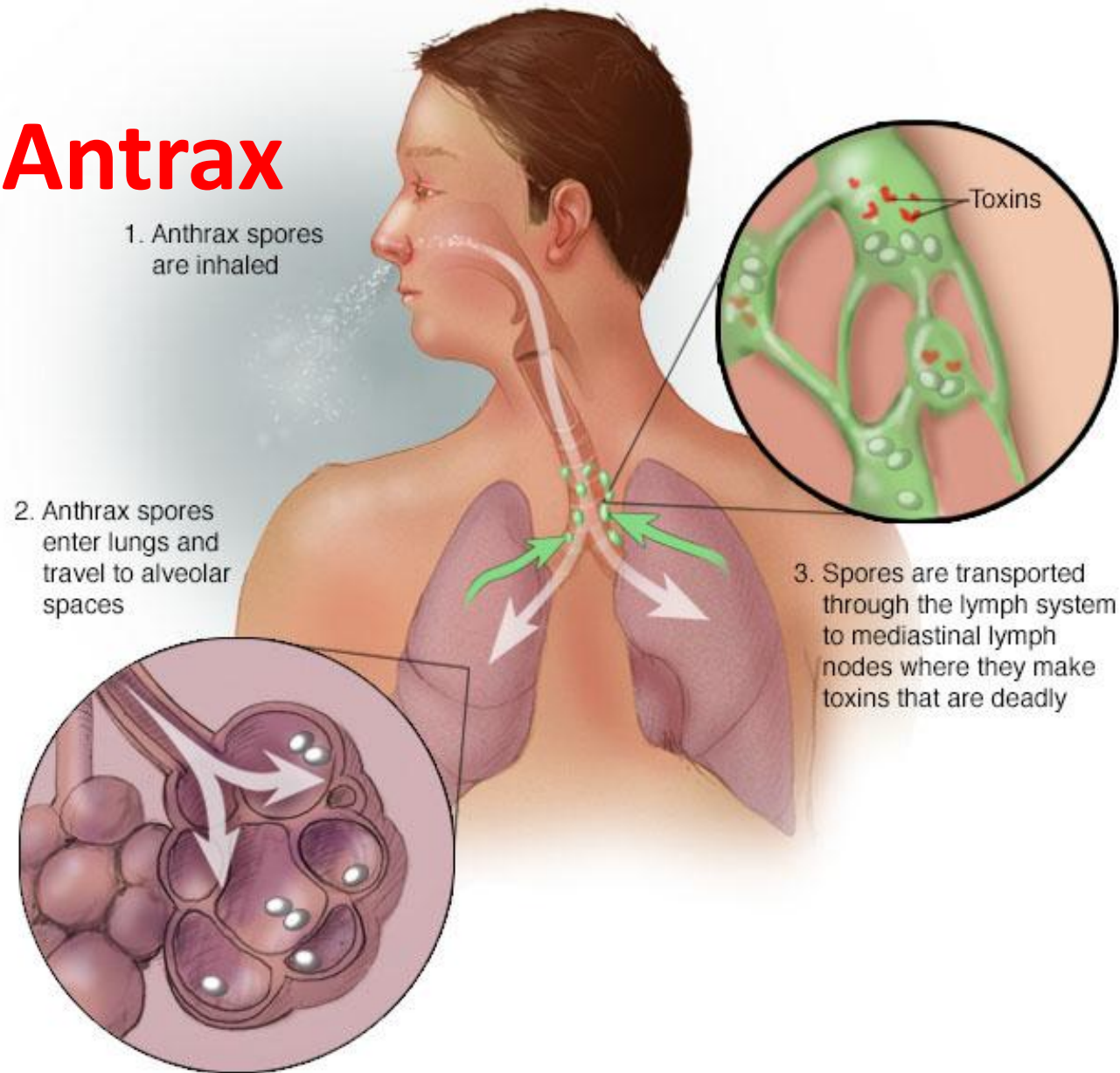
Antoine Ghossain, M.D.

Rizk Hospital
Beirut 1107-2130, Lebanon

A 25-YEAR-OLD MAN WAS ADMITTED FOR PAIN AND DISTENTION OF THE abdomen. He had a three-day history of dizziness, fatigue, myalgia, and mild fever. On physical examination, he was in shock, with ascites and oculofacial congestion. Bowel sounds were absent. A doughy mass in the right inferior fossa was palpable and slightly tender. The peripheral white-cell count was 16,000 cells per cubic millimeter (78 percent neutrophils), and the hematocrit was 40 percent. A radiograph



Inhalational Anthrax





Worldwide incidence of Human Brucellosis

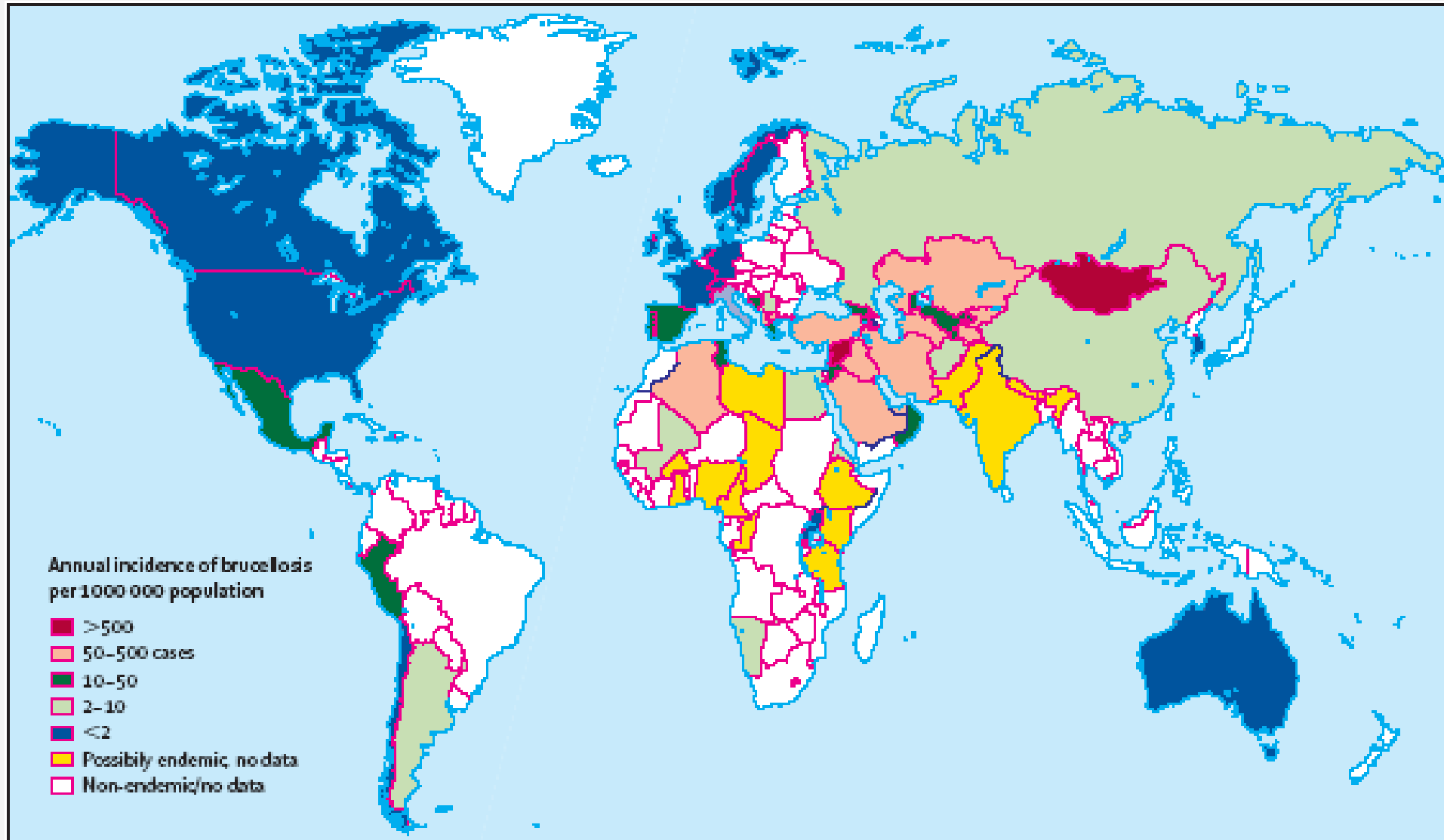


Figure 1: Worldwide Incidence of human brucellosis



Species	Biovar/ Sero var	Natural Host	Human Pathogen
B. abortus	1-6, 9	cattle	yes
B. melitensis	1-3	goats, sheep	yes
B. suis	1, 3	swine	yes
	2	hares	yes
	4	reindeer, caribou	yes
	5	rodents	yes
B. canis	none	dogs, other canids	yes
B. ovis	none	sheep	no
B. neotomae	none	Desert wood rat	no
B. maris		marine mammals	?



Transmission

1. Gastrointestinal

- Raw milk & unpasteurized dairy products

2. Conjunctiva or broken skin contacting infected tissues

- Blood, urine, vaginal discharges, aborted fetuses, placentas

3. Inhalation of infectious aerosols

- Laboratory workers



Fastidious & aerobic
Facultative intracellular
Gram negative non motile
cocobacilli



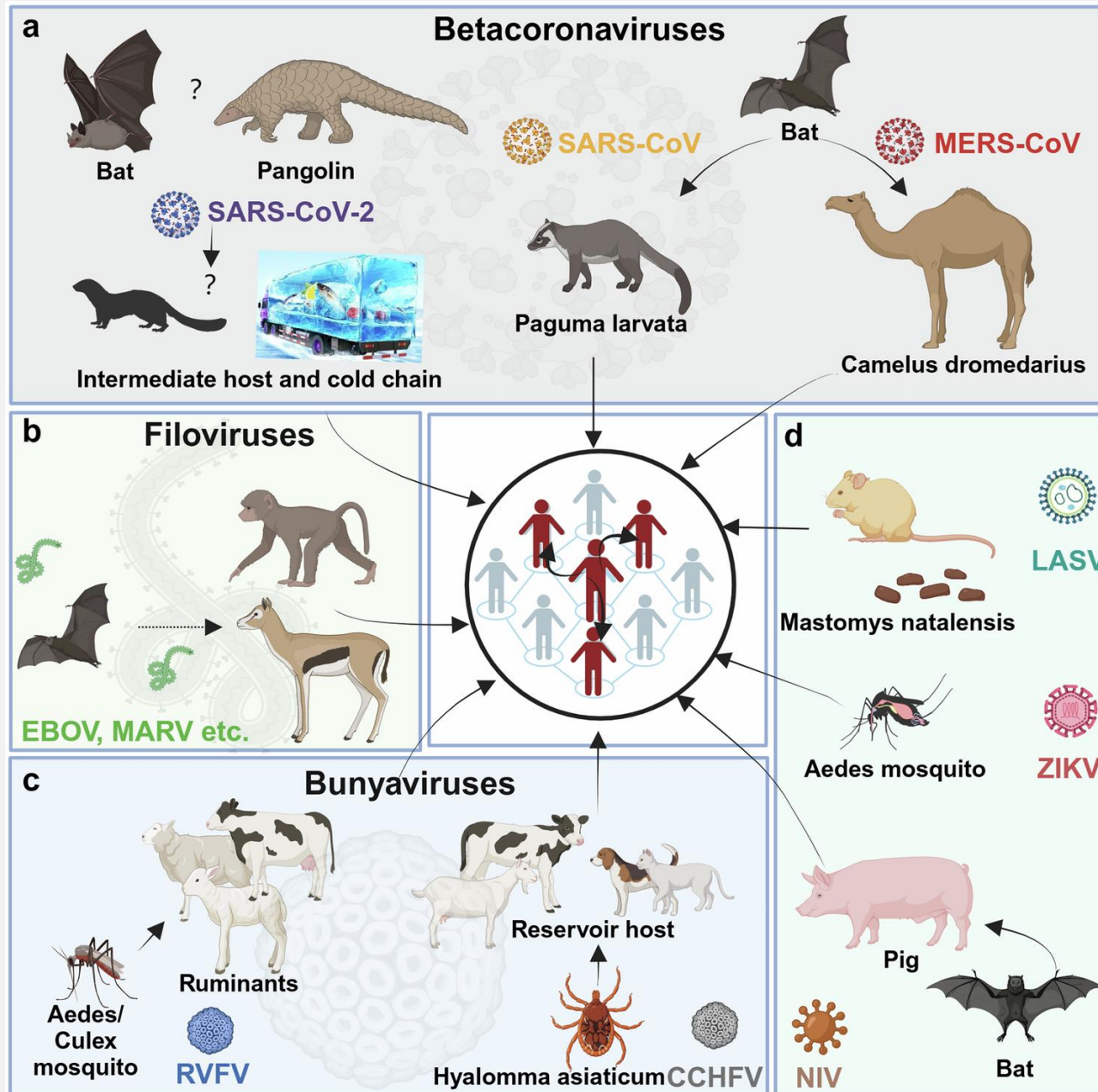
Rodents

Transmission	Organism
Fecal	Salmonella (typhoidal and non-typhoidal), <i>Yersinia pseudotuberculosis</i> , Cryptosporidium, Hepatitis E
Aerosol	Lymphocytic choriomeningitis virus, leptospirosis, Mpox, Hantavirus
Cutaneous	Tricophyton
Saliva	Rabies, <i>Yersinia pestis</i> , <i>Francisella tularensis</i> , Rat bite fever (<i>Spirillum minus</i>)
Wild rodents:	Chlamydia psittaci, Cryptococcus neoformans



Fish

Transmission	Organism
Cutaneous	<i>Mycobacterium marinum</i>
	<i>Burkholderia pseudomallei</i>
	<i>Erysipelothrix rhusiopathiae</i>
	<i>Vibrio vulnificus</i>



Emerging and reemerging infectious diseases

Wang, S., Li, W., Wang, Z. *et al.* Emerging and reemerging infectious diseases: global trends and new strategies for their prevention and control. *Sig Transduct Target Ther* **9**, 223 (2024)



Thank you



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