The Emergence of Zoonoses: Downstream Impacts on Human Healthcare and Long-term Care

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CONFLICT OF INTEREST DISCLOSURE

Grant/Research Support: Merck Animal Health

Speaker's Bureau: Zoetis, Merck Animal Health, Virox, Elanco

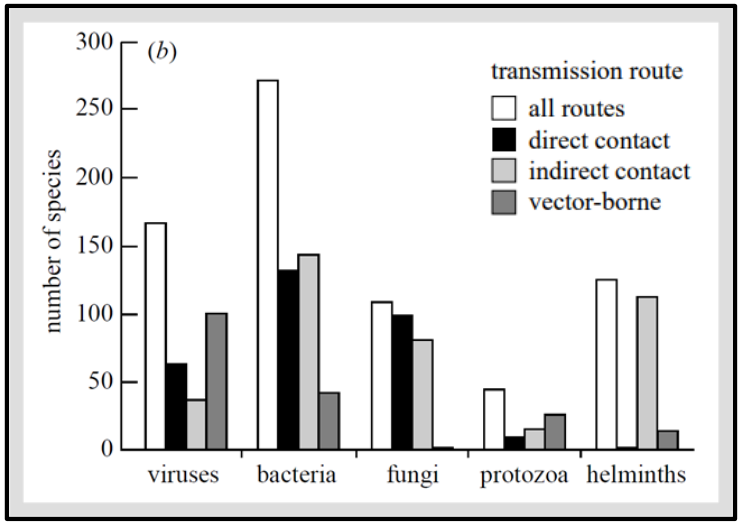
Consultant: Zoetis, Merck Animal Health, Virox, AVMA

OBJECTIVES

- **Recall the recognized drivers for the emergence and spread of zoonotic diseases**
- **Examine previous and likely future examples (and healthcare impacts) of emerging zoonoses, notably those linked to companion animals**
- **Identify approaches, both local and global, to mitigate and prevent emerging zoonoses**

INFECTIOUS AND ZOONOTIC DISEASES

Predicted by 2050, infectious diseases will be the number one killer globally, surpassing heart disease



Zoonoses: infectious agent transmissible between a vertebrate animal reservoir and humans under natural conditions

Of 1,415 species pathogenic to people

- **61% zoonotic**
- **75% emerging pathogens zoonotic**

Taylor 2001

EMERGING/RE-EMERGING ZOONOSIS

"Pathogen that is newly recognized or newly evolved, or that has occurred previously but shows an increase in incidence or expansion in geographical, host, or vector range"

WHO/FAO/OIE 2004 Joint Conference Geneva

Zoonotic Pathogens Causing Recent Epidemics

Zoonotic pathogen	Reservoir host/Vector	Disease (key syndromes)	Major recent epidemics
SARS-CoV	Likely bats	SARS (pneumonia)	Global (2002–2003)
MERS-CoV	Dromedary camels	MERS (pneumonia)	Saudi Arabia, South Korea (2012–2019)
SARS-CoV-2	Unknown	COVID-19 (pneumonia)	Global (2020–present)
Ebola virus	Likely bats	Ebola virus disease (haemorrhagic fever)	West Africa (2013–2016) DRC (2018–2020)
Lassa virus	Multimammate rat	Lassa fever (haemorrhagic fever)	Nigeria (2018)
Rift valley fever virus	*Aedes* and *Culex* mosquitoes	Rift valley fever (haemorrhagic fever)	East Africa (2006–2007)
Zika virus	*Aedes* mosquitoes	Zika virus disease (arthralgia/myalgia, rash)	Brazil, Americas (2015–2016)
Chikungunya virus	*Aedes* mosquitoes	Chikungunya fever (arthralgia/myalgia, rash)	Indian Ocean Islands, India (2004–2007)
Dengue virus	*Aedes* mosquitoes	Dengue fever (arthralgia/myalgia, rash, haemorrhage)	Americas (2010)
West Nile virus	Birds/*Culex* mosquitoes	West Nile disease (meningitis/encephalitis, paralysis)	United States (2002)
Influenza A viruses	Waterfowl, Poultry, Pigs	Influenza (pneumonia)	Global (2009)
Yersinia pestis	Rats/Fleas	Plague (sepsis, pneumonia)	Madagascar (2017)
Brucella spp.	Cattle, sheep, goats	Brucellosis (undulant fever, endocarditis)	China (2020)
Coxiella burnetii	Cattle, sheep, goats	Q fever (pneumonia, hepatitis)	Netherlands (2007)

Judson, S. Zoonoses and global epidemics. 2021

Majority of homes have at least 1 pet

- Dog or cat (>50%)
- Fish
- Birds
- Rabbits, hamsters, guinea pigs, gerbils, ferrets, snakes, frogs, turtles, lizards

TABLE 4 Weighted reported exposures to animals, animal food and animal-related venues in the last 7 days, among urban and rural respondents, 2014–2015, Canada

	Urban		Rural		National	
Exposure	%	95% CI	%	95% CI	%	95% CI
Animals or animal food/waste/habitat	58.6*	55.3, 61.8	74.1*	71.5, 76.6	63.4	60.9, 65.8
Cat	28.2*	25.5, 31.0	40.3*	37.1, 43.6	31.9	29.8, 34.2
Dog	37.9*	34.9, 41.0	55.4*	52.2, 58.4	43.3	40.9, 45.7
Bird	2.6	1.9, 3.6	2.5	1.9, 3.1	2.6	2.0, 3.3
Reptile	1.7	1.0, 2.6	1.6	1.2, 2.3	1.6	1.2, 2.3
Amphibian	1.3	0.6, 2.8	1	0.6, 1.5	1.2	0.7, 2.2
Rodent/pocket pet	2.7*	2.0, 3.7	5.1*	3.8, 6.8	3.4	2.8, 4.3
Fish/aquarium	4.3	2.9, 6.3	5.2	4.0, 6.7	4.5	3.5, 5.9
Cow	1.2*	0.6, 2.4	6.5*	5.0, 8.5	2.9	2.2, 3.8
Goat/Sheep/Lamb	1.2*	0.6, 2.5	3.9*	2.7, 5.7	2.1	1.4, 3.0
Horse	1.9*	1.4, 2.5	6.8*	5.4, 8.5	3.4	2.4, 4.1
Pig	0.9	0.4, 2.1	1.8	1.1, 3.0	1.2	0.7, 2.0
Poultry/Baby poultry	1.6*	0.9, 2.8	5.5*	4.2, 7.3	2.8	2.1, 3.7
Any farm animal	3.9*	2.9, 5.4	14.6*	12.4, 17.1	7.2	6.2, 8.5
Handled dry pet food	39.6*	36.5, 42.7	50.8*	47.6, 54.0	43.0	40.6, 45.5
Handled canned/wet pet food	12.0	10.2, 14.0	12.6	11.1, 14.2	12.1	10.8, 13.6
Handled raw pet food	2.5*	2.0, 3.2	6.5*	4.0, 10.3	3.8	2.8, 5.0
Handled treats derived from animal parts	7.9	6.3, 9.9	9.1	7.6, 11.0	8.3	7.1, 9.8
Handled processed animal treats	21.7*	19.2, 24.4	27.4*	24.4, 30.6	23.5	21.5, 25.6
Handled rodents/ insects for reptiles	1.4	0.7, 2.6	1.2	0.7, 2.1	1.3	0.8, 2.1
Handled farm animal/ livestock feed	1.8*	1.1, 2.9	8.4*	6.6, 10.7	3.8	3.1, 4.8
Visit petting zoo	1.1	0.5, 2.2	1.2	0.7, 2.1	1.1	0.7, 1.9
Visit farm	4.6*	3.2, 6.3	12.0*	10.2, 14.2	6.9	5.7, 8.2
Visit agriculture fair	0.9	0.5, 1.7	2.1	1.1, 3.9	1.3	0.8, 2.0
Visit pet store	4.6	3.6, 5.8	4.3	3.3, 5.6	4.5	3.7, 5.4

*Significant at the critical *p*-value of 0.05.

Raschkowan A, et al. Measuring animal exposure in Canada: Foodbook study, 2014–2015

PETS INCORPORATED INTO HUMAN HEALTHCARE

- Builders of social capital
- Harm reduction
- Motivators for healthy behavior change
- Participants in treatment plans

Source: Pixabay

Hodgson et al., 2015


Check their papers-- they're probably forged!
They'll scratch the furniture...And they'll transmit ringworm!

Box 2: Pathogens of particular concern in pet-associated infections

Pathogen	Key pet sources	Disease in high-risk patients (age < 5 or ≥ 65 yr, immunocompromised or pregnant)	
		Incidence	Severity
Bacterial diseases			
Bartonella species	Cats (*B. clarridgeiae*, *B. henselae*); rodents, rabbits, and dogs (*B. alsatica*, *B. vinsonii* species)	Low (likely underdiagnosed)	Low to high
Brucella canis	Dogs	Rare	Moderate
Campylobacter jejuni	Dogs, cats (likely other species)	High	Low
Capnocytophaga canimorsus	Dogs, cats	Rare	High
Chlamydophila psittaci	Birds	Rare	Moderate
Leptospira interrogans	Dogs, cats, rodents	Low	Moderate
Multidrug-resistant bacteria (e.g., MRSA, *Clostridium difficile*, ESBL-producing organisms)	Likely all species (although data limited)	Variable	Variable
Mycobacterium marinum	Fish	Rare	Low
Pasteurella multocida	Dogs, cats	Moderate	Moderate
Salmonella species	All species; high prevalence in amphibians, reptiles, exotic animals, rodents and young poultry, in addition to certain raw pet foods (e.g., meat, eggs and animal product treats, such as pig's ears)	Moderate	Moderate (particularly in newborns and patients with sickle cell anemia)
Parasitic diseases			
Cutaneous larva migrans (hookworms; canine and feline)	Dogs, cats (particularly juvenile animals)	Low to high (depending on geography)	Low
Cryptosporidium species	Dogs, cats, possibly birds	Moderate	Moderate

Stull JW, et al. CMAJ 2015

PET-ASSOCIATED DISEASE

70+ pathogens of pets transmissible to people

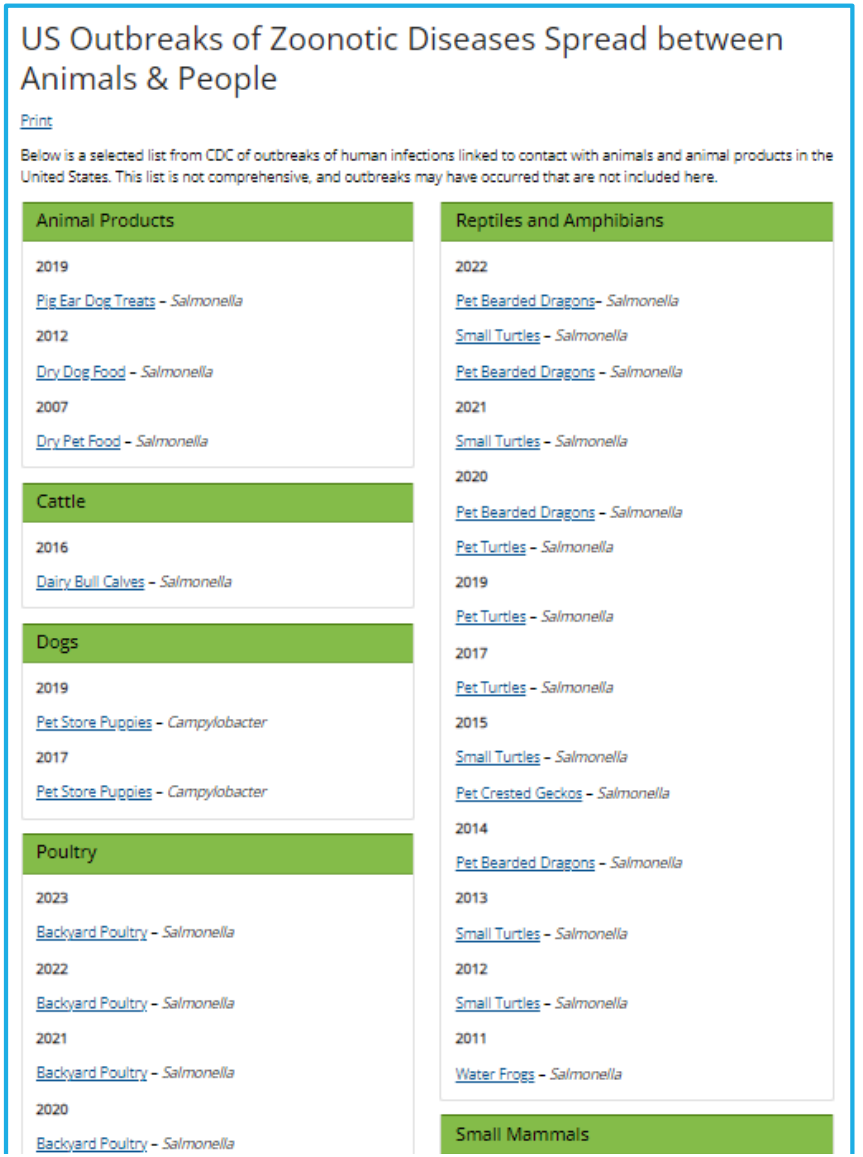
Pets often subclinical shedding

Emerging & remerging diseases

Animal and human reservoirs

Animals visiting/living at human healthcare facilities

Lefebvre 2009; https://www.cdc.gov/healthypets/outbreaks.html



US Outbreaks of Zoonotic Diseases Spread between Animals & People

Print

Below is a selected list from CDC of outbreaks of human infections linked to contact with animals and animal products in the United States. This list is not comprehensive, and outbreaks may have occurred that are not included here.

Animal Products

2019

Pig Ear Dog Treats – *Salmonella*

2012

Dry Dog Food – *Salmonella*

2007

Dry Pet Food – *Salmonella*

Cattle

2016

Dairy Bull Calves – *Salmonella*

Dogs

2019

Pet Store Puppies – *Campylobacter*

2017

Pet Store Puppies – *Campylobacter*

Poultry

2023

Backyard Poultry – *Salmonella*

2022

Backyard Poultry – *Salmonella*

2021

Backyard Poultry – *Salmonella*

2020

Backyard Poultry – *Salmonella*

Reptiles and Amphibians

2022

Pet Bearded Dragons– *Salmonella*

Small Turtles – *Salmonella*

Pet Bearded Dragons – *Salmonella*

2021

Small Turtles – *Salmonella*

2020

Pet Bearded Dragons – *Salmonella*

Pet Turtles – *Salmonella*

2019

Pet Turtles – *Salmonella*

2017

Pet Turtles – *Salmonella*

2015

Small Turtles – *Salmonella*

Pet Crested Geckos – *Salmonella*

2014

Pet Bearded Dragons – *Salmonella*

2013

Small Turtles – *Salmonella*

2012

Small Turtles – *Salmonella*

2011

Water Frogs – *Salmonella*

Small Mammals

FACTORS INFLUENCING EMERGENCE

Movement and distribution of people and animals

Encroachment into wildlife habitats

Ownership of companion animals and 'status' of animals within households

Exotic animal trade

Adaptation (resistance, epidemiology)

Vectors (ticks, fleas)


Examples

SARS-COV-2 (COVID)

Companion and farmed animals tested for SARS-CoV-2 under field conditions

	Clinical signs	Detection of viral RNA	Sero-conversion	Number of references
Companion animals				
Dog *Canis lupus familiaris*	✔	✔	✔	58
Domestic cat *Felis catus*	✔	✔	✔	78
Ferret *Mustela furo*	✔	✔	✔	4
Rabbit *Oryctolagus cuniculus*	✘	✘	✔	4
Syrian hamster *Mesocricetus auratus*	✘	✔	✔	2
Farmed animals				
Cattle *Bos taurus*	✘	✘	✔	3
Mink *Neogale vison*	✔	✔	✔	12
White-tailed deer *Odocoileus virginianus*	✘	✘	✔	2

Symbols: ✔ detected ✘ not detected

EFSA AHAW Panel. SARS-CoV-2 in animals: susceptibility of animal species, risk for animal and public health, monitoring, prevention and control. 2023

Zoo and wild animals tested for SARS-CoV-2 under field conditions

Zoo animals	Detection of viral RNA	Sero-conversion	Number of references
Lion *Panthera leo*	✔	✔	7
Puma *Puma concolor*	✔	✖	1
Tiger *Panthera tigris*	✔	✔	6
Wild or feral animals			
Badger *Meles meles*	✖	✔	1
Bat *Rhinolophus acuminatus*	✖	✔	1
Jackal *Canis aureus*	✖	✖*	2
Marten *Martes sp.*	✖	✔	2
Mink *Neogale vison*	✔	✖	3
Leopard *Panthera pardus*	✔	✖	1
Pangolin *Manis javanica*	nd	✔	1
Red fox *Vulpes vulpes*	✖	✖*	2
Wild boar *Sus scrofa*	✖	✖*	2
White-tailed deer *Odocoileus virginianus*	✔	✔	6

Symbols ✔ detected ✖ not detected nd not determined

* some were positive in ELISA but negative in confirmatory test, and thus considered false positive.
Large signs indicate that >1 animal was tested in at least one of the studies

EFSA AHAW Panel. SARS-CoV-2 in animals: susceptibility of animal species, risk for animal and public health, monitoring, prevention and control. 2023

Transmission of SARS-CoV-2 Delta variant (B.1.617.2) from a fully vaccinated human to a canine in Georgia, July 2021

Suspected Cat-to-Human Transmission of SARS-CoV-2, Thailand, July–September 2021

Thanit Sila, Jutapoln Sunghan, Wison Laochareonsuk, Smonrapat Surasombatpattana, Chanon Kongkamol, Thammasin Ingviya, Pisud Siripaitoon, Narongdet Kositpantawong, Siripen Kanchanasuwan, Thanaporn Hortiwakul, Boonsri Charernmak, Ozioma Forstinus Nwabor, Kachornsakdi Silpapojakul, Sarunyou Chusri

Contribution of cats and dogs to SARS-CoV-2 transmission in households

Egil A. J. Fischer [1*†], Els M. Broens[1], Hans S. Kooistra[1], Myrna M. T. De Rooij[1], Jan Arend Stegeman[1] and Mart C. M. De Jong[2†]

[1]Faculty Veterinary Medicine, Utrecht University, Utrecht, Netherlands, [2]Department of Quantitative Veterinary Epidemiology, Wageningen University, Wageningen, Netherlands

INFLUENZA A VIRUSES

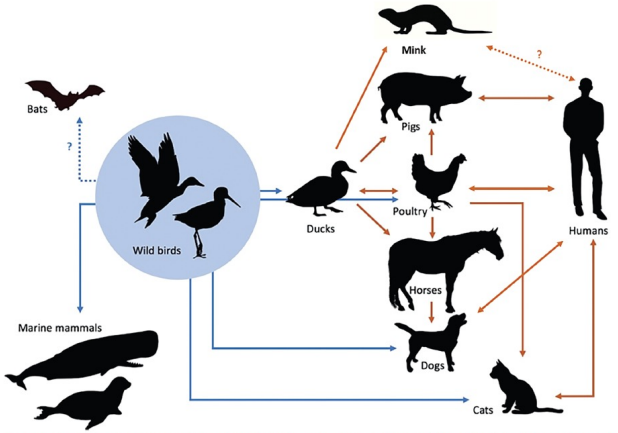


Figure 2—Emergence and transmission of influenza A viruses from aquatic wild bird reservoirs and zoonotic and reverse zoonotic events involving veterinary species. *Adapted from Frymus, T., Belák, S., Egberink, H., Hofmann-Lehmann, R., Marsilio, F., Addie, D.D., Boucraut-Baralon, C., Hartmann, K., Lloret, A., Lutz, H., et al. 2021. Influenza Virus Infections in Cats. Viruses 13, 1435.* https://doi.org/10.3390/v13081435. Used under the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

Reservoir waterfowl

Causes minimal to no clinical signs in waterfowl

Virus shed in high numbers in the feces and respiratory tract

Very contagious among birds

Close human contact with backyard birds

- **21% with flocks allowed birds to come into the house**

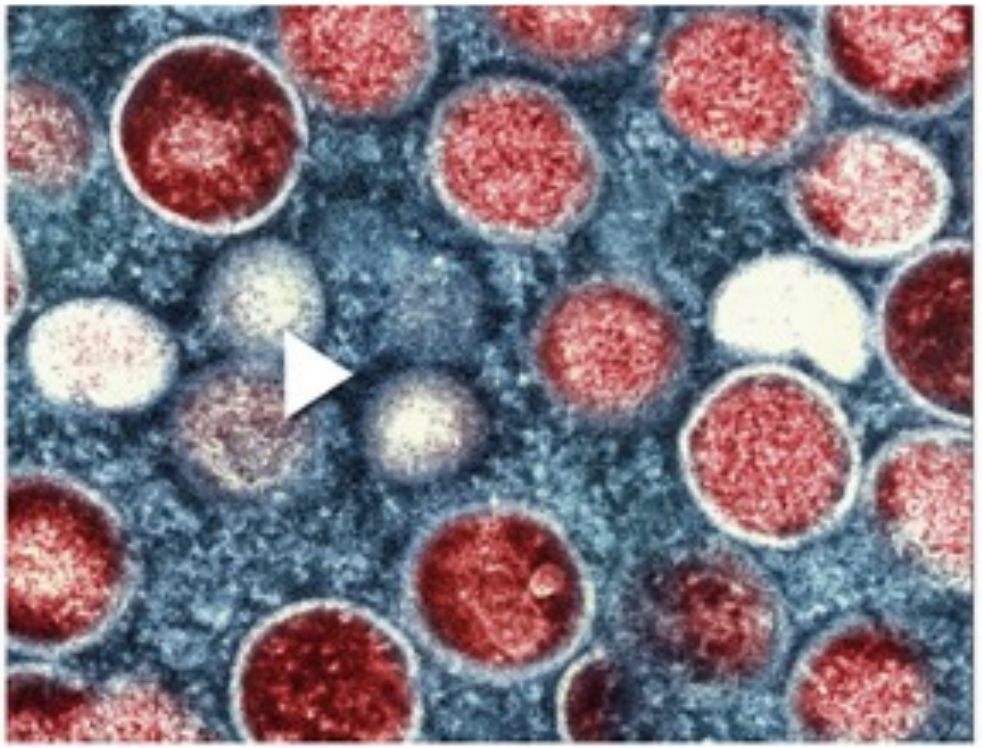
HPAI (H5N1) Outbreak (2022-Present)

- **US: 325 commercial flocks, 514 backyard flocks, 58.8 million commercial/backyard birds affected**
- **Infection with clinical disease in many animal species, incl dogs and cats**
- **Currently low risk for human infection/illness…however…**

Paphitis K. Can Vet J. 2023 Kibenge F. Amer J Vet Res. 2023

HEALTH | News

Sporadic new mpox cases in Canada have experts urging vaccination ahead of summer



Alexandra Mae Jones
CTVNews.ca writer
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As the weather warms and Canadians start looking forward to summer travel and festivities, some experts are echoing a call made by health officials in Europe and the U.K. to be on the lookout in case mpox makes a return this summer.

Evidence of human-to-dog transmission of monkeypox virus

Human monkeypox virus is spreading in Europe and the USA among individuals who have not travelled to endemic areas.[1] On July 23, 2022, monkeypox was declared a Public Health Emergency of International Concern by WHO Director-General Tedros Adhanom Ghebreyesus.[2] Human-to-human transmission of monkeypox virus usually occurs through close contact with the lesions, body fluids, and respiratory droplets of infected people or animals.[3] The possibility of sexual transmission is being investigated, as the current outbreak appears to be concentrated in men who have sex with men and has been associated with unexpected anal and genital lesions.[3,4] Whether domesticated cats and dogs could be a vector for monkeypox virus is unknown. Here we describe the first case of a dog with confirmed monkeypox virus infection that might have been acquired through human transmission.

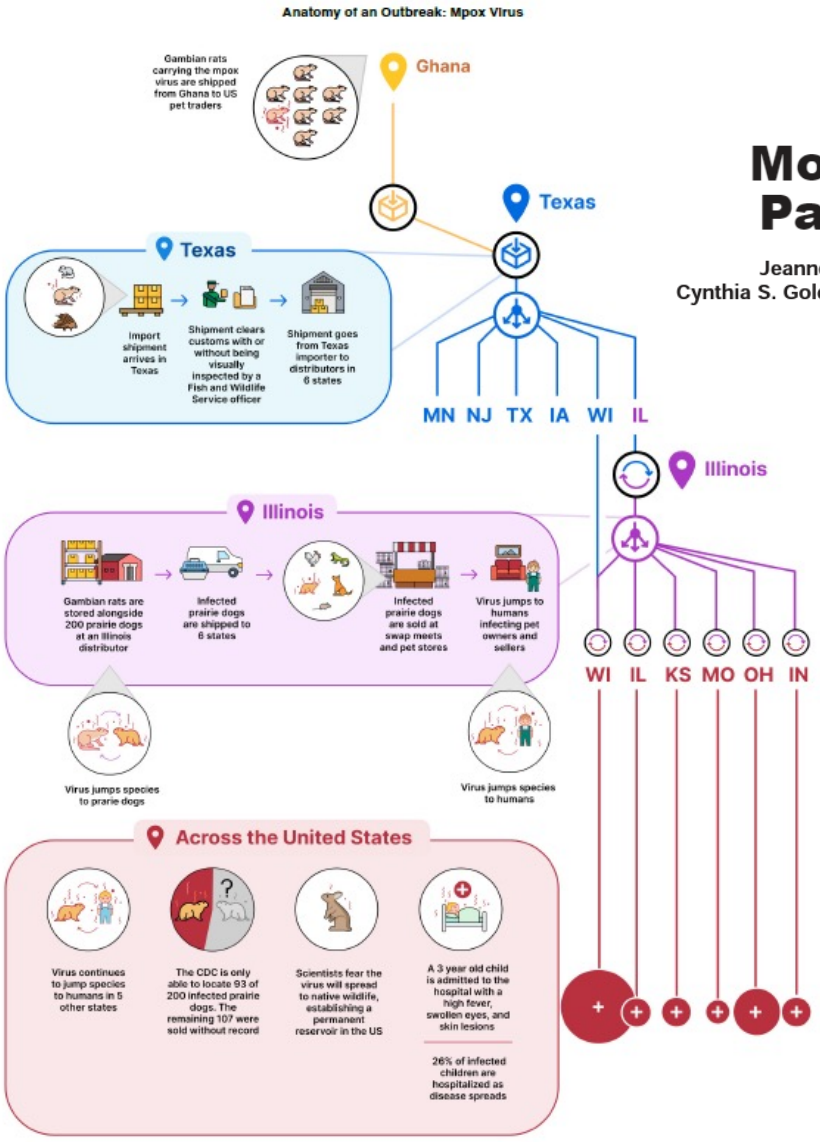
Two men who have sex with men attended Pitié-Salpêtrière Hospital, Paris, France, on June 10, 2022 (appendix). One man (referred to as patient 1 going forward) is Latino, aged 44 years, and lives with HIV with undetectable viral loads on antiretrovirals; the second man (patient 2) is White, aged 27 years, and HIV-negative. The men are non-exclusive partners living in the same household. They each signed a consent form for the use of their clinical and biological data, and for the publication of anonymised photographs. The men had presented with anal ulceration 6 days after sex with other partners. In

patient 1, anal ulceration w
by a vesiculopustular rash c
ears, and legs; in patient 2,
and back (figure A, B). In t
rash was associated with
headaches, and fever 4 day

Monkeypox virus was a
real-time PCR (LightCycler 4
Roche Diagnostics, Meylan,
patient 1, virus was detec
and oropharynx samples;
patient 2, virus was detec
and oropharynx samples.

12 days after sympto
their male Italian gr
aged 4 years and with n
medical disorders, prese
mucocutaneous lesions,
abdomen pustules and a
ulceration (figure C, D; app
dog tested positive for m
virus by use of a PCR protoc
from Li and colleagues[5] tha
scraping skin lesions and

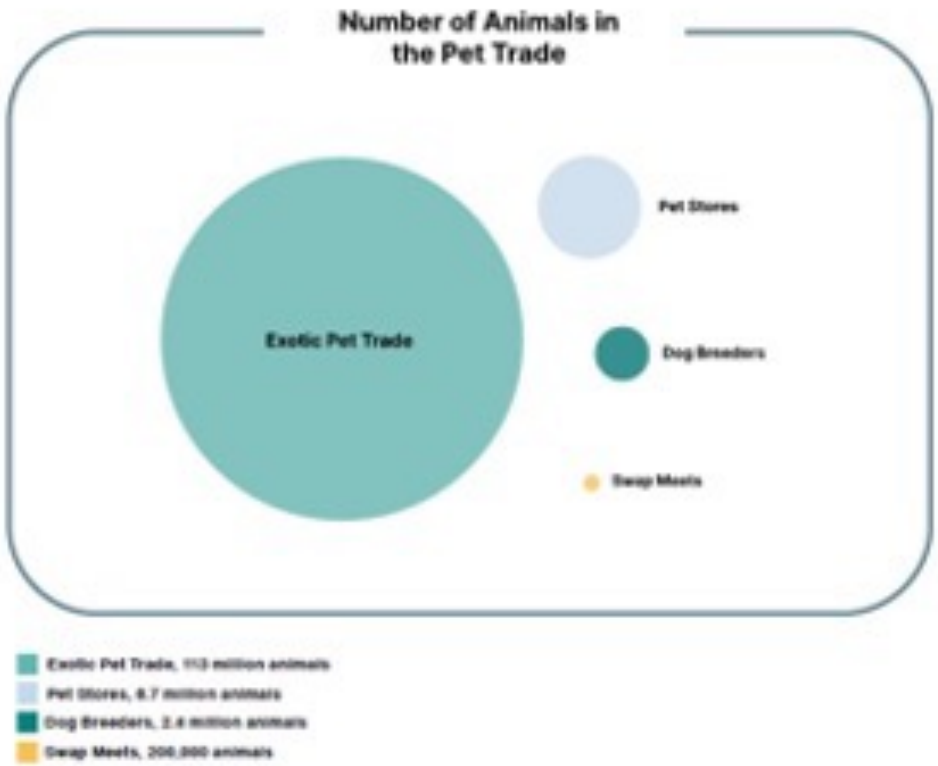
Seang, Sophie, et al. "Evidence of human-to-dog transmission of monkeypox virus." *The Lancet* 400.10353 (2022): 658-659.

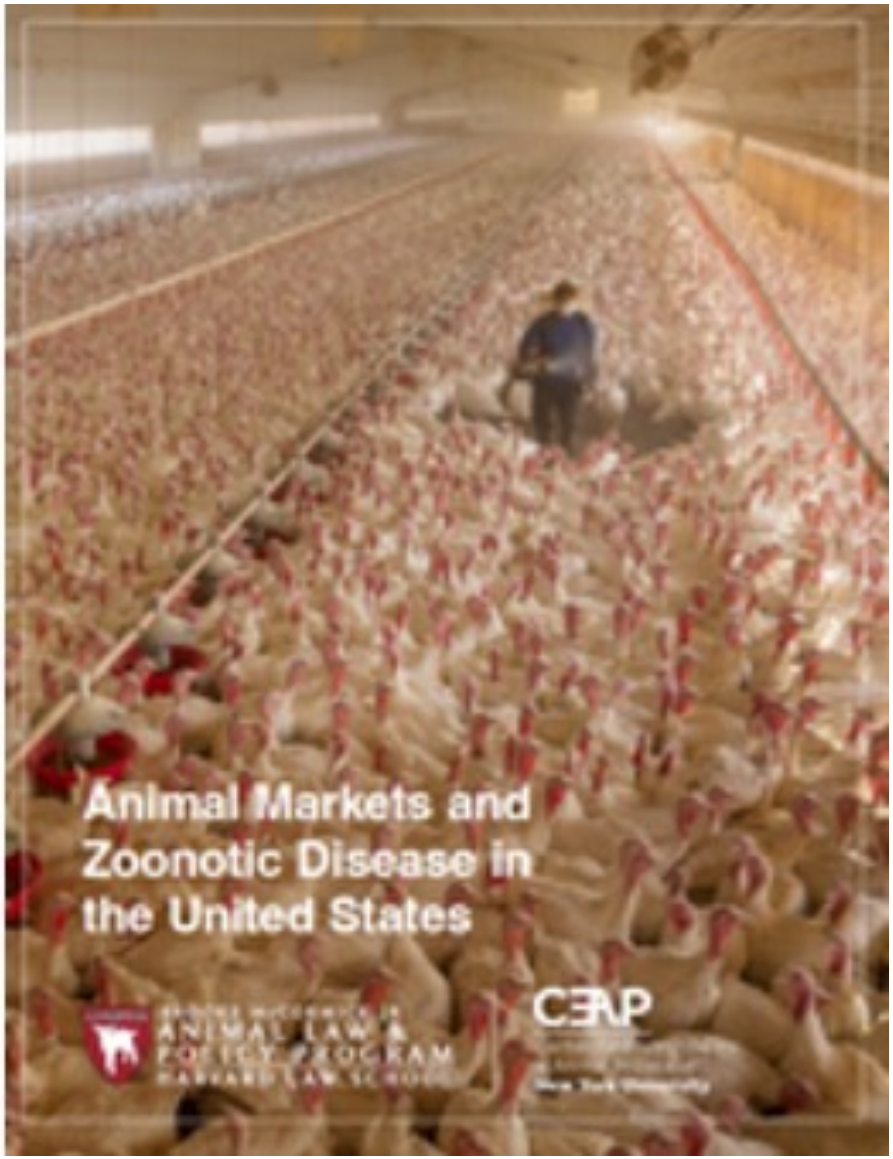


Monkeypox Transmission and Pathogenesis in Prairie Dogs

Jeannette Guarner,* Bill J. Johnson,† Christopher D. Paddock,* Wun-Ju Shieh,* Cynthia S. Goldsmith,* Mary G. Reynolds,* Inger K. Damon,* Russell L. Regnery,* Sherif R. Zaki,* and the Veterinary Monkeypox Virus Working Group[1]

Animal Markets and Zoonotic Disease in the United States


Number of Animals in the Pet Trade
Exotic Pet Trade
Pet Stores
Dog Breeders
Swap Meets
Exotic Pet Trade, 113 million animals
Pet Stores, 8.7 million animals
Dog Breeders, 2.4 million animals
Swap Meets, 200,000 animals


Animal Markets and Zoonotic Disease in the United States
ANIMAL LAW & POLICY PROGRAM
CEAP

A multi-provincial *Salmonella* Typhimurium outbreak in Canada associated with exposure to pet hedgehogs, 2017–2020

Katharine Fagan-Garcia[1], Leann Denich[2], Joanne Tataryn[2], Rachelle Janicki[2], Olivia Van Osch[2], Ashley Kearney[3], Cynthia Misfeldt[3], Céline Nadon[4], Colette Gaulin[5], Victor Mah[6], Ramindarjeet Sandhu[7], Michelle Waltenburg[8], Bijay Adhikari[9], Hanan Smadi[10], Anne-Marie Lowe[2]✉

Abstract

Background: In October 2020, an investigation began in Canada on an outbreak of *Salmonella* Typhimurium infections of the same strain as a concomitant outbreak in the United States (US) that was linked to pet hedgehogs. The objective of this article is to identify the source of the outbreak, determine if there was a link between the Canadian and US outbreaks and identify risk factors for infection to inform public health interventions.

Methods: Cases were identified through whole genome sequencing of *S.* Typhimurium isolates. Information was collected on case exposures, including animal contact. Hedgehog and environmental specimens were tested for *S.* Typhimurium and a trace back investigation was conducted.

Results: There were 31 cases in six provinces, with illness onset dates from June 1, 2017, to October 15, 2020. Median case age was 20 years and 52% were female. Isolates grouped together between 0-46 whole genome multi locus sequence typing allele differences. Of 23 cases with available exposure information, 19 (83%) reported contact with hedgehogs in the seven days prior to symptoms; 15/18 (83%) reported direct contact and 3/18 (17%) reported indirect contact. Trace back investigation did not identify a common source of hedgehogs but uncovered an industry with a complex distribution network. The outbreak strain was detected in samples collected from a hedgehog in one case's home and from a hedgehog in a Québec zoo.

Conclusion: Direct and indirect contact with hedgehogs was identified as the source of this *S.* Typhimurium outbreak. Public health communications aimed to increase awareness about the risks of zoonoses from hedgehogs and shared key hygienic practices to reduce disease transmission.

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Affiliations

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Suggested citation: Fagan-Garcia K, Denich L, Tataryn JR, Janicki R, Van Osch O, Kearney A, Misfeldt C, Nadon CA, Gaulin C, Mah V, Sandhu R, Waltenburg MA, Adhikari B, Smadi H, Lowe A-M. A multi-provincial

SPOROTRICHOSIS

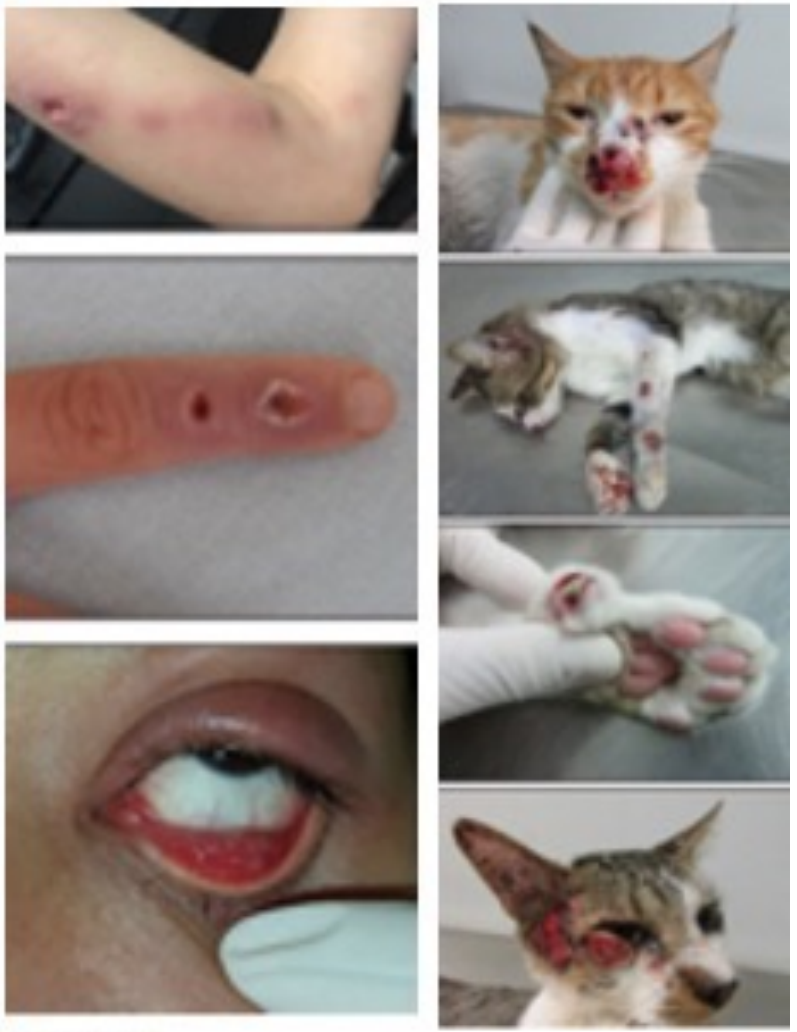
Fungus *Sporothrix*; "rose gardener's disease"

Feline sporotrichosis (*S. brasiliensis*)

- **Cat scratches or bites**
- **Disease in cats and people in parts S. America**
- **Thousands of human cases spread by cats identified**
- **Cutaneous, respiratory, ocular, neurologic signs**
- **Cases recently identified in UK**

Prevention

- **Reduce cat scratches, bites**
- **Early identification infected cats**



https://www.cdc.gov/fungal/diseases/sporotrichosis/brasiliensis.html

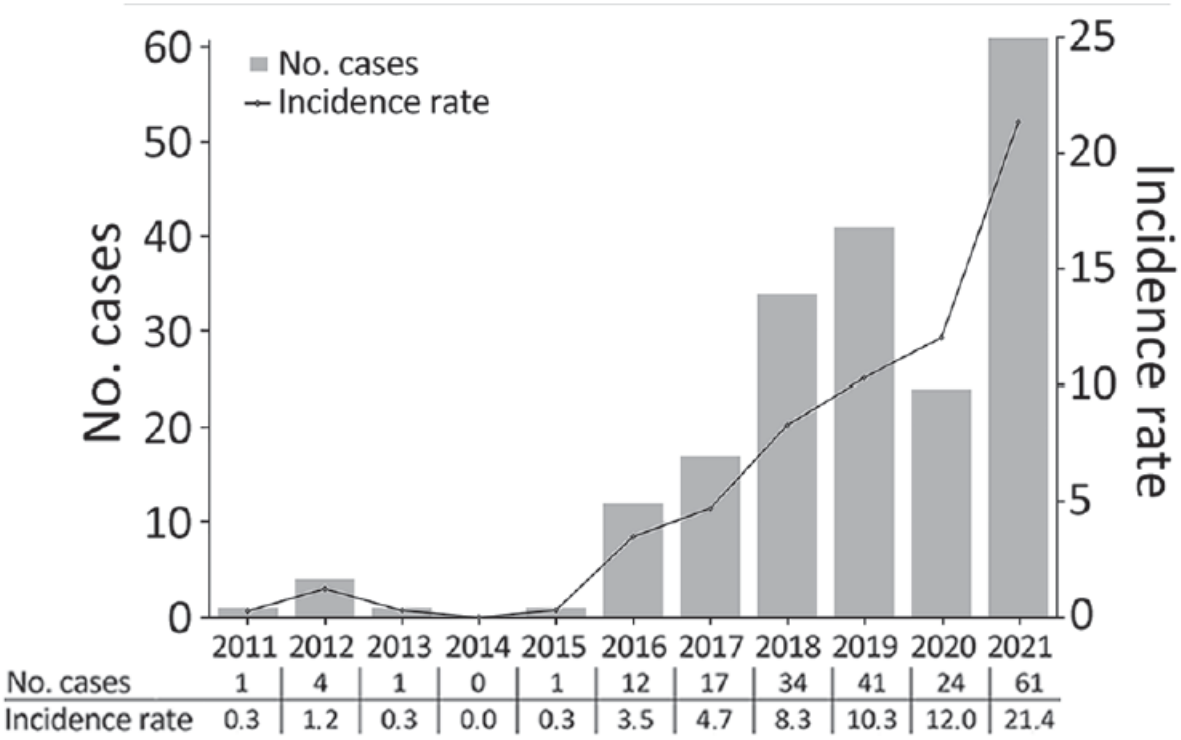


Figure 5. Epidemiologic curve and incidence rate (cases/100,000 outpatient visit-years) of cat-transmitted sporotrichosis patients treated at Hospital de Clínicas, Federal University of Paraná, Curitiba, Brazil, 2011–2021.

Cognialli RCR, et al. Emerg Infec Dis. 2023

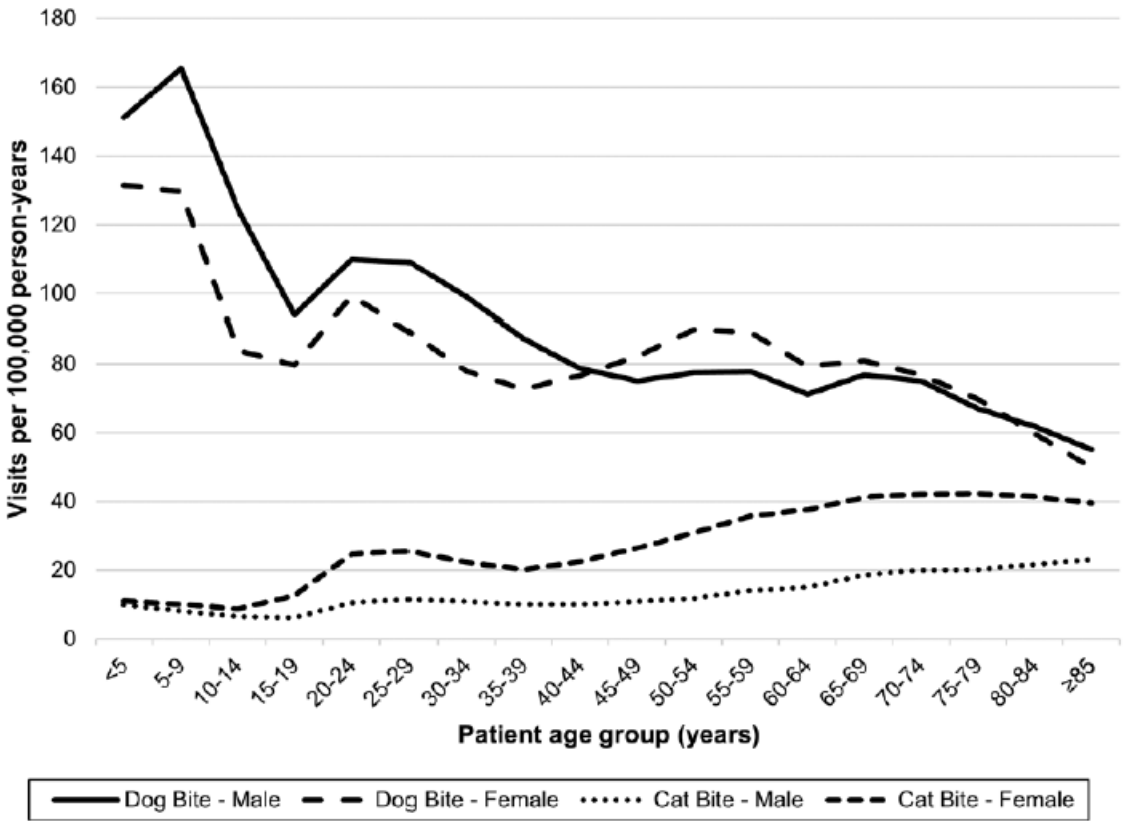


Figure 1—Dog and cat bite–related emergency department visit incidence rates by patient age and gender in California from 2005 to 2019.

Campagna RA, *et al.* JAVMA. 2023

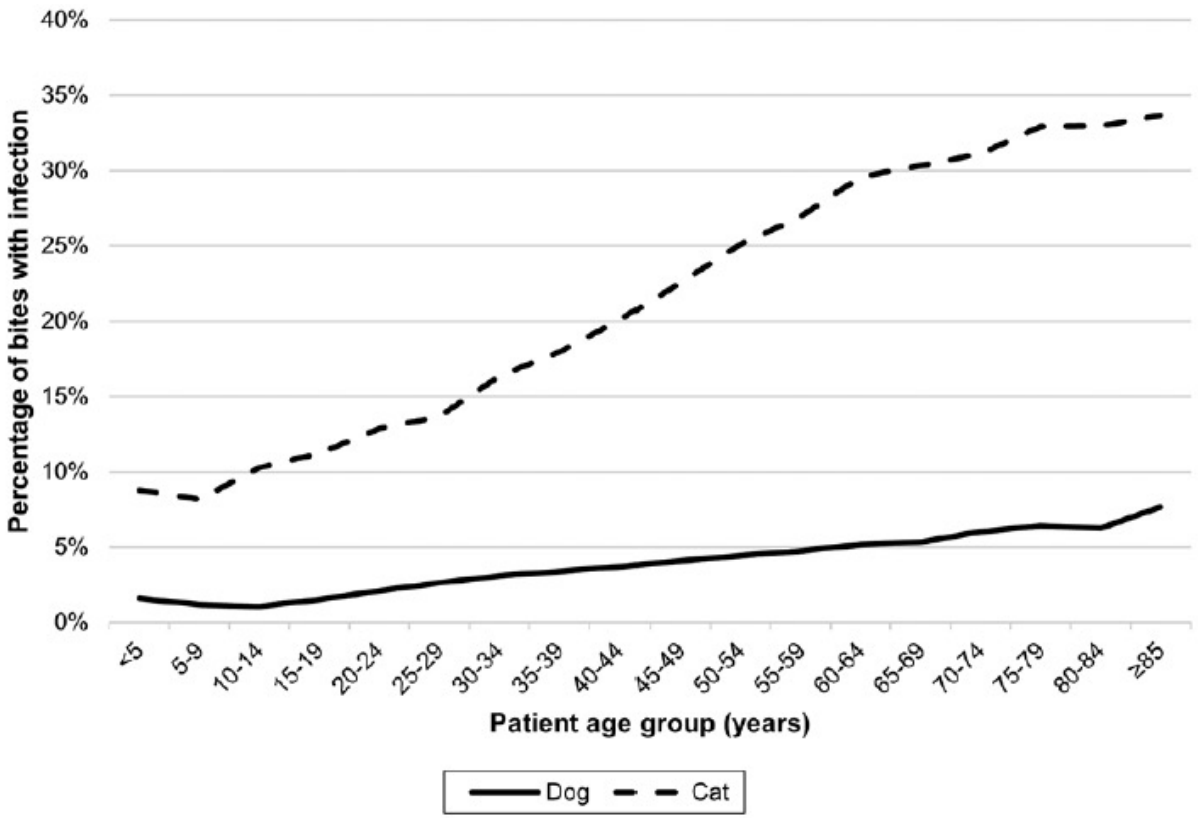


Figure 3—Wound infections in dog and cat bite victims presenting to emergency departments in California from 2005 to 2019.

Campagna RA, et al. JAVMA. 2023

BITE/SCRATCH PATHOGENS

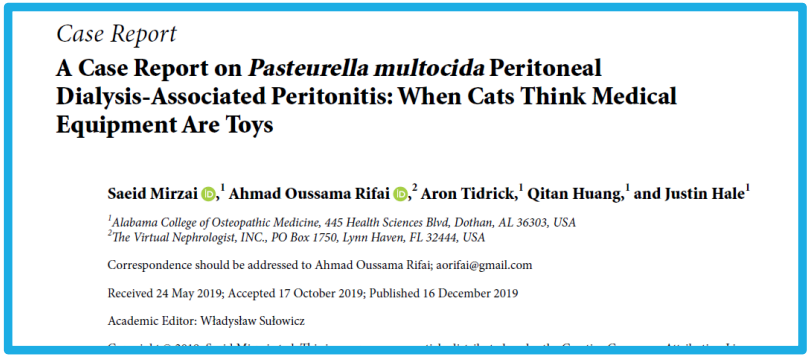
Man has 4 limbs amputated after dog lick leads to severe infection, report says

COMMON ORAL PATHOGENS

Infections typically involve both aerobes and anaerobes

Each animal species carries different resident flora

- **Some high consequence**
  - ***Capnocytophaga canimorsus***
  - ***Pasteurella multocida***
  - **Methicillin-resistant *Staphylococcus aureus* (MRSA)**
  - ***Streptobacillus moniliformis***



Case Report

A Case Report on *Pasteurella multocida* Peritoneal Dialysis-Associated Peritonitis: When Cats Think Medical Equipment Are Toys

Saeid Mirzai,[1] Ahmad Oussama Rifai,[2] Aron Tidrick,[1] Qitan Huang,[1] and Justin Hale[1]

[1]*Alabama College of Osteopathic Medicine, 445 Health Sciences Blvd, Dothan, AL 36303, USA*
[2]*The Virtual Nephrologist, INC., PO Box 1750, Lynn Haven, FL 32444, USA*

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Received 24 May 2019; Accepted 17 October 2019; Published 16 December 2019

Academic Editor: Władysław Sułowicz

RAT-BITE FEVER

Streptobacillus moniliformis

Reservoir: rodents (often rat)

Transmission: bites & scratches

- **Other direct & indirect contact (kissing, cage cleaning)**
- **>50% of cases 0-19 yr**

Normal rat flora (50-100%); no clinical disease

Rare but ↑ frequency with "pocket pet" ownership?

RBF: DISEASE & PREVENTION

People (2-3 days up to 3 wks after exposure)

- **Fever, joint/muscle pain, rash (soles, palms, extremities)**
- **Rarely endocarditis, meningitis, sepsis**
- **High risk: children, those with high rodent exposure**

Antimicrobials

- **Untreated: 7-13% fatality**

Querying animal ownership is key to diagnosis/suspicion

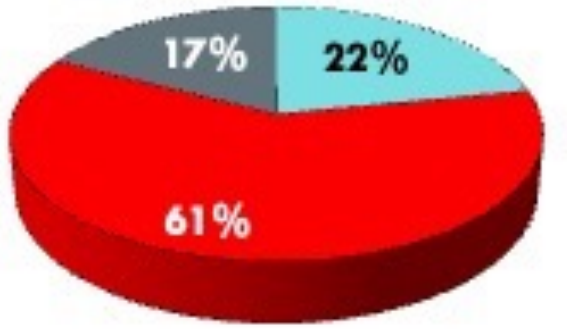
Sean P. Elliott Clin. Microbiol. Rev. 2007;20:13-22

PHYSICIAN COUNSELING

MDs rarely ask about pet contact

MDs rarely provide information about pet risks

"Medical doctors or their staff ever asked if you owned any pets?"
(N=630)



Stull JW. 2013

Can we address drivers of emerging zoonoses?

Interventions to Reduce Risk for Pathogen Spillover and Early Disease Spread to Prevent Outbreaks, Epidemics, and Pandemics

Neil M. Vora, Lee Hannah, Chris Walzer, Mariana M. Vale, Susan Lieberman, Ashley Emerson, Jonathan Jennings, Robyn Alders, Matthew H. Bonds, Jo Evans, Bhavana Chilukuri, Sonila Cook, Nigel C. Sizer, Jonathan H. Epstein

Stopping the clearing and degradation of tropical and subtropical forests

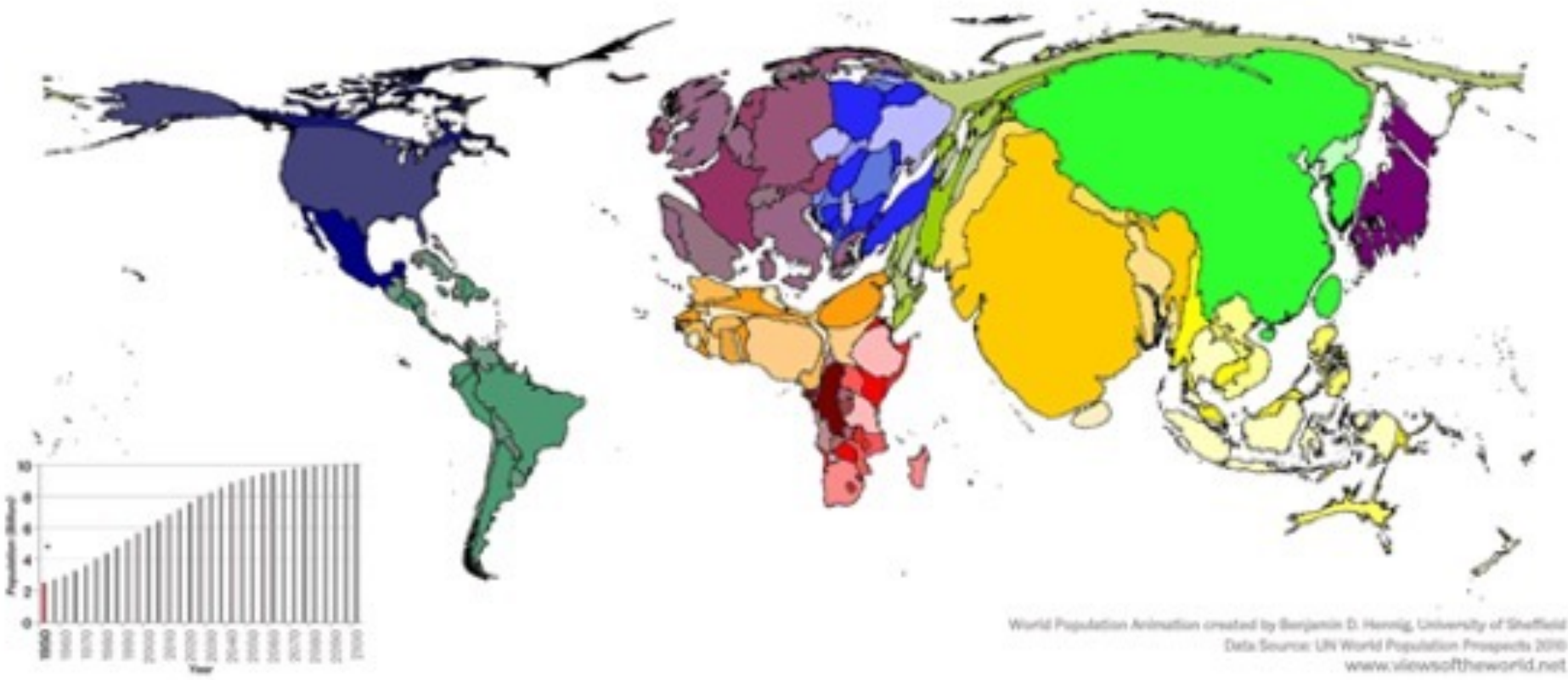
Improving health and economic security of hotspot communities

Enhancing biosecurity in animal husbandry

Shutting down/strictly regulating wildlife markets and trade

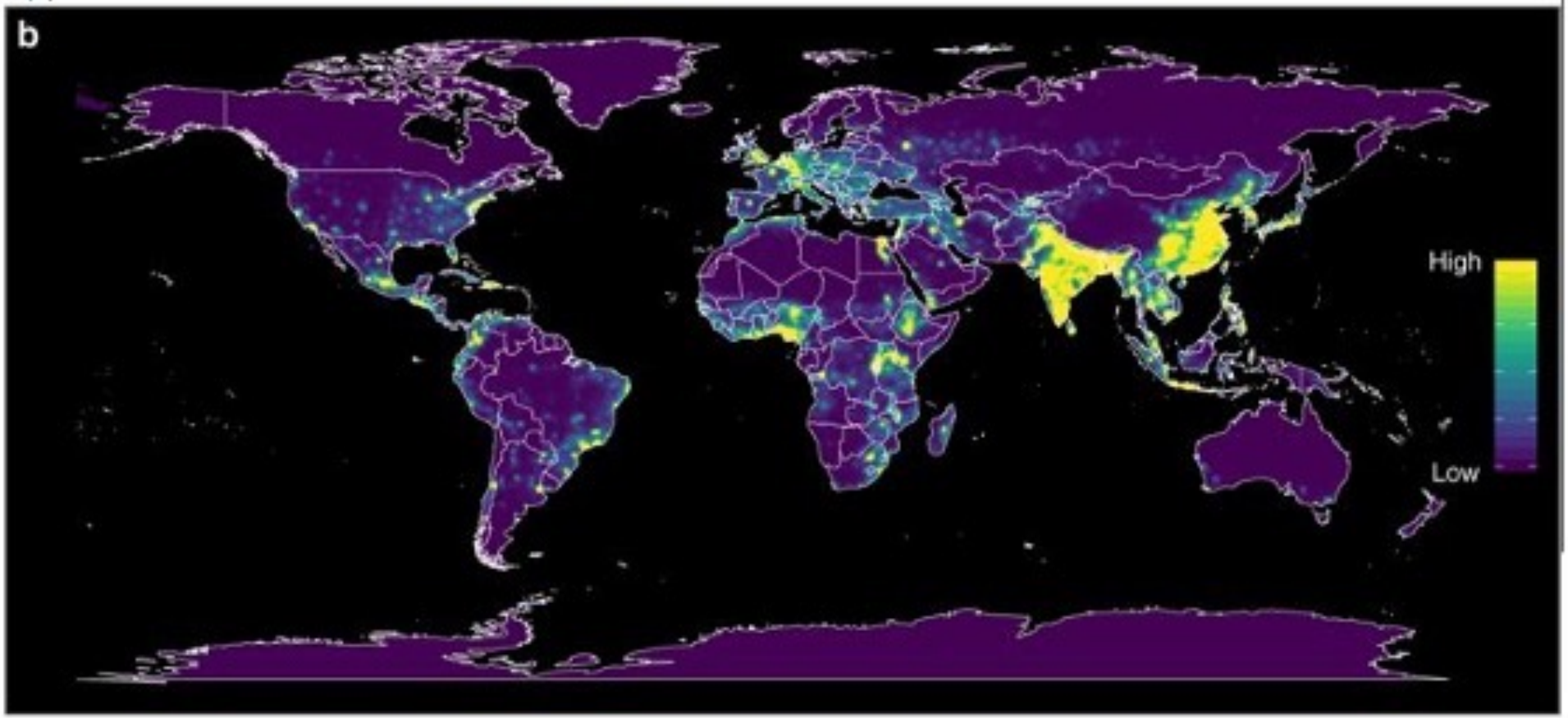
Expanding pathogen surveillance

World Population 1950

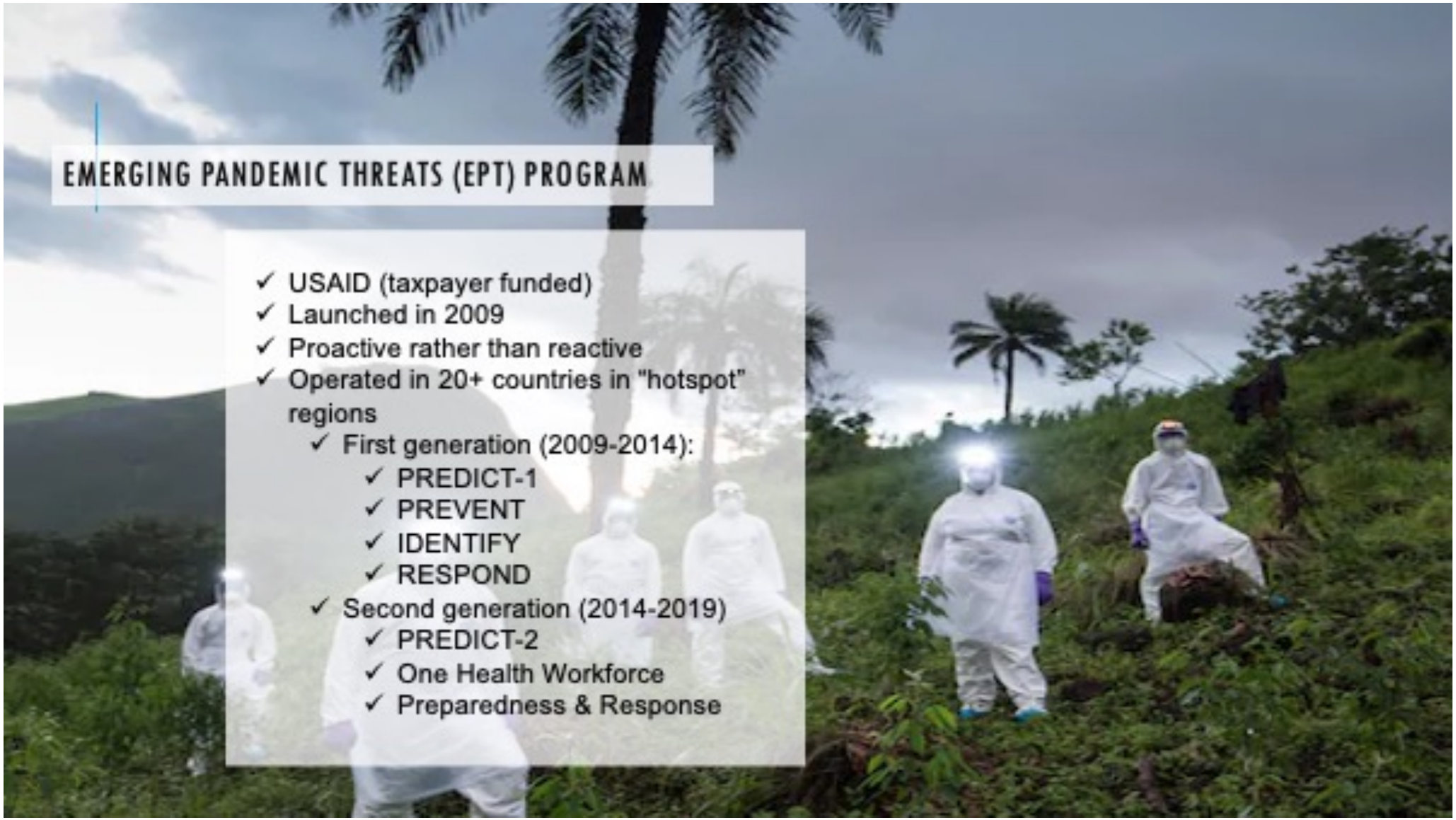


World Population Animation created by Benjamin D. Hennig, University of Sheffield
Data Source: UN World Population Prospects 2010
www.viewsoftheworld.net

Global Risk of Emerging Zoonoses



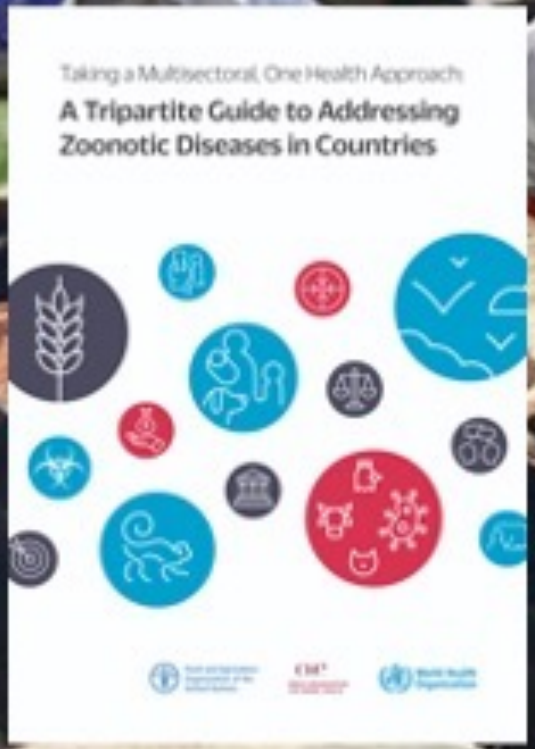
Allen T, et al., 2017. Global hotspots and correlates of emerging zoonotic diseases. Nature Communications.


EMERGING PANDEMIC THREATS (EPT) PROGRAM
✓ USAID (taxpayer funded)
✓ Launched in 2009
✓ Proactive rather than reactive
✓ Operated in 20+ countries in "hotspot" regions
✓ First generation (2009-2014):
✓ PREDICT-1
✓ PREVENT
✓ IDENTIFY
✓ RESPOND
✓ Second generation (2014-2019)
✓ PREDICT-2
✓ One Health Workforce
✓ Preparedness & Response

FAO/WOAH/WHO COLLABORATION (TRIPARTITE)

- ✓ Tripartite established in 2010
- ✓ Recognize a joint responsibility for addressing zoonotic and other high-impact diseases
- ✓ Collaborate to form early warning systems, mechanisms for enhanced coordination between member countries
  - ✓ Global Early Warning and Response System for Major Animal Diseases (GLEWS)
- ✓ Prove a neutral platform for countries to engage in dialogue and negotiations

The FAO-OIE-WHO Collaboration, A Tripartite Concept Note, 2010



LOCAL ACTIONS

Animal contact, Ownership, Zoonoses

Surveillance; early warning

Education/Risk Communication

Infection control – healthcare, public, home

Contents lists available at ScienceDirect

Preventive Veterinary Medicine

journal homepage: www.elsevier.com/locate/prevetmed

Risk for zoonotic *Salmonella* transmission from pet reptiles: A survey on knowledge, attitudes and practices of reptile-owners related to reptile husbandry

Marialaura Corrente*, Giancarlo Sangiorgio, Erika Grandolfo, Livia Bodnar, Cristiana Catella, Adriana Trotta, Vito Martella, Domenico Buonavoglia

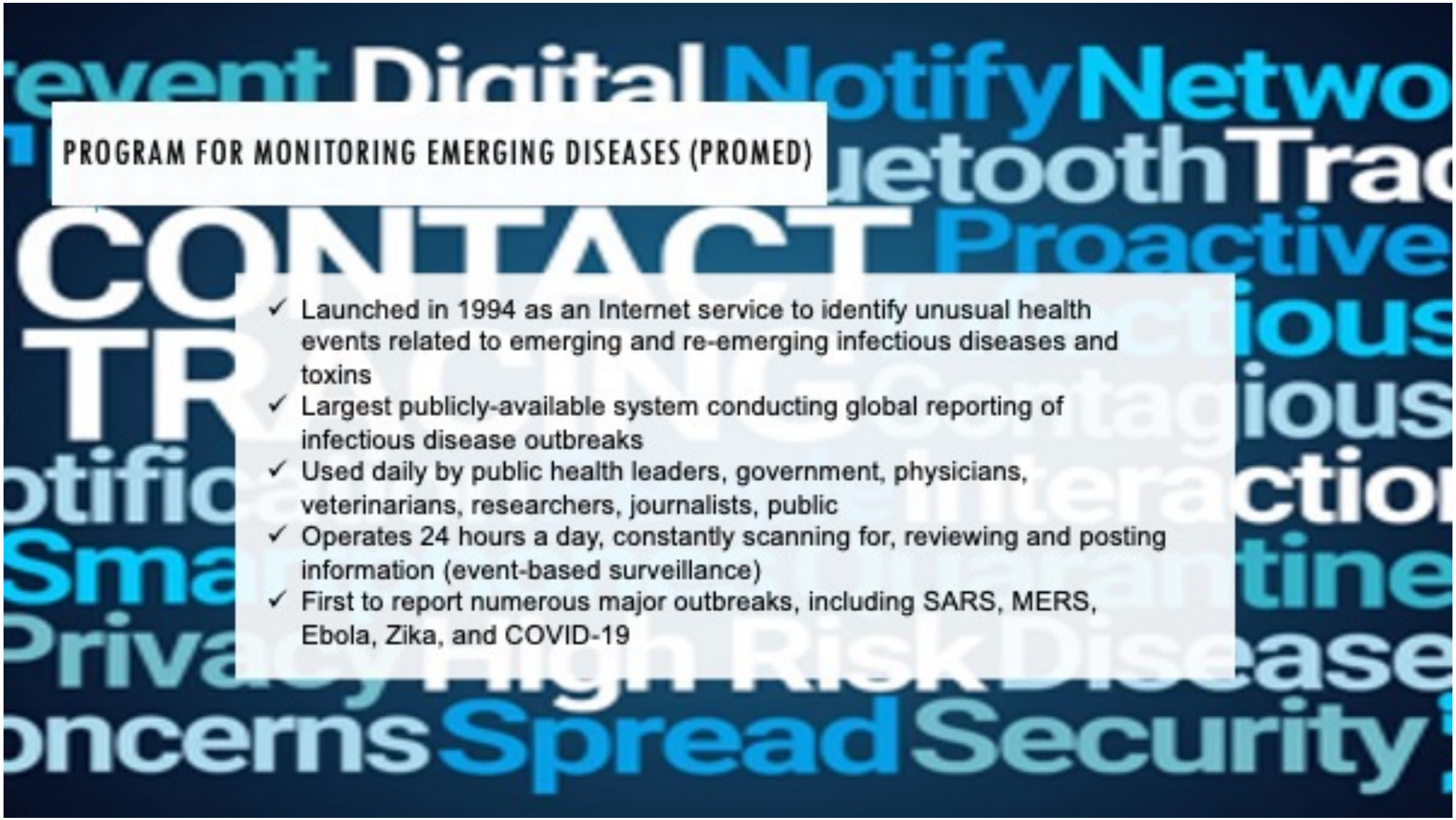
Box 3: Suggestions for reducing transmission of zoonotic pathogens from pets to patients at high risk

Personal hygiene

- Wash hands after handling animals or their environment; supervise hand-washing for children less than 5 years of age
- Protect skin from direct contact with animal feces by wearing vinyl or household cleaning gloves or using a plastic bag when cleaning up after a pet
- Avoid contact with animal-derived pet treats
- Promptly wash bites and scratches inflicted by animals
- Do not allow pets to lick open wounds, cuts or medical devices (e.g., intravascular catheters); pets may also be discouraged from licking the faces of young children and immunocompromised patients
- Wear gloves to clean aquariums; do not dispose of aquarium water in sinks used for food preparation
- Ensure playground sandboxes are kept covered when not in use

Types and ages of pets

- Avoid contact with dogs and cats less than 6 months of age or stray animals (avoid acquiring a cat < 1 yr old), particularly in households with very young children or immunocompromised patients
- Avoid contact with animals with diarrhea
- Avoid contact with young farm animals (e.g., petting zoos)
- Avoid contact with reptiles, amphibians, rodents and baby poultry (chicks and ducklings), as well as anything that has been in contact with these animals; such animals should be kept out of the households of high-risk patients
- Reptiles, amphibians, rodents and baby poultry should not be permitted to roam freely through a home or living area and should be kept out of kitchens and food-preparation areas
- Exercise caution when playing with cats to limit scratches; keep cats' nails short (declawing is not recommended)


PROGRAM FOR MONITORING EMERGING DISEASES (PROMED)
✓ Launched in 1994 as an Internet service to identify unusual health events related to emerging and re-emerging infectious diseases and toxins
✓ Largest publicly-available system conducting global reporting of infectious disease outbreaks
✓ Used daily by public health leaders, government, physicians, veterinarians, researchers, journalists, public
✓ Operates 24 hours a day, constantly scanning for, reviewing and posting information (event-based surveillance)
✓ First to report numerous major outbreaks, including SARS, MERS, Ebola, Zika, and COVID-19

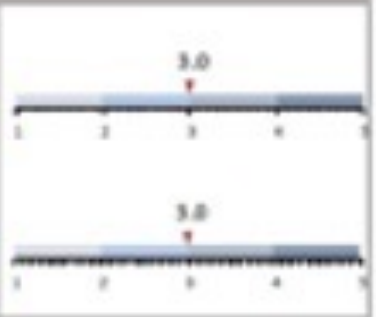
WEEKLY INTELLIGENCE REPORT

July 24th 2023 – July 30th 2023

SUMMARY: RELEVANT SIGNALS (includes all signals rated ≥ 3.0)

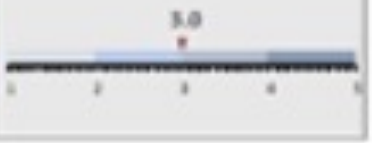
Highly Pathogenic Avian Influenza

- **Finland** has reported HPAI H5N1 in a total of 20 fur farms; the Finnish Food Agency has ordered all mink on HPAI infected fur farms (3) to be culled, meanwhile the termination of foxes and raccoons will be decided upon on a case-by-case basis — Read More
- **South Korea** has confirmed HPAI H5N1 in a total of five cats at two different animal shelters in **Seoul**; surveillance activities and an epidemiological investigation are underway — Read More



Influenza A (H5N6)

- **China** has released details on the new human case of influenza A virus H5N6; the case involves a 64-year-old male from **Guangxi Autonomous Region**, who had close contact with domestic poultry before the onset of symptoms — Read More



INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY

SHEA EXPERT GUIDANCE

Animals in Healthcare Facilities: Recommendations to Minimize Potential Risks

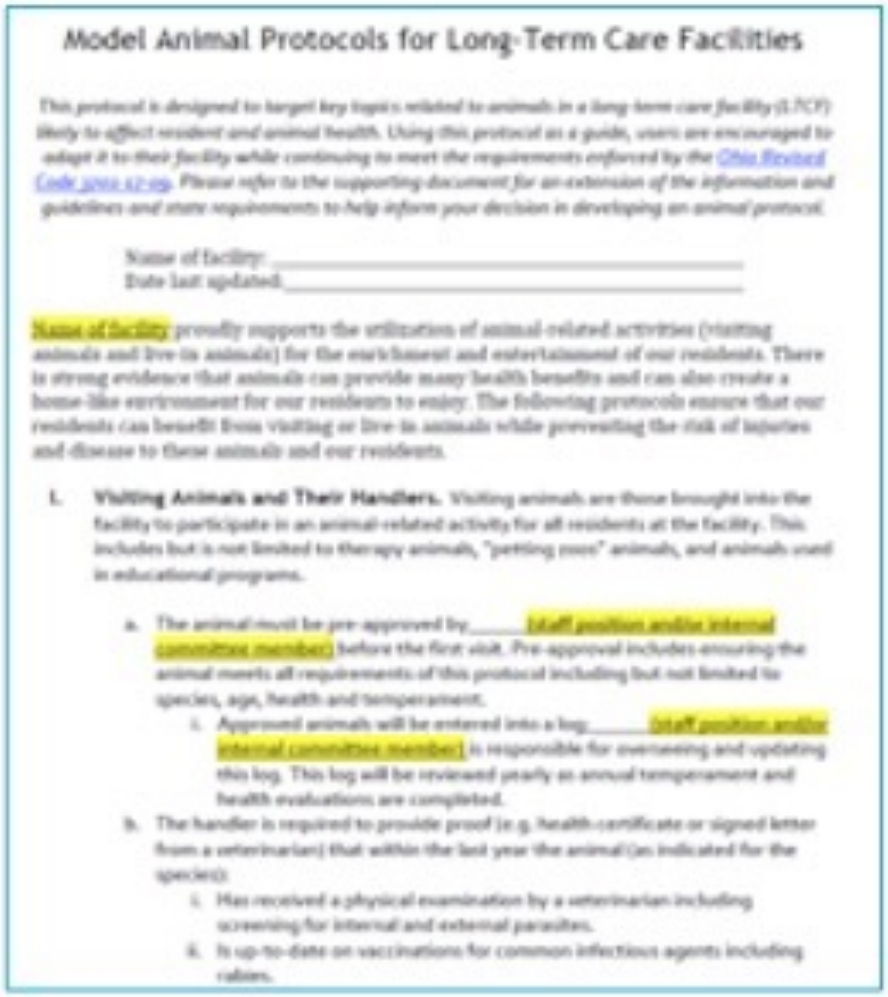
Rekha Murthy, MD;[1] Gonzalo Bearman, MD, MPH;[2] Sherrill Brown, MD;[3] Kristina Bryant, MD;[4] Raymond Chinn, MD;[5] Angela Hewlett, MD, MS;[6] B. Glenn George, JD;[7] Ellie J.C. Goldstein, MD;[8] Galit Holzmann-Pazgal, MD;[9] Mark E. Rupp, MD;[10] Timothy Wiemken, PhD, CIC, MPH;[4] J. Scott Weese, DVM, DVSc, DACVIM;[11] David J. Weber, MD, MPH[12]

PURPOSE

Animals may be present in healthcare facilities for multiple reasons. Although specific laws regarding the use of service animals in public facilities were established in the United States in 1990, the widespread presence of animals in hospitals, including service animals to assist in patient therapy and research, has resulted in the increased presence of animals in acute care hospitals and ambulatory medical settings. The role

guidance on the management of AHC in four categories: animal-assisted activities, service animals, research animals, and personal pet visitation. Institutions considering these programs should have policies that include well-organized communication and education directed at healthcare personnel (HCP), patients, and visitors. Appropriately designed studies are needed to better define the risks and benefits of allowing animals in the healthcare setting for specific purposes.

Murthy R, et al. Animals in healthcare facilities: recommendations to minimize potential risks. *Infect Control Hosp Epidemiol.* 2015



Model Animal Protocols for Long-Term Care Facilities

This protocol is designed to target key topics related to animals in a long-term care facility (LTCF) likely to affect resident and animal health. Using this protocol as a guide, users are encouraged to adapt it to their facility while continuing to meet the requirements enforced by the Ohio Revised Code (ORC 17-19). Please refer to the supporting document for an extension of the information and guidelines and state requirements to help inform your decision in developing an animal protocol.

Name of facility: _____
Date last updated: _____

Name of facility proudly supports the utilization of animal-related activities (visiting animals and live-in animals) for the enrichment and entertainment of our residents. There is strong evidence that animals can provide many health benefits and can also create a home-like environment for our residents to enjoy. The following protocols ensure that our residents can benefit from visiting or live-in animals while preventing the risk of injuries and disease to these animals and our residents.

I. **Visiting Animals and Their Handlers.** Visiting animals are those brought into the facility to participate in an animal-related activity for all residents at the facility. This includes but is not limited to therapy animals, "petting zoos" animals, and animals used in educational programs.

   a. The animal must be pre-approved by _____ (staff position and/or internal committee member) before the first visit. Pre-approval includes ensuring the animal meets all requirements of this protocol including but not limited to species, age, health and temperament.
      i. Approved animals will be entered into a log. _____ (staff position and/or internal committee member) is responsible for overseeing and updating this log. This log will be reviewed yearly as annual temperament and health evaluations are completed.
   b. The handler is required to provide proof (e.g. health certificate or signed letter from a veterinarian) that within the last year the animal (as indicated for the species):
      i. Has received a physical examination by a veterinarian including screening for internal and external parasites.
      ii. Is up-to-date on vaccinations for common infectious agents including rabies.

http://www.go.osu.edu/nhpets


8
Climate
Change
1
Global
Population
2
Global
Movement
3
Changes
in Land
Use
4
Agricultural
Intensity
5
Companion
Animals
6
Exotic
Pets
7
Wildlife
Use
8
Pathogen
Adaptation
Zoonoses
Emergence

QUESTIONS


Fewer infections means more time for snuggling
Infection prevention and control - good for everyone
https://webbertraining.com

www.webbertraining.com/schedulep1.php

August 16, 2023	*(FREE South Pacific Teleclass)* **UNDERSTANDING THE "IMMUNITY DEBT" TO COMMON INFECTIONS DURING THE COVID-19 PANDEMIC** Speaker: **Prof. Matthias Maiwald**, National University of Singapore
August 24, 2023	**ARE THERE OTHER POSSIBLE SOLUTIONS FOR CONTROLLING THE SPREAD OF CPE?** Speaker: **Dr. Jean–Ralph Zahar**, French-Muslim Hospital, Bobigny, France
September 13, 2023	*(South Pacific Teleclass)* **HUMAN AMR SURVEILLANCE - WHERE ARE WE NOW AND WHERE SHOULD WE BE HEADING?** Speaker: **Prof. Paul Turner**, Oxford University Centre for Tropical Medicine and Global Health, Thailand
September 21, 2023	**FACTORS INFLUENCING OPPORTUNISTIC PREMISE PLUMBING PATHOGENS** Speaker: **Prof. Joseph O. Falkinham III**, Virginia Tech University
	(FREE European Teleclass)

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