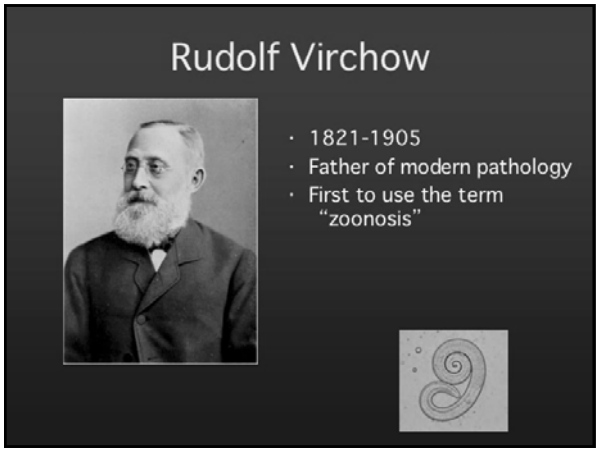
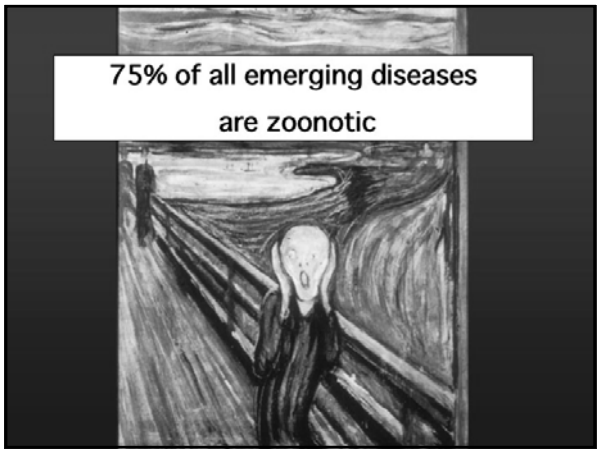
Emerging Zoonosis – Blurring Interface of Human and Animal Diseases

Dr. Corrie Brown, DVM PhD

A Webber Training Teleclass





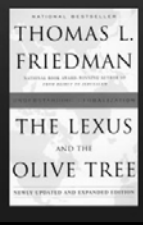
Emerging Zoonosis – Blurring Interface of Human and Animal Diseases

Dr. Corrie Brown, DVM PhD

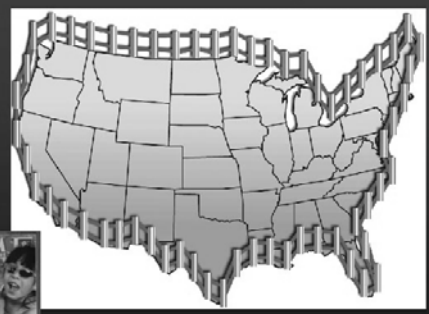
A Webber Training Teleclass

Globalization/Future Shock

- Increasing human population
- Changing environment
- International trade/globalization



This Is Not An Option



THE ROYAL SOCIETY

Diseases of humans and their domestic mammals: pathogen characteristics, host range and the risk of emergence

S. Cleaveland*, M. K. Laurenson and L. H. Taylor

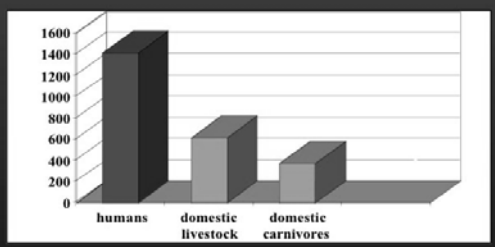
Centre for Tropical Veterinary Medicine, University of Edinburgh, Easter Bush, Roslin, Midlothian EH25 9RG, UK

Pathogens that can be transmitted between different host species are of fundamental interest and importance from public health, conservation and economic perspectives, yet systematic quantification of these pathogens is lacking. Here, pathogen characteristics, host range and risk factors determining disease emergence were analysed by constructing a database of disease-causing pathogens of humans and domestic mammals. The database consisted of 1415 pathogens causing disease in humans, 616 in livestock and 374 in domestic carnivores. Multihost pathogens were very prevalent among human pathogens (61.6%;) and even more so among domestic mammal pathogens (livestock 77.3%, carnivores 90.0%;). Pathogens able to infect human, domestic and wildlife hosts contained a similar proportion of disease-causing pathogens for all three host groups. One hundred and ninety-six pathogens were associated with emerging diseases, 175 in humans, 29 in livestock and 12 in domestic carnivores. Across all these groups, helminths and fungi were relatively unlikely to emerge whereas viruses, particularly RNA viruses, were highly likely to emerge. The ability of a pathogen to infect multiple hosts, particularly hosts in other taxonomic orders or wildlife, were also risk factors for emergence in human and livestock pathogens. There is clearly a need to understand the dynamics of infectious diseases in complex multihost communities in order to mitigate disease threats to public health, livestock economies and wildlife.

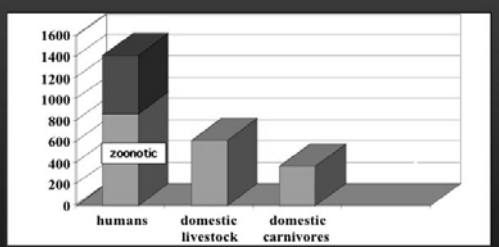
Keywords: pathogen; epidemiology; emerging diseases; zoonoses; wildlife; multihost pathogen

Crossing species boundaries

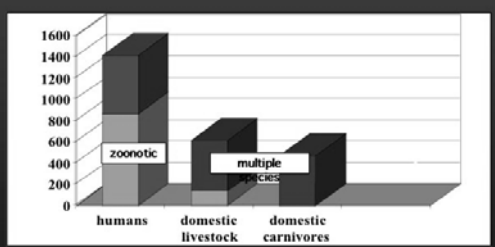
Numbers of Known Pathogens



Numbers of Known Pathogens



Numbers of Known Pathogens

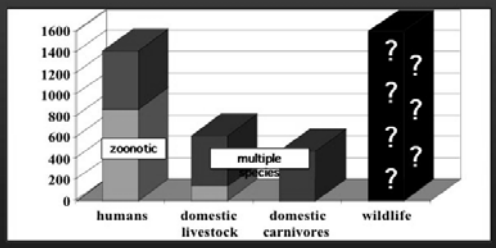


Emerging Zoonosis – Blurring Interface of Human and Animal Diseases

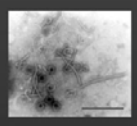
Dr. Corrie Brown, DVM PhD

A Webber Training Teleclass

Numbers of Known Pathogens



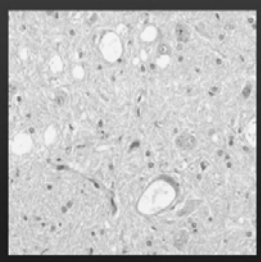
Ebola, a continuing saga



Ebola blamed in tragic decline of great apes

Emergency meeting aimed at staving off extinction from disease, poaching, habitat destruction

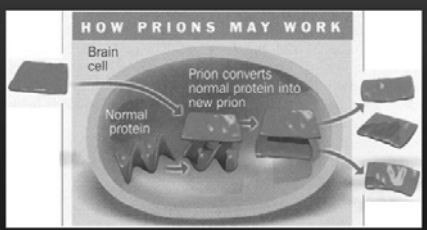
Bovine Spongiform Encephalopathy
"mad cow disease"



- First noted in cattle in U.K. 1987
- Source was "infected" meat and bone meal
- Caused by a prion agent

TSE Pathogenesis

- all are caused by "prions"
  proteinaceous infectious particle



BSE _ A Zoonosis?

- March 20, 1996
  cluster of unusual CJD cases

Spongiform Encephalopathy Advisory Committee

Hosted by Paul Webber, paul@webbertraining.com

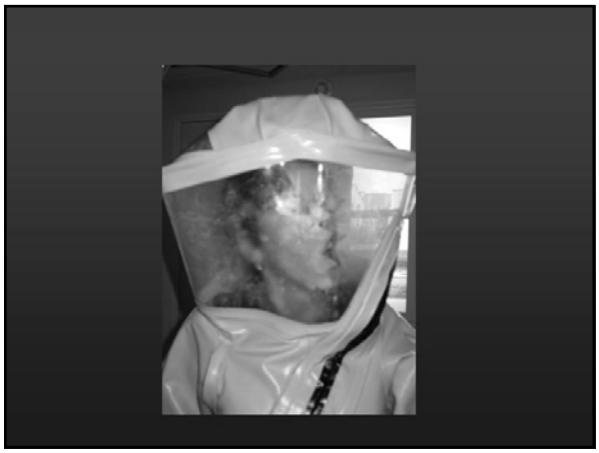
www.webbertraining.com

Emerging Zoonosis – Blurring Interface of Human and Animal Diseases

Dr. Corrie Brown, DVM PhD

A Webber Training Teleclass

	vCJD	CJD
age	young	old
disease course	prolonged	rapid
clinical disease	behavioral changes	dementia
PrP plaques	frequent	infrequent



Diseases from fruit bats

- Hendra
- Menangle
- Lyssavirus
- Nipah

Twinkle, twinkle, little bat,
How I wonder what you're at.
- Lewis Carroll, Alice in Wonderland

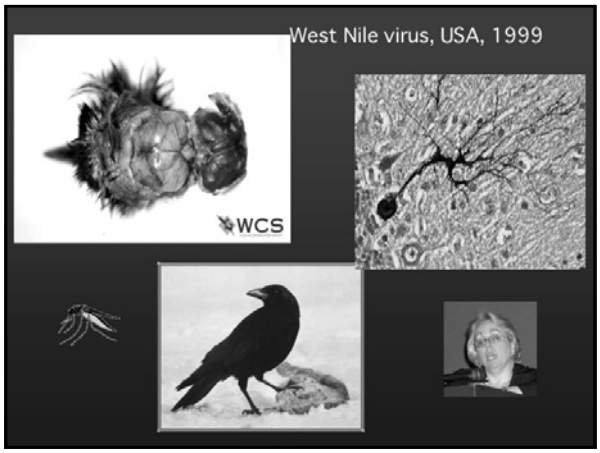
Hosted by Paul Webber, paul@webbertraining.com

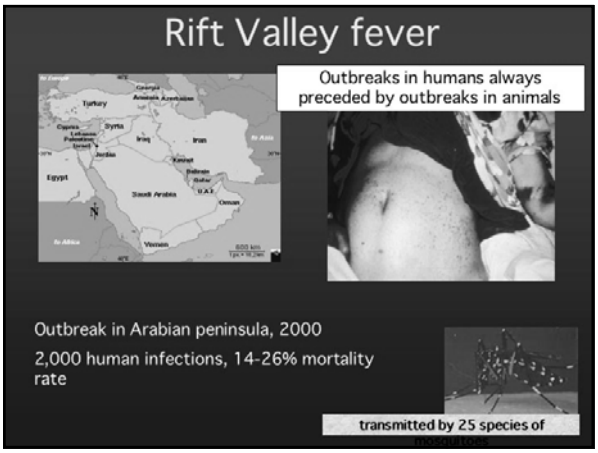
www.webbertraining.com

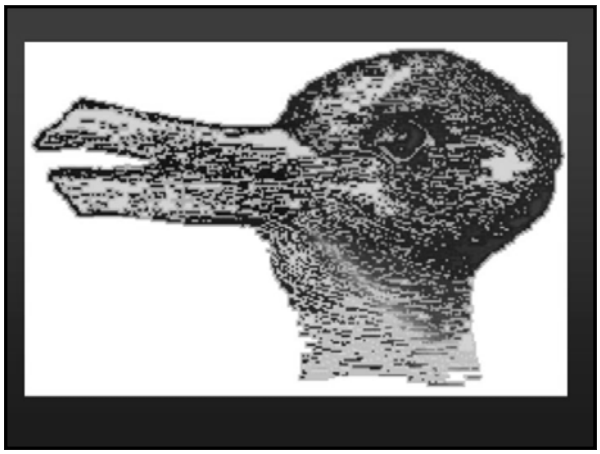
Emerging Zoonosis – Blurring Interface of Human and Animal Diseases

Dr. Corrie Brown, DVM PhD

A Webber Training Teleclass







Hosted by Paul Webber, paul@webbertraining.com

www.webbertraining.com

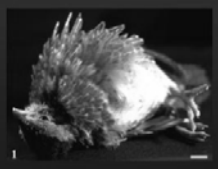
Emerging Zoonosis – Blurring Interface of Human and Animal Diseases

Dr. Corrie Brown, DVM PhD

A Webber Training Teleclass

Host Range

- Many birds, especially aquatic



100 million chickens killed

World Health Organization

Confirmed Human Cases of Avian Influenza A(H5N1)

24 March 2004

Country/Territory	Total cases	Deaths
Thailand	12	8
Viet Nam	22	15
Total	**34**	**23**

Notes

Total number of cases includes number of deaths.
WHO reports only laboratory-confirmed cases.

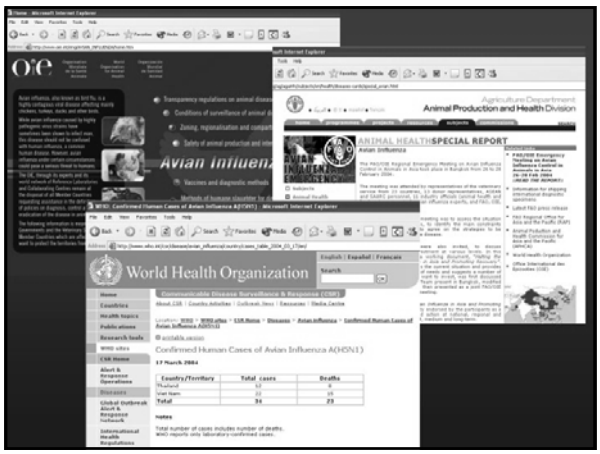
Hosted by Paul Webber, paul@webbertraining.com

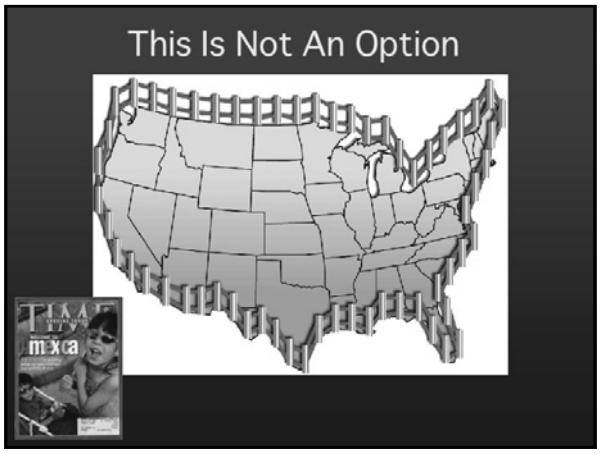
www.webbertraining.com

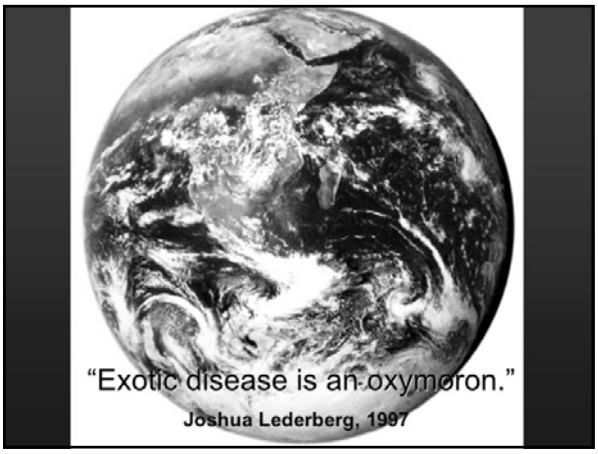
Emerging Zoonosis – Blurring Interface of Human and Animal Diseases

Dr. Corrie Brown, DVM PhD

A Webber Training Teleclass







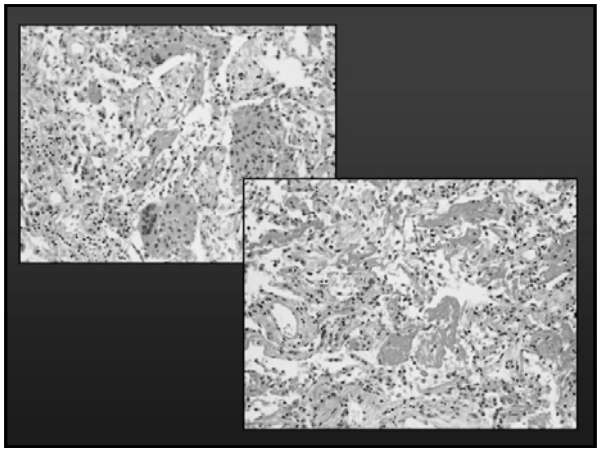
Hosted by Paul Webber, paul@webbertraining.com

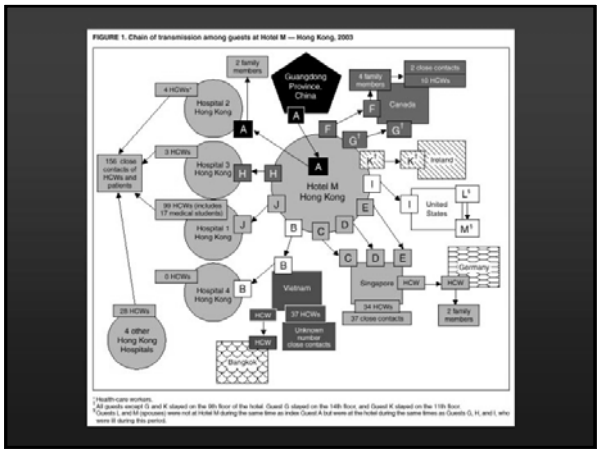
www.webbertraining.com

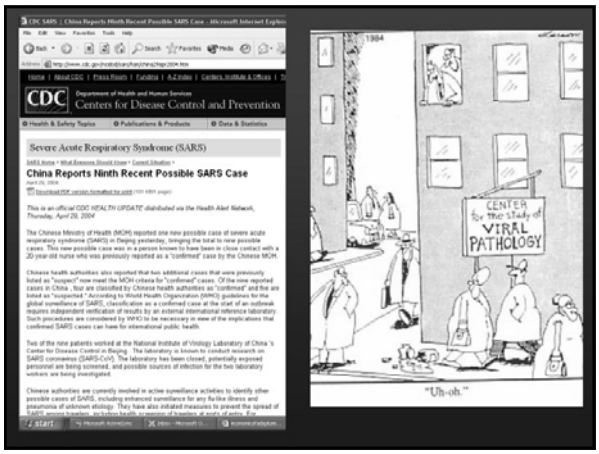
Emerging Zoonosis – Blurring Interface of Human and Animal Diseases

Dr. Corrie Brown, DVM PhD

A Webber Training Teleclass







Hosted by Paul Webber, paul@webbertraining.com

www.webbertraining.com

Emerging Zoonosis – Blurring Interface of Human and Animal Diseases

Dr. Corrie Brown, DVM PhD

A Webber Training Teleclass

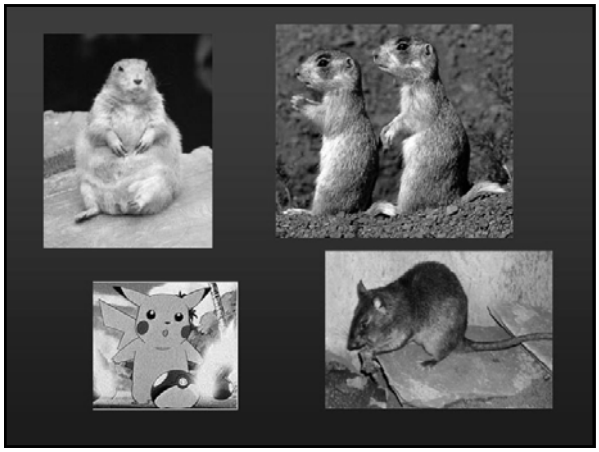
Hosted by Paul Webber, paul@webbertraining.com

www.webbertraining.com

Emerging Zoonosis – Blurring Interface of Human and Animal Diseases

Dr. Corrie Brown, DVM PhD

A Webber Training Teleclass



Tularemia outbreak identified in pet prairie dogs

In late July, investigators at the national Centers for Disease Control and Prevention, working with the Texas Department of Health, identified an outbreak of tularemia, a zoonotic disease, in captive, wild prairie dogs at a commercial facility that distributes many of them for sale as pets. The facility is located in Denton County, Texas.

"Prairie dogs are kept as pets. It's actually more common than you might think," said Julie Rawlings, deputy state epidemiologist for the Texas Department of Health.

Officials recommended that people who had handled a sick or dead ... contact a health care ... press time, officials had not ... any human cases of the ... sociated with the dogs. ... human cases of tularemia ... year in the United States, ... individuals living in the ... and western states.

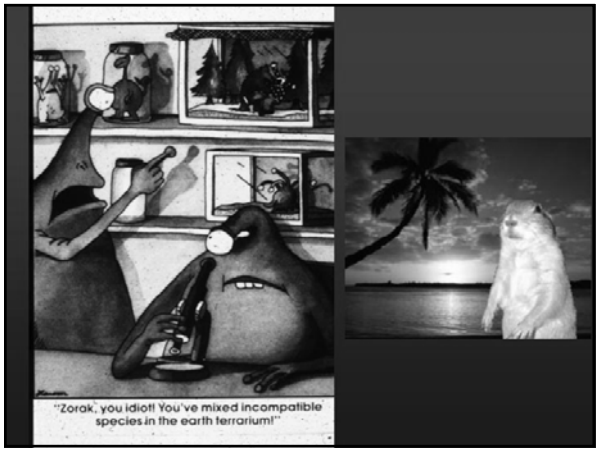
Officials notified states and countries that received shipments of the potentially infected animals. These included Arkansas, Florida, Illinois, Michigan, Mississippi, Nevada, Ohio, Texas, Washington, West Virginia, Belgium, the Czech Republic, Japan, the Netherlands, and Thailand.

The Division of Quarantine, CDC, Atlanta, has coordinated international notifications with the World Health Organization and with the European Disease Surveillance Networks," said David Dennis, MD, a medical epidemiologist at the CDC.

Until the company halted shipments Aug. 1, approximately 250 of an estimated 3,600 prairie dogs that had passed through the Texas facility had died of the bacterial disease. Officials determined that the sick animals were part of a single shipment of prairie dogs caught in South Dakota starting May 18 and shipped to the Texas distributor June 16. All prairie dogs that were shipped by the Texas facility after June 16 or by the South Dakota trader after May 18 were recalled. According to Dr. Dennis, Texas, West Virginia, and the Czech Republic reported unusually high numbers of sick or dead prairie dogs.

Tularemia, an infectious disease caused by the hardy bacterium *Francisella tularensis*, is found in animals, especially rodents, rabbits, and hares. The bacterium is transmitted via direct or indirect methods, including tick and horse fly bites, contact with infected animal carcasses, consumption of contaminated food or water, or inhalation of infected aerosols. Symptoms include high fever, chills, head and muscle aches, a feeling of weakness, chest discomfort, and a dry cough. The disease, which can be treated with antimicrobials, cannot be spread ... person to person.

JAVMA, Vol 221, No. 7, October 1, 2002



Wildlife ranching

- South Africa _ 13,000 game ranches, 4,000 are integrated domestic/wild animals
- Deer farming _ 4.8M worldwide
  - _ New Zealand _ $200M per year
  - _ China _ 0.5M animals for velvet
  - _ Throughout Europe
- Costa Rica _ 10,000 iguanas per year
- Brazil _ 100 metric tonnes of capybara, peccaries, turtles, for consumption

Hosted by Paul Webber, paul@webbertraining.com

www.webbertraining.com

Emerging Zoonosis – Blurring Interface of Human and Animal Diseases

Dr. Corrie Brown, DVM PhD

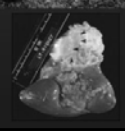
A Webber Training Teleclass

Diseases from pets

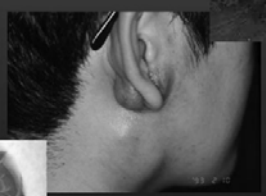
- 136M dogs and cats in U.S.
- 62M households with pets
- Increasing importance of human-animal bond

Emerging diseases from pets

- Cat scratch disease
- *Capnocytophaga canimorsus*
- Salmonellosis
- Alveolar hydatid disease
- *Baylisascaris procyonis*



- Cat scratch disease
- *Capnocytophaga canimorsus*



Emerging diseases from pets

- Salmonellosis

Reptile owner donates blood, passes on lethal *Salmonella* infection

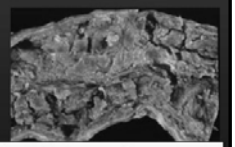
A study in the New England Journal of Medicine (Oct.3,2002) reports that a snake is the source of a *Salmonella* organism that contaminated a platelet transfusion and infected two platelet recipients, killing one of them. The AVMA and Association of Reptilian and Amphibian Veterinarians have long been proponents of educating the public about *Salmonella* risks and reptile ownership, and the study is further evidence that this is key.

Doctors traced the infection to the platelet donation and discovered that both transfusions came from the same individual. Upon further investigation, they found that the donor, although appearing healthy at the time of apheresis, had asymptomatic salmonellosis.

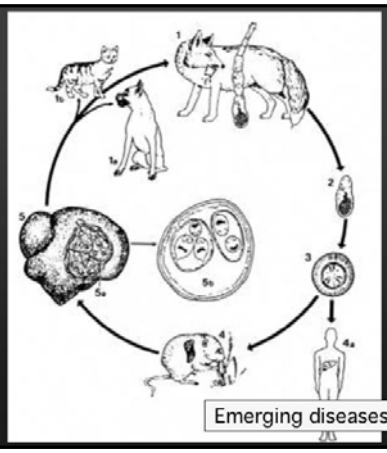
cases of *Salmonella* infections that occur annually in the United States.

Dr. Wilbur Amand, ARAV executive director, thinks the top figure is closer to eight percent. "There are many more cases of salmonellosis due to contamination of poultry and egg products than there are to cases coming from reptiles," he said.

"To me, the message (of this study) is to reemphasize the need for the (reptile) pet-owning public to maintain high sanitation standards." Dr. Amand said. "I think that the veterinarian has a role to remind clients (that), whether it is a green iguana, or a box turtle, or a boa constrictor, that any or all of them may be a carrier of the organism, and as such, they need to

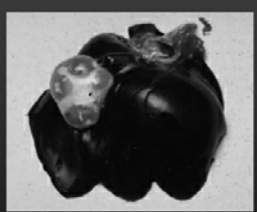


Emerging diseases from pets



Alveolar hydatid disease

- *Echinococcus multilocularis* – range increasing



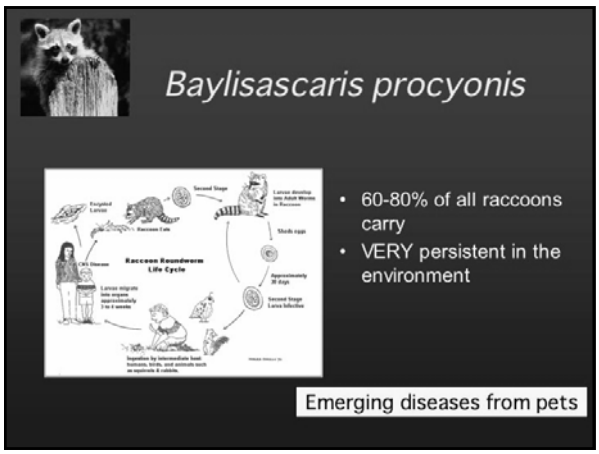
Hosted by Paul Webber, paul@webbertraining.com

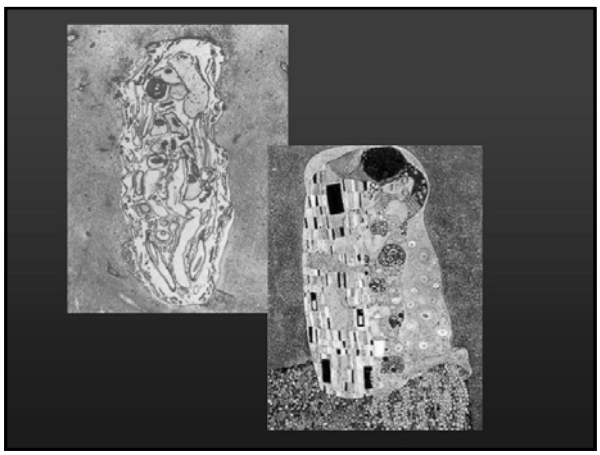
www.webbertraining.com

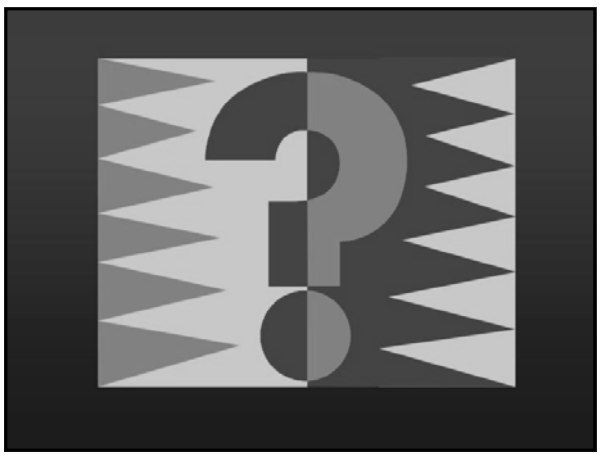
Emerging Zoonosis – Blurring Interface of Human and Animal Diseases

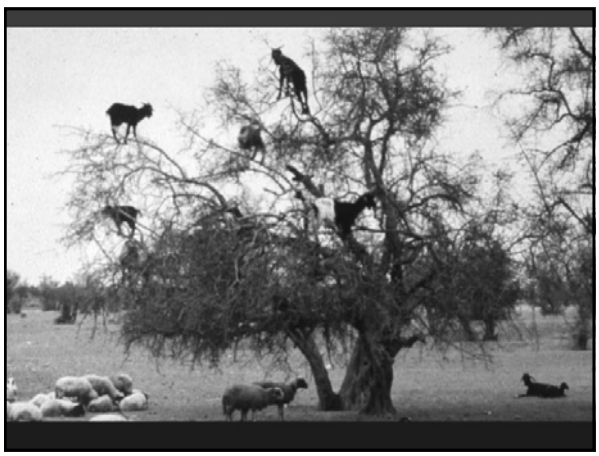
Dr. Corrie Brown, DVM PhD

A Webber Training Teleclass









Hosted by Paul Webber, paul@webbertraining.com

www.webbertraining.com

Emerging Zoonosis – Blurring Interface of Human and Animal Diseases

Dr. Corrie Brown, DVM PhD

A Webber Training Teleclass

Hosted by Paul Webber, paul@webbertraining.com

www.webbertraining.com