


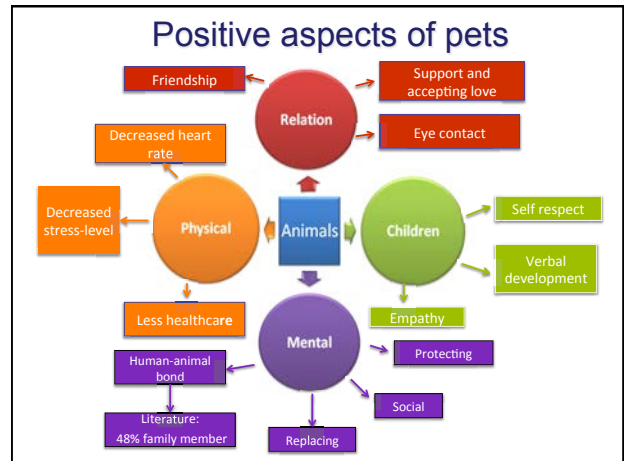
Utrecht University
University of Applied Sciences
hardenbosch

Companion Animal Zoonoses



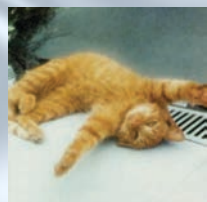
DIGO, 14 november 2012
Paul A.M. Overgaauw DVM PhD Dip ACVM

Institute for Risk Assessment Sciences



Outline

- Significance of zoonotic infections
- Which zoonotic microorganisms are relevant?
- Significant companion animal zoonoses
- Control of zoonoses



Can you answer these questions?


- Should dog and cat bite wounds in the human always be treated with antibiotics?
- Are cats allowed with immunosuppressed patients (HIV, splenectomy)?
- Is deworming of the dog/cat twice a year sufficient to prevent human toxocarosis?
- Should pregnant women prevent any contact with cats?
- Will a new SARS outbreak require stringent measures regarding cats?

Zoonotic infections

- **Definition:** any disease and infection that are naturally transmitted between vertebrate animals and humans (WHO)
- Approx. **61% of existing human pathogens are zoonotic**¹
- Since 1979 more than **40 new human infectious diseases** → **75%** of these (emerging) diseases **are zoonotic**¹
- Global impact more significant than indicated

¹ Taylor and Latham. 2001

Global impact



Certain zoonotic outbreaks of the last decade (Clin Microbiol Inf Dis, 2011;17:323)

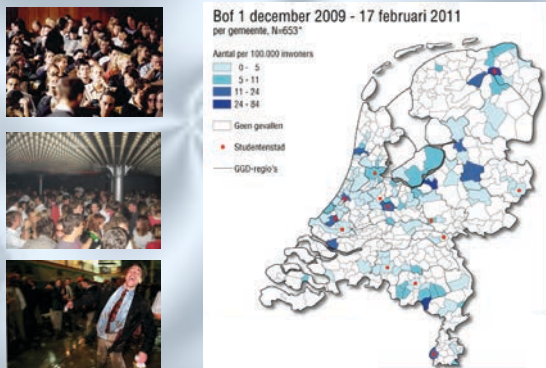
Reasons for emerging zoonoses

- Extensive population movements
 - tourism to 'true nature' (rabies, leptospirosis)
 - business travel
 - military operations (Iraq, Afghanistan → leishmaniosis, Q-fever)
 - immigration (brucellosis, echinococcosis, tuberculosis)
- Exotic pets
- Tasting all sorts of raw delicacies (even in the field; bush meat)
- Global warming

Reasons for emerging zoonoses

- Medical progress created a vast reservoir:**
- **Immunocompromized patients (YOPI's)**
 - Young
 - Old
 - Pregnant
 - Immune suppressed (cancer treatment, AIDS, splenectomy)
 - (students)

Mumps epidemic in Dutch students

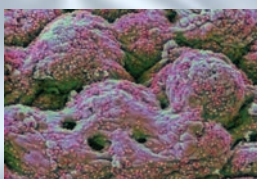


Reasons for emerging zoonoses

- Medical progress created a vast reservoir:**
- Immunocompromized patients (YOPI's)
 - YOPI's can be found:
 - children playgrounds / petting zoos
 - children care centres
 - homes for the elderly
 - care farms

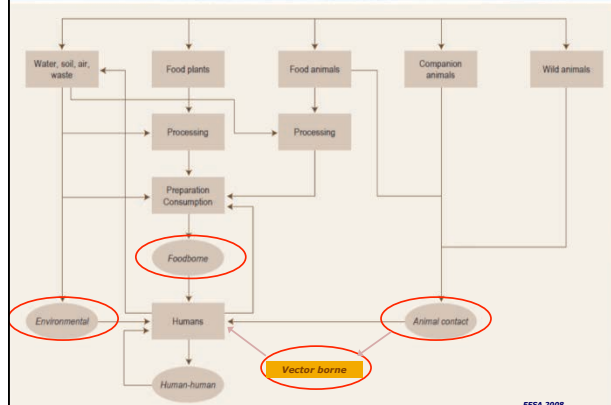
Reasons for emerging zoonoses

- In immunocompromized patients development of **opportunistic infections** which were previously harmless zoonotic agents:
 - e.g. cryptosporidiosis (unknown 40 yrs ago)
 - toxoplasmosis and listeriosis in AIDS patients



Small intestine infected with *Cryptosporidium parvum* (round pink dots)

Routes of transmission



Classification zoonoses based on routes of transmission

animal - human
 animal - vector - human
 animal - environment - human
 animal - food - human

Classification zoonoses based on routes of transmission

animal - human → *direct*
 animal - vector - human → *vector-borne*
 animal - environment - human → *indirect*
 animal - food - human → *food-borne*

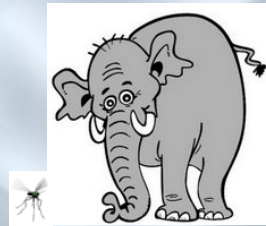
↑
Veterinary responsibility

Veterinary Public Health ~ One Health



Which zoonoses are significant?

Risk perception



make an elephant out of a mosquito



make a mountain out of a molehill

Risk perception vs. the facts

Relativize

	<u>Harm</u>	<u>Risk analysis</u>	<u>Risk perception</u>
BSE	++	---	+++
Growth hormones	+	--	+++
Salmonella	+	++	-

Potential feline zoonotic agents

(J Fel Med Surg 2005; 7: 243-74)

Bacteria	Rickettsiae & Chlamydiae	-Protozoa
-Bacillus anthracis	-Chlamydia felis	*Cryptosporidium parvum
-Bartonella sp.	-Coxiella burnetii	*Entamoeba histolytica
-Bordetella bronchiseptica	-Rickettsia felis	*Giardia sp.
-Borrelia burgdorferi	Parasites	*Toxoplasma gondii
-Campylobacter jejuni	-Nematoda	-Ectoparasites
-Capnocytophaga canimorsus	*Ancylostoma braziliense	*Cheyletiella
-Corynebacterium diptheriae	*Ancylostoma tubaeforme	*Sarcoptes scabiei
-Francisella tularensis	*Dirofilaria immitis	Fungi
-Helicobacter sp.	*Strongyloides stercoralis	-Dermatophytes
-Mycoplasma felis	*Toxocara cati	Viruses
-Salmonella sp.	-Cestoda	-Avian influenza
-Streptococcus gr. A	*Dipylidium caninum	-Cowpox
-Yersinia enterocolitica	*Echinococcus multilocularis	-Rabies
-Yersinia pestis		

Potential feline zoonotic agents

Bacteria

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Rickettsiae & Chlamydiae

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Parasites
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 *Ancylostoma braziliense
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***Toxocara cati**
-Cestoda
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 *Echinococcus multilocularis

-Protozoa

*Cryptosporidium parvum
 *Entamoeba histolytica
***Giardia sp.**
***Toxoplasma gondii**
-Ectoparasites
***Cheyletiella**
 *Sarcoptes scabiei

Fungi

-Dermatophytes

Viruses

-Avian influenza
 -Cowpox
 -Rabies

How to define risk?

- Risk = Exposure x Hazard
 (chance of infection x seriousness of the outcome)
- Risk = a number
 Risk = ~~a percentage!~~



Simple risk analysis

- Risk = Exposure x Hazard



100



10



10

Simple risk analysis

- Risk = Exposure x Hazard



0



Child protected socket outlet

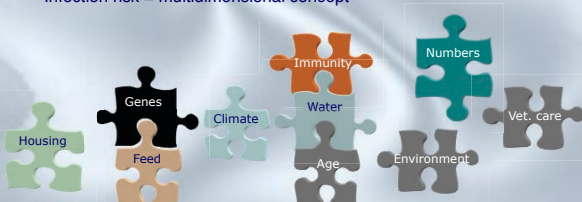
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Quantitative infection risk analysis

- Infections and infection risks are **never similar**. Every situation may be different and influenced by many (difficult measurable) factors
- **Distinguish**: contamination – infection – disease
- Infection risk = multidimensional concept

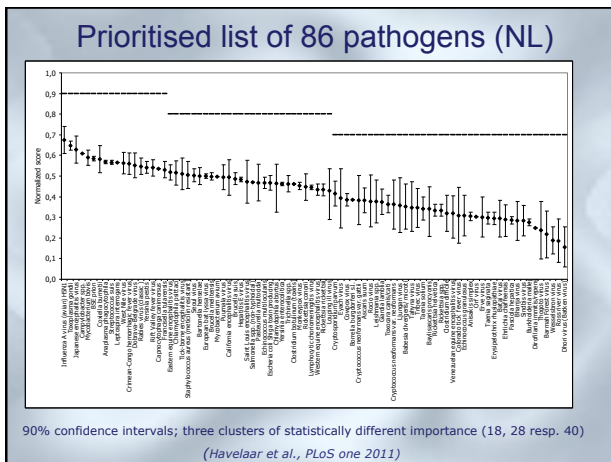
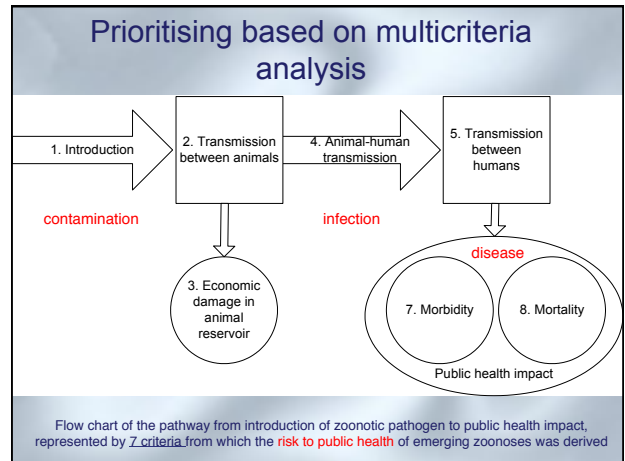
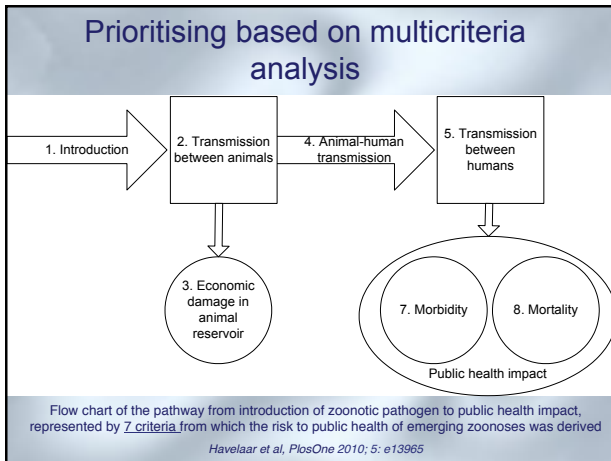


Analysis emerging zoonoses NL

1. to provide a systematic approach to **signal** emerging zoonoses
2. to **prioritize emerging zoonoses** relevant for our country
3. to develop a blueprint for an **early warning and surveillance system** for emerging zoonoses



Report 2010



Significant companion animal zoonoses

Based on multi-criteria analysis & in terms of infection risk and/or health risk:

- toxoplasmosis
- bite wounds
- cat scratch disease (*Bartonella henselae*)
- *Toxocara canis*, *T. cati*, *Echinococcus multilocularis*
- *Giardia intestinalis*
- dermatophytosis

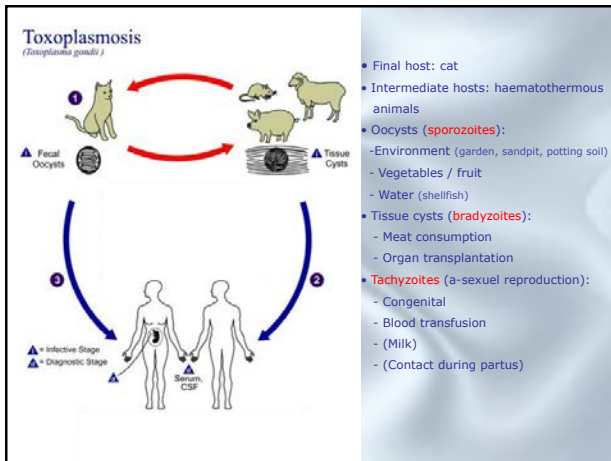
* B.R. Berends, 2008

Significant companion animal zoonoses

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- *Toxocara canis*, *T. cati*, *Echinococcus multilocularis*
- *Giardia intestinalis*
- dermatophytosis
- zoonoses and hygiene of the owner





Toxoplasmosis

Routes of transmission

1. Ingestion tissue cysts in meat, milk
2. Ingestion sporulated oocysts environment (incl. water)
3. Congenital infection
4. Transplantation/infusion

Congenital toxoplasmosis

Prevalence Netherlands: 2/1000 newborns

⇒ 390 babies /yr in NL (in 1987 → 107)

⇒ Other European countries (similar screening method):

- Ireland: 0,1/1000 (**20x less!**)
- Denmark: 0,2/1000 (**10x less!**)
- USA (Mass): 0,2/1000 (**10x less!**)
- Poland: 0,5/1000 (**4x less!**)

⇒ **2300 DALY's/year**

(Disability Adjusted Life Years)*

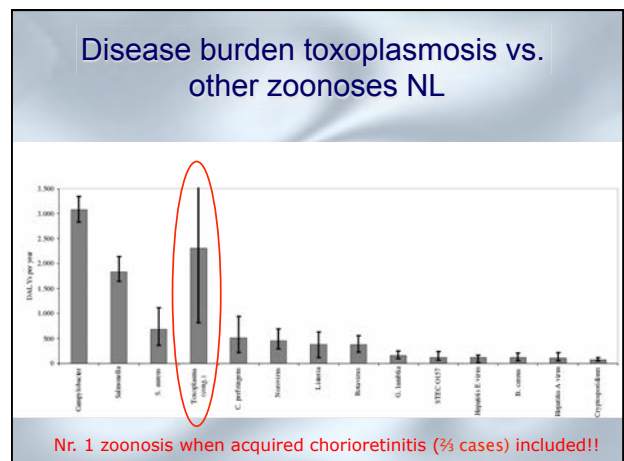
** Havelaar et al, Clin Inf Dis 2007; 44: 1467-74*

Disease burden – DALY's

- Conceptually simple:
 - disease burden is a function of the number of affected persons, the duration of the adverse health effect and the severity of the effect
- DALY = YLL + YLD
 - mortality: years of life lost
 - $YLL = \sum_{\text{all diseases}} (D \times e)$
 - morbidity: years lived with disability, weighted for severity of illness
 - $YLD = \sum_{\text{all diseases}} (N \times t \times w)$

DALY toxoplasmosis NL

	Total number			Duration (years)	Disability weight
	Most likely	Low	High		
Stillbirth (after 24 weeks)	3	1.4	9.5	79	1
Chorioretinitis in 1 st year of life	14	6.6	25	79	0.08
Intracranial calcifications	11.4	5	20.2	79	0.01
Hydrocephalus	1.9	0.7	4.4	79	0.36
CNS abnormalities	2.7	0.5	9.6	79	0.36
Death in 1 st year of life	0.75	0.2	2	79	1
Chorioretinitis later in life	17	3	76	69	0.08



Owners & pets sleeping together

- 56% of the owners sleeps with the dog next to them (USA)
- 62% small dogs – 41% medium sized – 32% large dogs
- 25% women – 16% men
- Cats: 62% slept with adults and 13% with children



So what?

Veterinary Parasitology 163 (2009) 115–122

Contents lists available at ScienceDirect

Veterinary Parasitology

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



Zoonotic parasites in fecal samples and fur from dogs and cats in The Netherlands

Paul A.M. Overgaauw^{a,*}, Linda van Zutphen^b, Denise Hoek^c, Felix O. Yaya^d, Jeroen Roelfsema^e, Elena Pinelli^f, Frans van Knapen^g, Laetitia M. Kortbeek^h

^aImB BV, Yalelaan 2, 3584 CM, Utrecht, The Netherlands

^bQuantitative Veterinary Epidemiology Group, Wageningen Institute of Animal Sciences, Wageningen University, The Netherlands

^cNational Institute for Public Health and the Environment, Department of Parasitology, Laboratory for

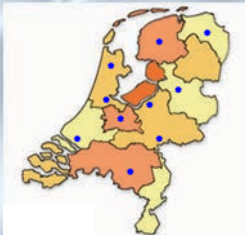
Diagnosis and Screening of Infectious Diseases, Bilthoven, The Netherlands

^dFree University of Amsterdam, Department of Biomedical Sciences, The Netherlands

^eInstitute for Risk Assessment Sciences, Division of Veterinary Public Health, Utrecht University, The Netherlands

Survey outline

- 60 **clinical healthy** cats & 152 **clinical healthy** dogs
- Questionnaires owner + sampling animals in vet clinics
 - divided all over the country
 - urban and rural



Prevalences zoonotic pathogens

Pathogen	Prevalences cat %	Prevalences dog %
<i>Giardia</i>	13.6 (3/22)	15.2 (14/92)
<i>Cryptosporidium</i>	4.6 (1/22)	8.7 (8/92)
<i>Toxocara feces</i>	4.6 (1/22)	4.4 (4/92)
<i>Salmonella</i>	0	1.3 (2/152)
<i>Campylobacter</i>	0	0
MRSA	0	0

* $P < 0.08$

Other zoonotic infections after close contact with pets

Pathogen	Sleeping	Kissing	Licking	Zoonosis
<i>Yersinia pestis</i>	D + C			bubonic plague
<i>Bartonella henselae</i>	D + C + K		K	CSD
<i>Pasteurella spp.</i> <i>C. canimorsus</i>	D + C D	D + C + R	D + C	meningitis, wound infections and abscesses, arthrosis
<i>Staph. intermedius</i>			D	wound infections
MRSA	D			wound infections
<i>Cheyletiella spp.</i>	D			dermatitis

D = Dog
C = Cat
R = Rabbit
K = Kitten



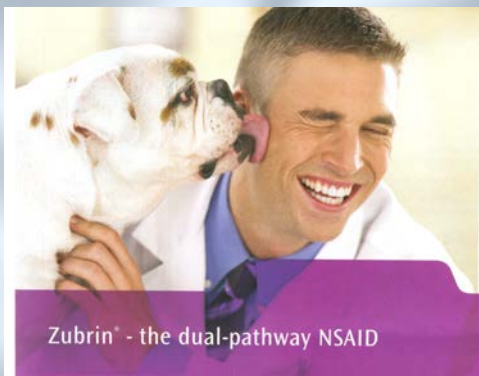
* Chomel and Sun. 2011

Licking faces by pets



Jacob has his happy, healthy best friend back.

Licking faces by pets



Is likken door hondentong minder vies?

Is likken door hondentong minder vies?

Wat Doggen? En hoe van Doggen?

Wat Doggen? Het onderzoek naar de afkomst van bacteriën die op de huid van mensen worden gevonden, is een belangrijk onderdeel van de bestrijding van infecties. Het onderzoek is gericht op het vaststellen van de afkomst van bacteriën die op de huid van mensen worden gevonden. Het onderzoek is gericht op het vaststellen van de afkomst van bacteriën die op de huid van mensen worden gevonden.

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Licking faces by pets

Vlaams Diergeneeskundig Tijdschrift, 2009, 78 Overzichtartikel 295

Bacteriën van huisdieren als oorzaak van maagklachten bij de mens

F. Haesebrouck, F. Pasmans, B. Flahou, T. Meyns, M. Vermoote, S. Kumar, K. Chiers, A. Decostere, R. Ducatelle

- There is clear evidence that animals are the source of gastric infections with non-*H. pylori Helicobacter* species of the human.
- Although it is not clear how gastric NHPH is transmitted from animals to the human, this is most likely by direct contact.

Licking eyes by a cat



Parinaud's oculoglandular syndrome → *B. henselae*



- Granulomatous conjunctivitis
- Fever, swollen lymph nodes
- **after direct inoculation or rubbing the eye following contact with a cat**

Licking face by pets

Incidence of acquisition of methicillin-resistant *Staphylococcus aureus*, *Clostridium difficile*, and other health-care-associated pathogens by dogs that participate in animal-assisted interventions

Sandra L. Lefebvre, *dm, phd*; Richard J. Reid-Smith, *dm, dvmc*; David Walker-Boers, *dm, phd*; J. Scott Weese, *dm, dvm, dactim*

J Am Vet Med Assoc 2009;234:1406-1417

- Rates of acquisition of MRSA and *C. difficile* 4.7 resp. 2.4 times higher among dogs that visited human health-care facilities, compared with dogs in other animal-assisted interventions.
- Dogs that licked patients or accepted treats during visits were more positive for MRSA and *C. difficile*.

Licking face by pets



Comparison of periodontal pathogens between cats and their owners

H.E. Booij-Vrieling^{a,c}, W.A. van der Reijden^b, D.J. Houwers^c, W.E.A.J. de Wit^b, C.J. Bosch-Tijhof^b, L.C. Penning^a, A.J. van Winkelhof^d, H.A.W. Hazewinkel^a

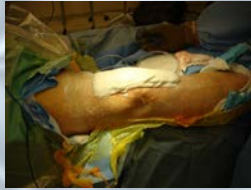
- The periodontal pathogens *Porphyromonas gingivalis* and *Tannerella forsythia* are highly prevalent in humans with periodontitis and have also been isolated from the oral cavity of cats
- Transmission to owners has been found and cats may therefore be a reservoir for these bacteria

Licking wounds by dog or cat

A bizarre postoperative wound infection

Br Med J 1990; **300**: 1552

- 73 yrs. old woman 3 months after knee replacement surgery
- Abscess with 20 ml pus
- Wound infection (*P. multocida*) after licking by her dog



Licking ear by pets

Beware of dogs licking ears

THE LANCET • Vol 354 • October 9, 1999

- A 67 yr old patient with right-side chronic purulent otorrhoea (perforated tympanic membrane)
- developed meningitis due to *Pasteurella multocida* transmitted by a dog that frequently licked his ear.



Cats allowed on the sink

In our survey in the NL: **45%**



Enterobacteriae may be isolated from food-preparing areas

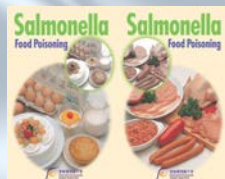
Significant exotic animal zoonoses (birds, reptiles)

Based on multi-criteria analysis & in terms of infection risk and/or health risk:

- salmonellosis
- psittacosis (*Chlamydomphila psittaci*)
- dermatophytosis

Reptiles & salmonellosis

- 50.000 clinical salmonellosis reported annually (NL)
- young children, pregnant women, elderly and diseased
- diarrhoea, abdominal cramps, dehydration, mortality
- alimentary zoonosis: eggs, meat, raw milk



Salmonella & pets

- 15% to 20% of cases are attributable to pets
- Esp. reptiles (lizards, snakes, and turtles) → 90% infected
- Reptiles in 3% households (US) (1.7 M. and doubled since '91)
- Responsible for 7% human salmonellosis (75.000/yr)



Connelly KP. *Inf Med* 2004; **21**: 557

Salmonella & pets

- FDA banned commercial distribution of turtles < 4 inch (1975)
- Result: 100.000 less salmonellosis in children per year
- Number of reptile-related *Salmonella*-serotypes in the human is raising proportional with the popularity of these animals
- All pet shops inform their clients about *Salmonella*-risks with sales of reptiles



Salmonella & pets

- Prevalences:

*dog: 10-25%

*cat: 1-13%

*ferret, bird

- dog chews, such as beef jerky, smoked hooves, pig ears, and pig snouts, may carry *Salmonella*



Salmonella & pets

- Pet stores, vets and pediatricians should inform owners and potential purchasers of reptiles about risks salmonellosis
- Always wash hands thoroughly after handling reptiles (cages)
- Children < 5 yrs and immunocompromised persons should avoid contact with reptiles
- Families expecting a new child should remove the pet reptile from the home
- Pet reptiles should not be kept in children-care centers
- Pet reptiles should not be allowed to roam freely in the home
- Avoid contact of children with dog chews

Answers of the questions

- Should dog and cat bite wounds in the human always be treated with antibiotics? → 95% yes (next presentation)
- Are cats allowed with immunosuppressed patients (HIV, splenectomy)? → only if bite and scratch wounds can be prevented
- Is deworming the dog/cat twice a year sufficient to prevent human toxocarosis? → in general: no → tailor-made deworming
- Should pregnant women prevent any contact with cats? → no
- Will a new SARS outbreak require stringent measures regarding cats?

SARS

SARS → Civet cat = *Viverra*
(marten like animal commonly found in Southeast Asia)



Not related with Felidae

No role in SARS!



Control of zoonoses

• Control: issue of veterinarians?

- identifying and eliminating diseases in animals
- however: numerous zoonotic agents in wildlife
- inadequate campaigns
- poor infrastructure developing countries → **zoonotic reservoirs**
- zoonoses are the diseases of the poor

• Control: issue of politicians?

- BSE: an example how a peculiar and vaguely understood zoonotic agent affected global politics....

Control of zoonoses

• Zoonoses control = interdisciplinary approach:

- medical
- veterinary
- public health
- animal biology
- entomology
- ornithology
- environmental
- ecology
- politics



Control = education

Role MD vs. DVM*

- Zoonoses seen: vets >> physicians
- C.A practitioners >> L.A practitioners
- Communication between physicians and vets is largely absent
- Physicians indicated that vets should play an equal or greater role in advising patients about zoonotic diseases
- Perceived zoonotic pathogens of greatest concern for immunocompromised persons:

	<u>Vets</u>	<u>Physicians</u>
animals:	reptiles	cats
pathogen:	<i>Salmonella</i>	<i>Toxoplasma</i>

*Grant, S, Olsen CW. *Emerg Infect Dis* 1999; 5: 159-63

Responsibility of vet (technician)

- Knowledge of infectious diseases of animals
- Knowledge about owner – animal bond
- Knowledge of zoonoses and zoonotic risks
- Responsible for important part of zoonosis control

Education of the owner is task of vet and veterinary technician!



Thanks for your attention!



Ask your vet about BOWOTOX for your pet!
BOTOX: Not just for humans anymore.

FreakingNews.com