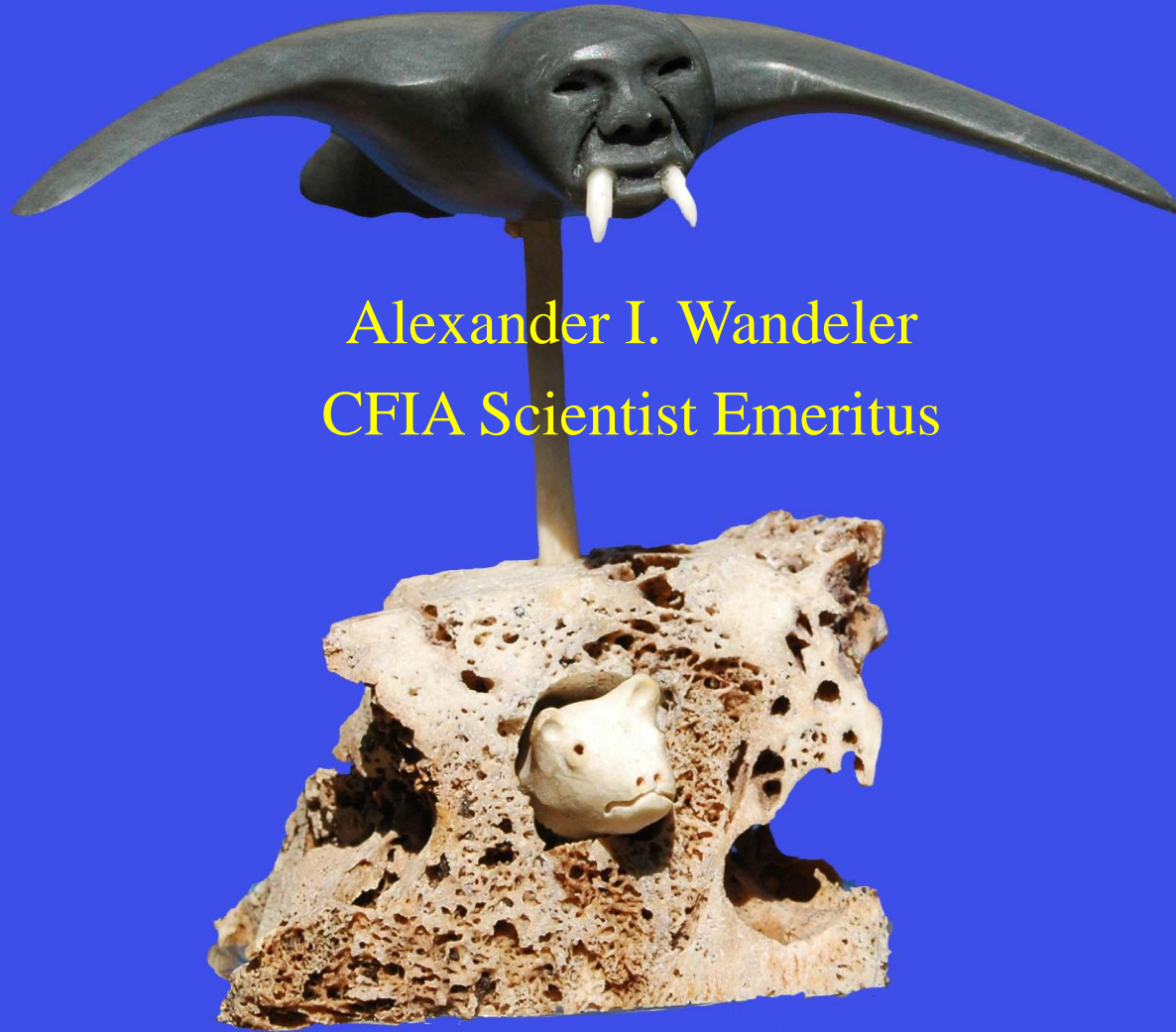


Global Perspective of Rabies



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Topics

- general review of global situation of rabies
- general problems and basic epidemiology of rabies
- why do we need to focus on fighting rabies at the animal source - in particular at dog level
- neglected zoonotic disease, complexity of one health approach
- output and progress since past two OIE regional rabies conferences (2005 Kiev, 2007 Paris)
- current activities of the veterinary profession in rabies control

The Global Situation of Rabies

- Different variants of rabies viruses and/or rabies-related Lyssaviruses occur on all continents, except Antarctica.
- Each variant is generally associated with a principal host species whose use of space and social interactions allow the virus to persist in its populations.
- These principal hosts are all members of the orders chiroptera (bats) or carnivora.

Epidemiology:

The European Fox Rabies Example (a)

- Front-wave moved 25 to 60 km/year
- 1st cases almost always in foxes
- Hardly any individuals with antibodies
→ high case fatality rate
- Epizootic reduced fox population densities

Epidemiology: The European Fox Rabies Example (b)

- Number of rabid specimens submitted for diagnosis fluctuating
- Prevalence of rabies in diagnostic submissions cycling
CAVE AT (observation/sampling window)
- true prevalence and incidence unknown
- Models explain periodicity, but have mostly little predictive power

Spill-over (a)

All principal hosts transmit the disease to other species, which are sometimes highly susceptible, but whose population biology and behaviour are not conducive to maintaining an epizootic.

Spill-over (b)

	LD ₅₀ in MICLD ₅₀	% of pos submissions (Switzerland)
Fox	10 ^{-0.5}	83
Hare	10 ^{1.6}	0
Cattle	10 ^{3.5}	1.6
Ferret	10 ^{4.7}	<< 0.1
Cat	10 ⁵	<< 0.1
Sheep	10 ^{5.7}	0.7
Dog	10 ⁶	0.4
Badger	?	4
Stone marten	?	2.5
Roe deer	?	5

after J. Blancou 1988

after Wandeler et al. 1974

What permits virus persistence in host populations?

- Triad:
 - high pathogenicity / high susceptibility
 - high susceptibility / high excretion
 - low immunogenicity / low survival
- Blancou's "biotypes"

Triad does not cover all virus adaptations necessary for the survival of a virus in a species

- with a habitat dependent population density
- population turnover and structure
- specific patterns of behaviour and social interactions (social use of space)

→ Molecular mechanisms determining incubation, duration and amount of excretion, etc. are poorly understood

Habitat, Resources, and Social Organization

Social use of space is flexible

Example: The red fox *Vulpes vulpes*

rural North America and Europe:

monogamous pairs in exclusive family territories

(→ Spread of rabies mostly from territory to territory)

urban/suburban Europe (UK):

non-exclusive, overlapping home ranges

or group territories with dominance hierarchies

Interrelationships between habitat (resource distribution and density), social organisation, mortality and dispersal

Higher resource densities permit higher population densities, resulting in smaller home ranges and shorter dispersal distances

→ consequences for transmission dynamics

Wildlife Rabies – Dog Rabies

- Areas of the world in which dogs are the principal hosts and those where rabies is maintained in wild animals
- In wildlife rabies areas of North America and Europe only 0.1–5.0% of cases reported are in dogs.
- In large parts of Asia, Africa and Latin America, rabies in dogs is much more common, making up 95% or more of all diagnosed cases. Rabid dogs are the major source of human infection.

Dog Rabies - Human Rabies

50,000 (?) human rabies cases worldwide

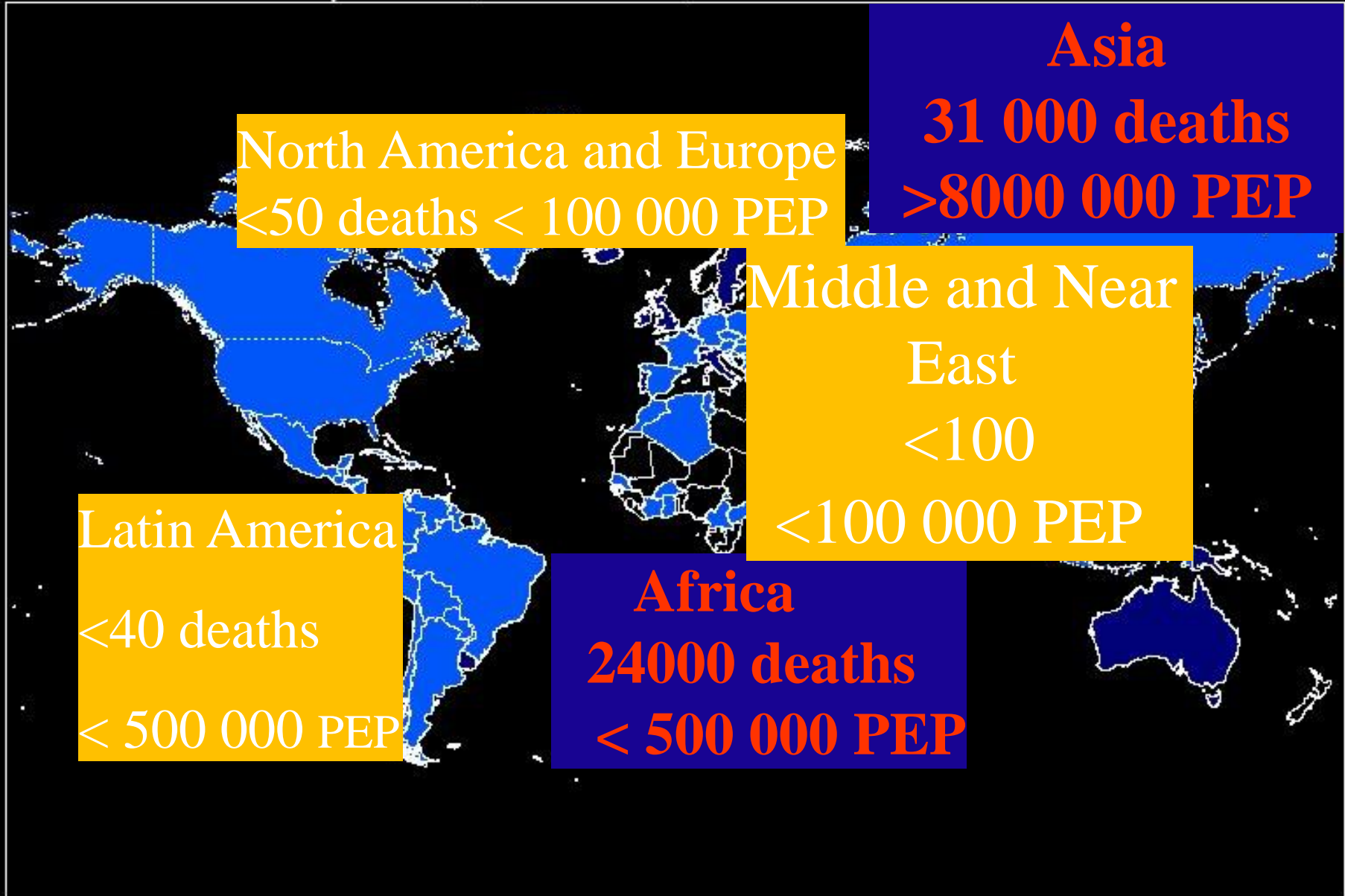
more than 99% result from bites by rabid dogs

up to 1 case per 100,000 inhabitants in some areas
(South and Southeast Asia, Africa?)

incidence of human rabies decreasing in areas with
successful dog rabies control (Latin America)

Occurrence of Rabies in Countries

Rabies endemicity status, worldwide, 2000



OIE's Stand

Bernard Vallat:

The cost of a post-bite treatment in humans is about twenty to one hundred times more costly than the vaccination of a dog

This is why it is cost effective that Ministries of Health provide financial resources to Veterinary Services to control the disease at its animal source

Considerations

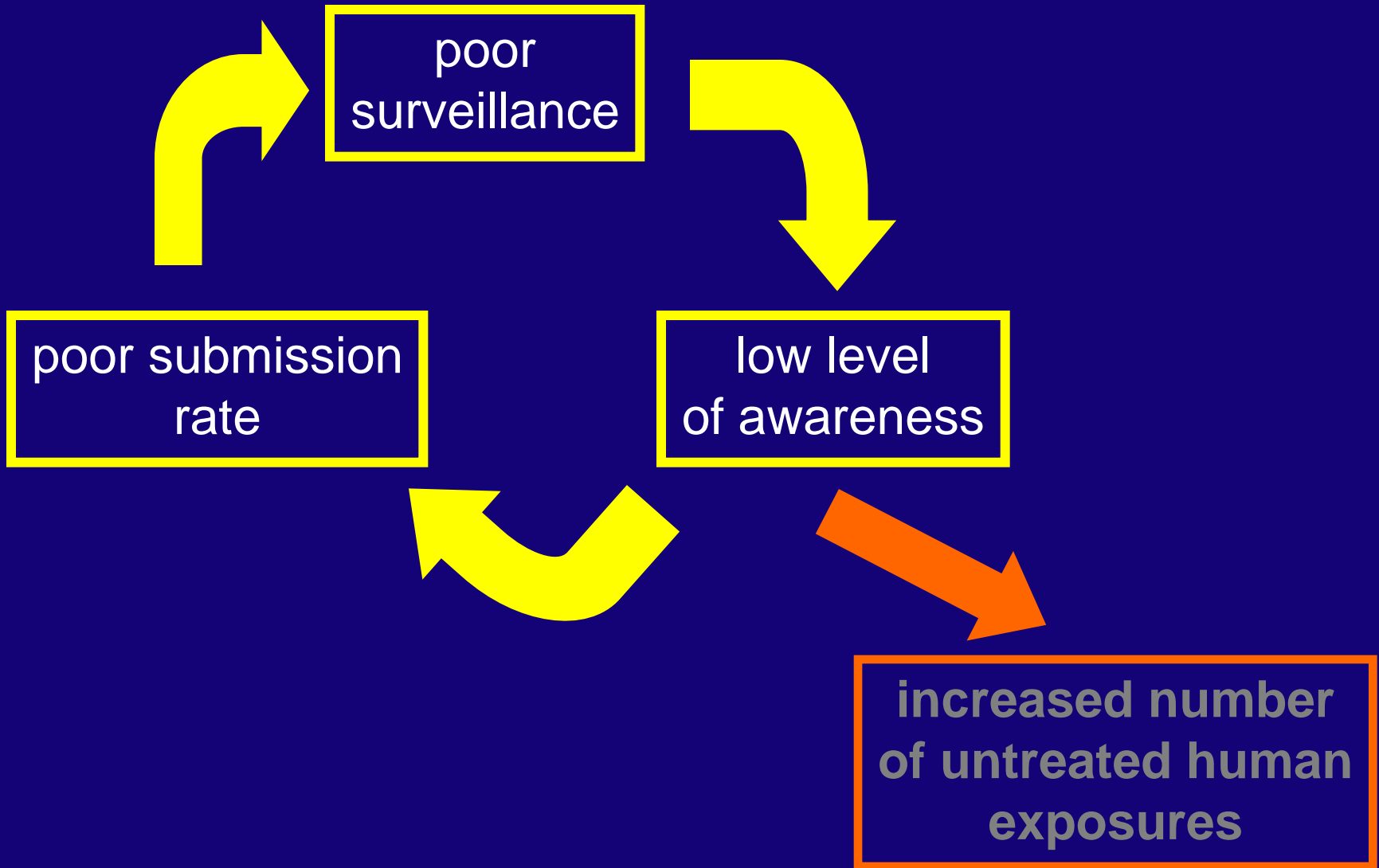
- Elimination of enzootic rabies in dogs is feasible – large efforts necessary – international support possibly required
- Modern Postexposure Prophylaxis (PEP) is highly effective
 - human rabies is preventable

Dog Rabies Control

Dog Population	Medical Systems	Western Medicine
Immunization	Western Medicine vs. competing traditional/culturally acceptable practices	Pre Exposure Prophylaxis (PreP)
Population Control	Education	Post Exposure Prophylaxis (PEP)

"One Health"

Surveillance and Human Rabies



The Veterinary Profession in Rabies Control

- Immunization of dogs (and wildlife) to establish herd immunities that stop the spread of rabies
- Promotion of responsible dog ownership (→ reduction of infectious contacts)
- Health education
- Support rabies diagnostics and surveillance