NC STATE
Veterinary Medicine
Population Health
and Pathobiology

Introduction to transboundary animal diseases

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Global Rinderpest Eradication Programme (GREP)

http://www.oie.int/en/for-the-media/rinderpest/eradication-programmes/

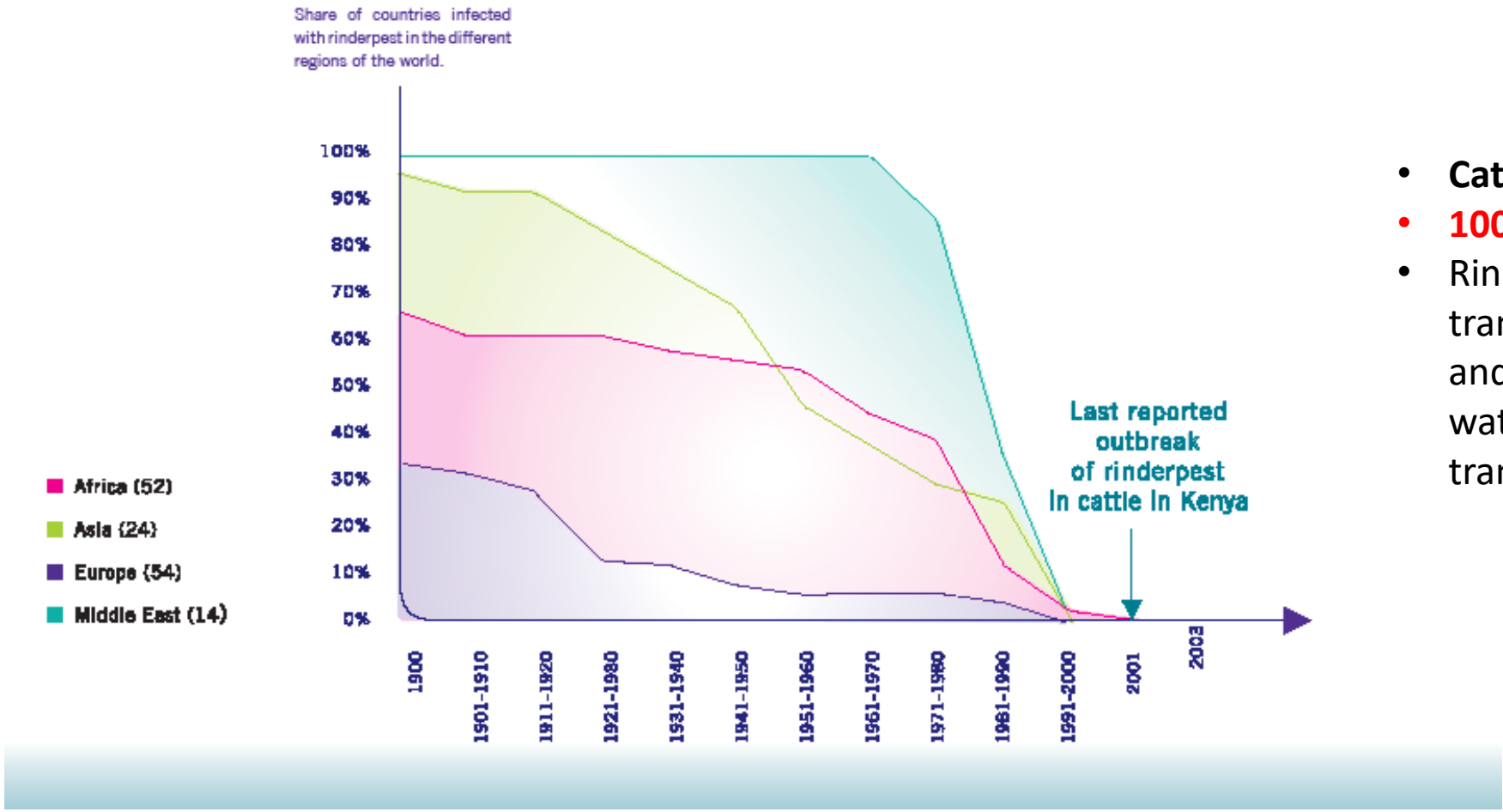
NC STATE Veterinary Medicine


Stone age

dicine

ERADICATING RINDERPEST : moments in time

Reported outbreaks of rinderpest steadly declined over the last 100 years.



- **Cattle plague**
- **100% mortality**
- Rinderpest was mainly transmitted by direct contact and by drinking contaminated water, although it could also be transmitted by air

TADs

- Transboundary Animal Diseases (TADs):
  - **Epidemic diseases** which **are highly contagious or transmissible**
  - Potential for very **rapid spread**, irrespective of **national borders**, causing serious socio-economic
  - Possibly public health consequences.
- Diseases which cause a **high morbidity and mortality** in susceptible animal populations-**threat to the livelihood of livestock farmers.**
- Significant detrimental effect on national economies.

Examples

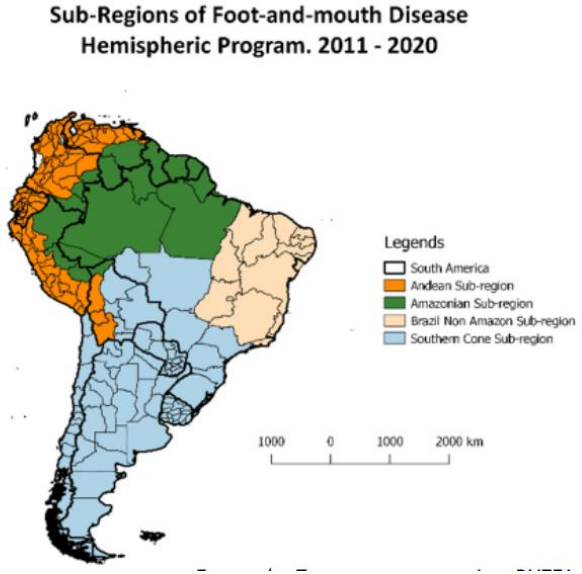
cine

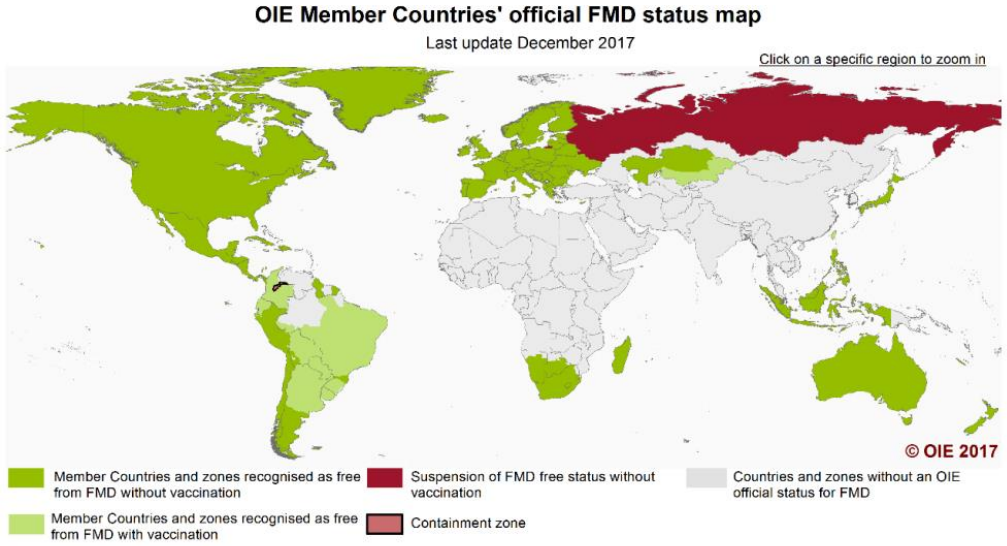
Diseases eradicated?

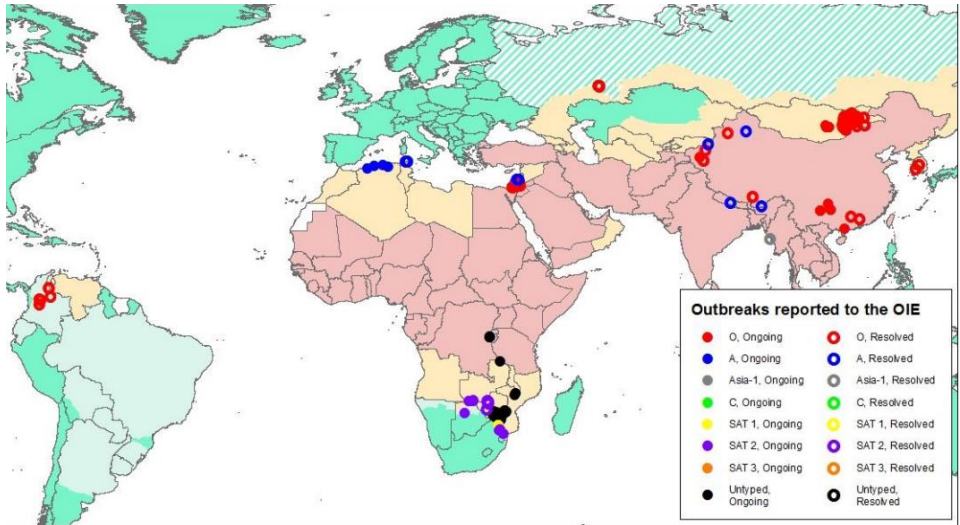
- Smallpox 1980
- **Rinderpest 2011**
- Why we were able to eradicated **only 2 diseases**?
  1. Direct transmitted (i.e., contagious)
  2. Manly by a single species – clinical sign were **serve** and **high mortality** and animals built lifelong immunity to re-infection.
  3. **+++++ vaccination and diagnostic were available**

Other candidates TADs for eradication

- Contagious bovine pleuropneumonia (CBPP)
- Rabies
- Peste des petits ruminants (PPR)
- **FMD**







Why FMD is so difficult to eradicate?

- Sub-Saharan Africa specifically, particular serotypes of FMD virus

(SATs) are maintained by wildlife populations

- The Eurasian serotypes of FMD virus have been eradicated from some regions of the world such as western Europe through **mass vaccination up to 1990**, followed by introduction of a non-vaccination policy!
- Just vaccination should be enough?!

What do we need?

- **An effective intervention is available and able to reduce the effective reproductive number to less than 1** ($R_0 < 1$),--R_e
- **Surveillance tools** and strategies with s**ufficient sensitivity and specificity** are available to detect **levels of infection that can lead to transmission**
- The definitive domestic animal host-**essential for the life cycle of the agent**
- The involvement of **free-living invertebrate-vertebrate vectors in the life cycle of the infectious agent**
- The **ability** of the agent **to persist or multiply in the environment in the absence of an animal host.**

Agreement for TAD control

Table 2. Factors and elements – with weighting – related to TADs eradicability

Vaccine efficacy	Score	Surveillance factors	Score	Epidemiological factors	Score
Induction of solid immunity to re-infection by available vaccine	8	Clinical signs in domestic livestock host(s) characteristic	5	Persistence in and transmission of the agent by invertebrate vectors	9
Duration of vaccinal immunity/requirement for administration of multiple (booster) vaccinations	7	Availability of laboratory tests for reliable identification of the infection in live animals	8	Persistence/multiplication of the agent outside the bodies of susceptible hosts (i.e. in the abiotic environment)	7
Amenability of vaccine to large-scale application (including cold-chain requirement)	4	Availability of laboratory tests for reliable identification of the infection in dead animals	5	Multiplicity of livestock hosts	4
Safety/innocuity of vaccine (acceptability to livestock owners)	5	Availability of tests to differentiate antibody responses to infection vs vaccination (DIVA)	4	Importance of free-living wildlife in maintenance and transmission of the infection	9
Cost of vaccine and vaccine administration	3	Availability of rapid testing systems (e.g. pen-side tests)	2	Extent of biological variation, including antigenic variation, within the infectious agent population	7
				Ability of recovered animals to transmit the infection (e.g. carrier transmission)	8
				Level of immunity and duration in recovered vertebrates	6

Table 4. Feasibility ranking of evaluated diseases based on the sum of weighted criteria scores

Rank	Disease (number ID)	Sum-weighted criteria score			
		Vaccine	Surveillance	Epidemiology	Total
1	Rinderpest (21)	135	85	241	461
2	Canine rabies (17)	117	72	221	410
3	Peste des petits ruminants (4)	99	74	228	401
4	Foot and mouth disease - E (11)	94	108	188	390
5	Infectious bovine rhinotracheitis (20)	102	85	199	386
6	Newcastle disease (25)	97	76	208	381
7	Classical swine fever (2)	109	67	204	380
8	Equine influenza (10)	95	68	213	376

Rinderpest, canine rabies, the Eurasian lineage of FMD viruses and peste des petits ruminants

In conclusion

- Before any TAD is considered as a candidate for either regional elimination or global eradication, **two primary considerations are vital:**

1. Technical capability to eradication
2. Assurance that the **long-term benefits will exceed the short-term costs** of an elimination/eradication programme.

Limitations and opportunities

- Lack of current understanding by the global community the importance of TAD;
- Few reviews about TAD;
- Lack of knowledge about the knowledge around TAD.

- Proposal for this call
- Generate a comprehensive review about ASF.

Learning objectives and outcomes

- Recognize the importance of Transboundary animal disease (TAD) for global food security
- Be exposed to disease mapping data and methods
- Identify open-source repositories of TAD and procedures for data gathering and analysis
  - Introduction to R and alternative mapping software.
- Proficient in making tables into maps
- Be exposed to spatial and spatiotemporal mapping tools and methods
- Learn how to integrate different data sources and test hypothesis
- Work on a short communication using secondary data.