Integrated Approaches to Control and Eradication of Brucellosis : One Health approach

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وزارة البيئة والمياه والزراعة
Ministry of Environment Water & Agriculture

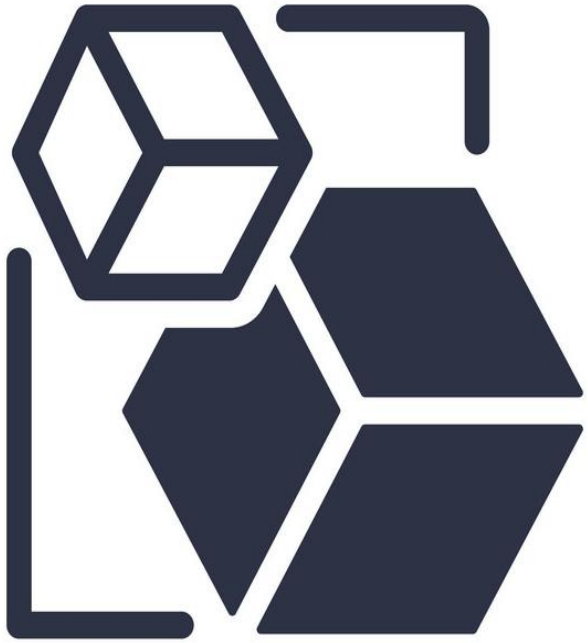
Arab Organization for Agricultural Development
with the Support of the World Organisation for Animal Health

Workshop on the Surveillance, Diagnosis, Control and Prevention of Brucellosis in Arab Countries

Kingdom of Saudi Arabia/Riyadh

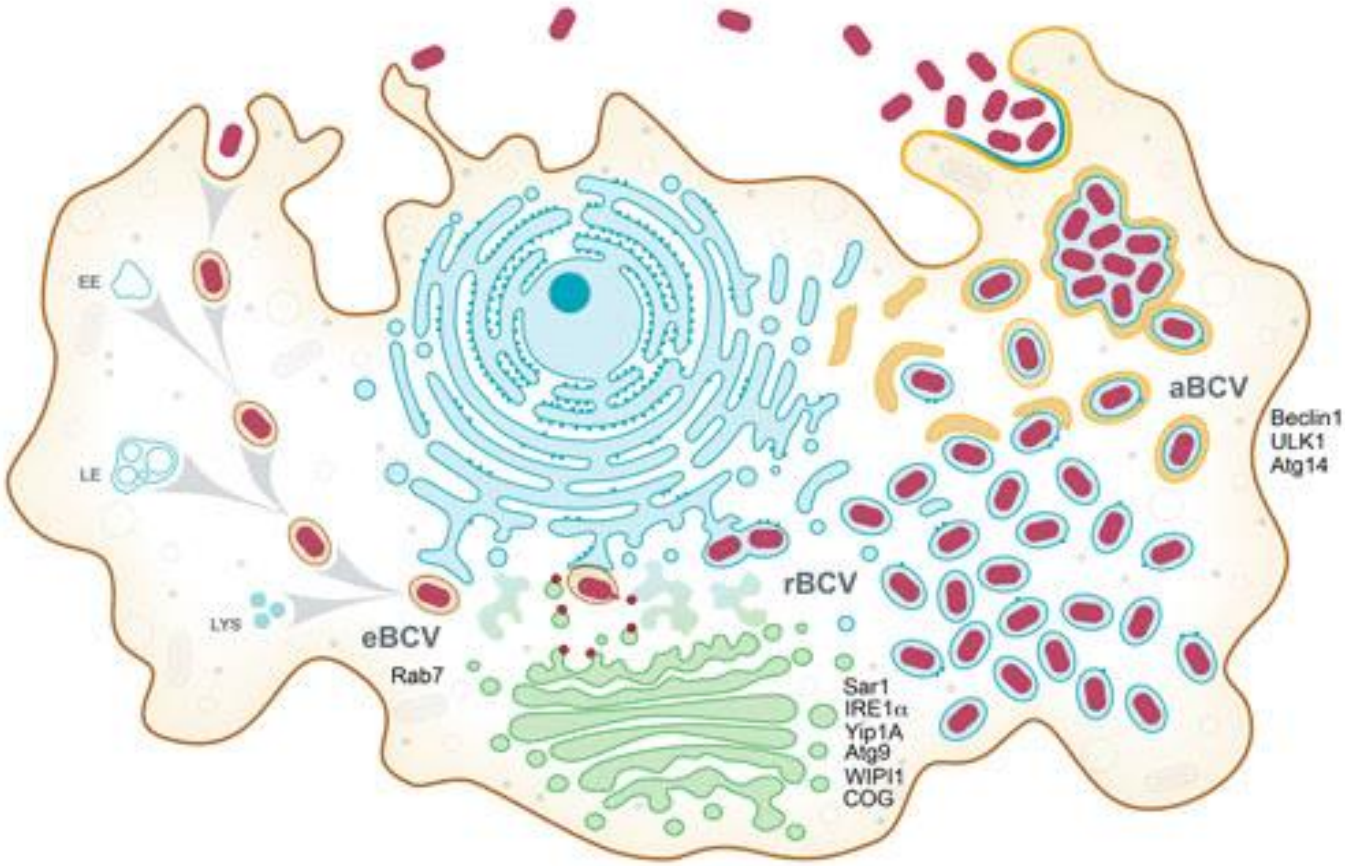
11-14 November 2024

Outlines:



- Background and Introducing on why we need one health ?
- Factors which contribute to the emergence and re-emergence of diseases ?
- How to make the efficient and effective one health implementation ?

Part 1



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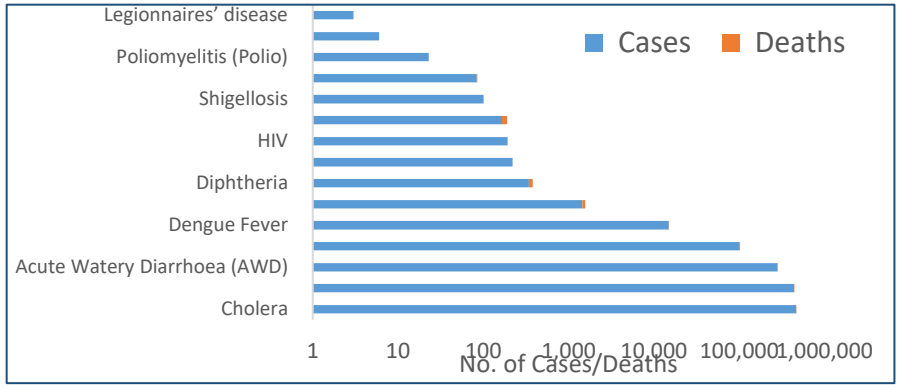
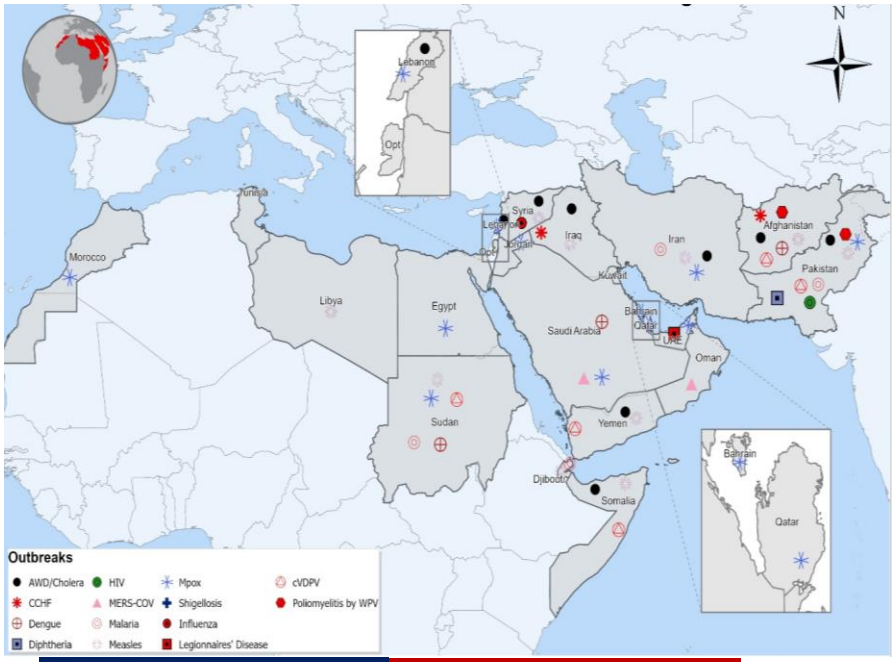
Ongoing Outbreaks in EMR



Disease	Cases *	Deaths *
Cholera	466,972	311
Malaria	442,872	19
Acute Watery Diarrhoea (AWD)	280,922	105
Measles	101,746	480
Dengue Fever	14,965	150
Crimean-Congo hemorrhagic fever (CCHF)	1,455	114
Diphtheria	342	39
Circulating vaccine-derived polioviruses (cVDPV)	220	-
HIV	192	2
Respiratory illness	165	26
Shigellosis	100	1
Mpox	84	1
Poliomyelitis (Polio)	23	-
Middle East respiratory syndrome (MERS)	6	-
Legionnaires' disease	3	-
Total	**1,310,067**	**1,248**

*As of 15 April 2023



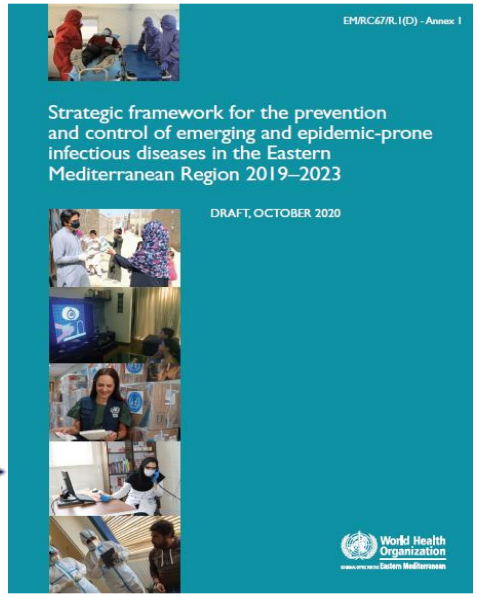
55**
Outbreaks in 2023

51**
Active outbreaks

**As of 7 May 2023

Strategic framework for the prevention and control of emerging and epidemic-prone infectious diseases in the Eastern Mediterranean Region 2019–2023

Aim of the strategy is to enhance the capacity of the Member States to **prevent**, **detect** and **respond** to emerging and epidemics-prone infections through improving preparedness, promoting evidence-based interventions, guidance and best practices for control and elimination efforts of infectious diseases



http://www.emro.who.int/images/stories/about-who/rc67/strategic-framework-diseases.pdf?ua=1

Priority Emerging and Epidemic prone diseases

Emerging zoonotic diseases
- MERS
- SARS
- COVID
- Other emerging respiratory diseases with epidemic/pandemic potential

Influenza with new subtypes
- Avian influenza A(H5N1)
- Influenza caused by any novel and zoonotic Viruses

Waterborne diseases
- Cholera
- Acute hepatitis (hepatitis A and E viruses)
- Typhoid fever
- Epidemic diarrhoeal disease (Escherichia coli and Shigella)

Vector-borne diseases
- Dengue fever
- Chikungunuya fever
- Sandfly fever
- West Nile fever
- Zika virus infection

Viral haemorrhagic diseases
- Ebola virus disease
- Crimean–Congo haemorrhagic fever
- RiLT Valley fever
- Yellow fever

❖ **Meningococcal meningitis**
❖ **Endemic zoonoses**
- Anthrax
- Brucellosis
- Leishmaniasis
- Rabies

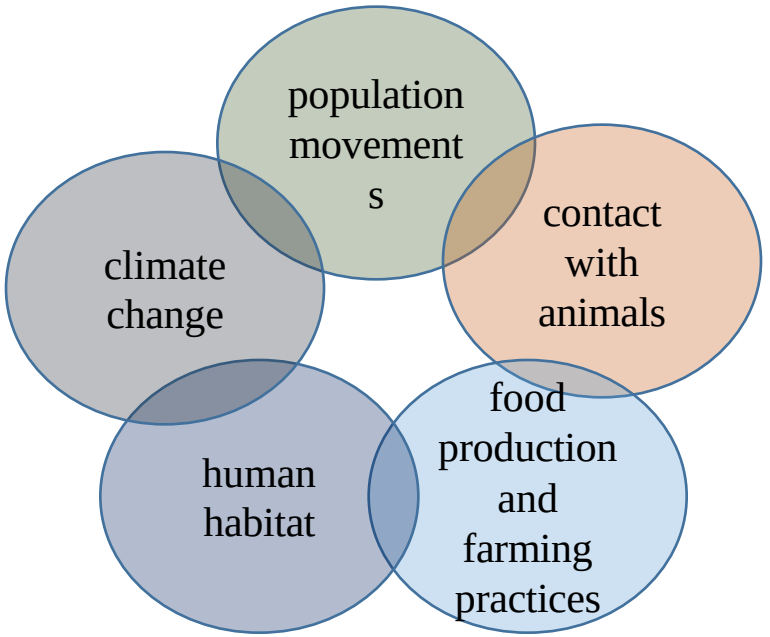
❖ **Disease X**
- Any other unknown diseases

Factors which contribute to the emergence and re-emergence of diseases

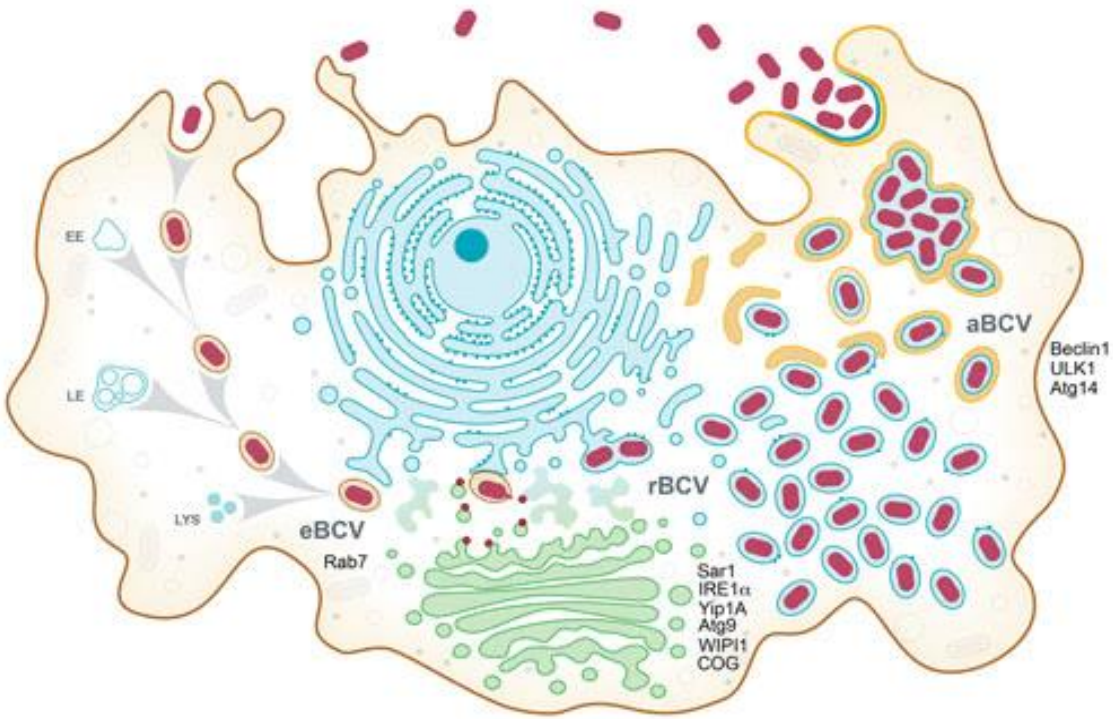
Emerging diseases
New Disease --- **New Threat**

Re-emerging diseases:
Old Disease --- **New Threat**

Despite our improved understanding of the epidemiology and control of infectious diseases, many new infections are emerging and re- emerging which pose an ongoing threat to global health security.



Part 2:
One Health



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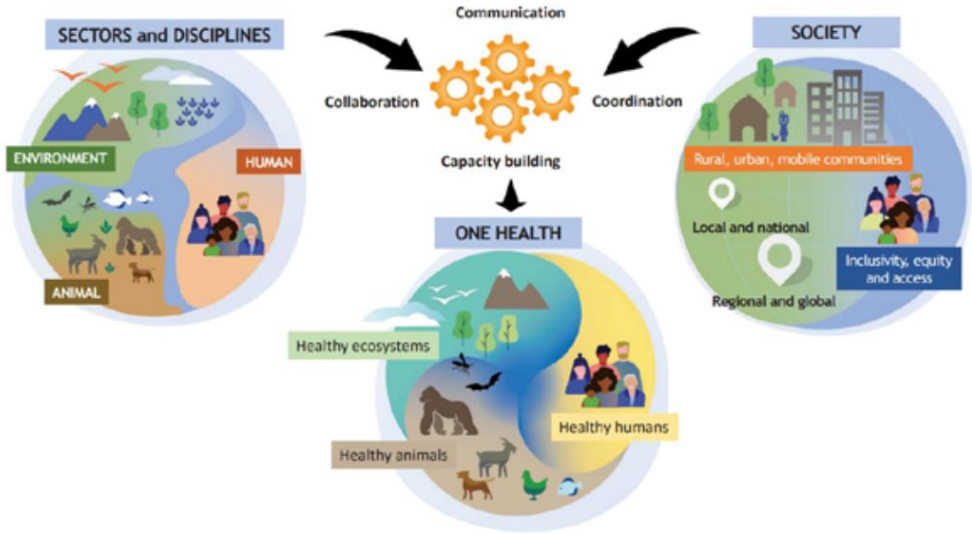
OHHLEP One Health Definition

- *"One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.*

- *It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent.*

- *The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development".*



PLOS PATHOGENS

One Health Foundational Principles

- **Equity** between sectors and disciplines
- **Sociopolitical parity** (all people are equal and deserve equal rights and opportunities), inclusion and engagement of communities and marginalized voices
- **Socioecological equilibrium** that seeks a harmonious balance between human—animal-environment interaction and acknowledging the importance of biodiversity, access to sufficient space and resources, and the intrinsic value of all living things within the ecosystem
- **Stewardship and the responsibility** of humans to adopt sustainable solutions that recognize the importance of animal welfare and the integrity of the whole ecosystem, thus securing the well-being of current and future generations
- **Transdisciplinary** and multisectoral collaboration which includes all relevant disciplines, both modern and traditional forms of knowledge and a broad representative array of perspectives.

Rationale

1-

2-

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Significance of Using One health approach

Improve the understanding of the pathogen's origins.

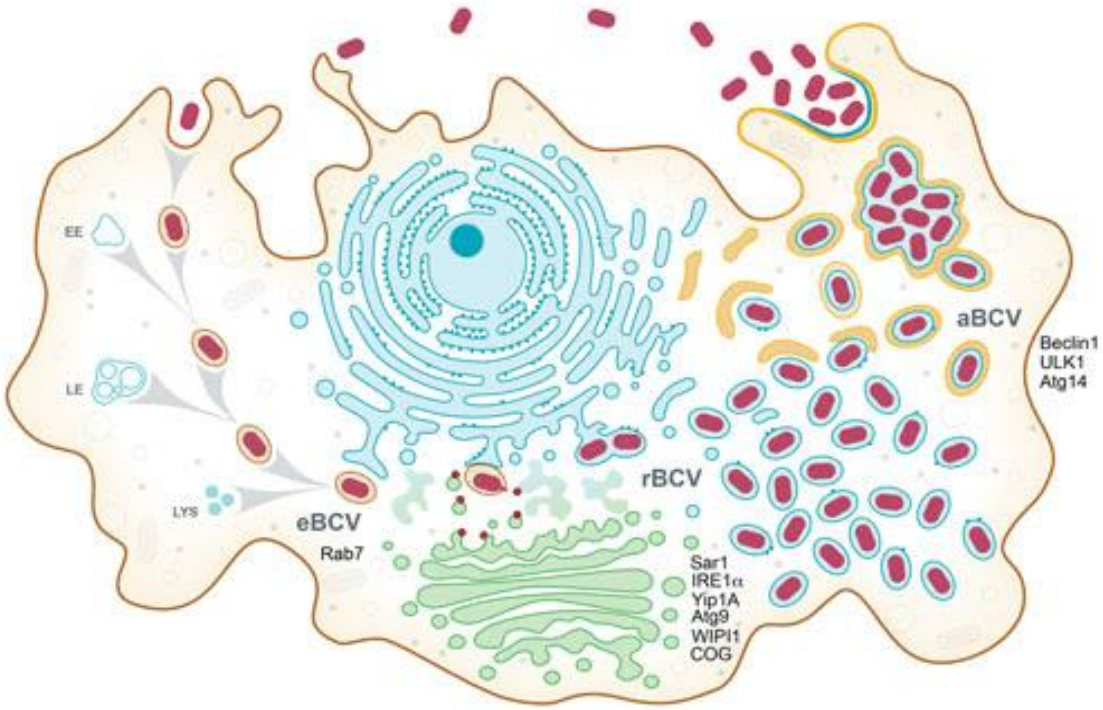
Improve preparedness and response

Improve the speed, quality, consistency, coordination, and comprehensiveness of investigations

Foreground the commitment of PPR

???????

Part 2: Brucellosis



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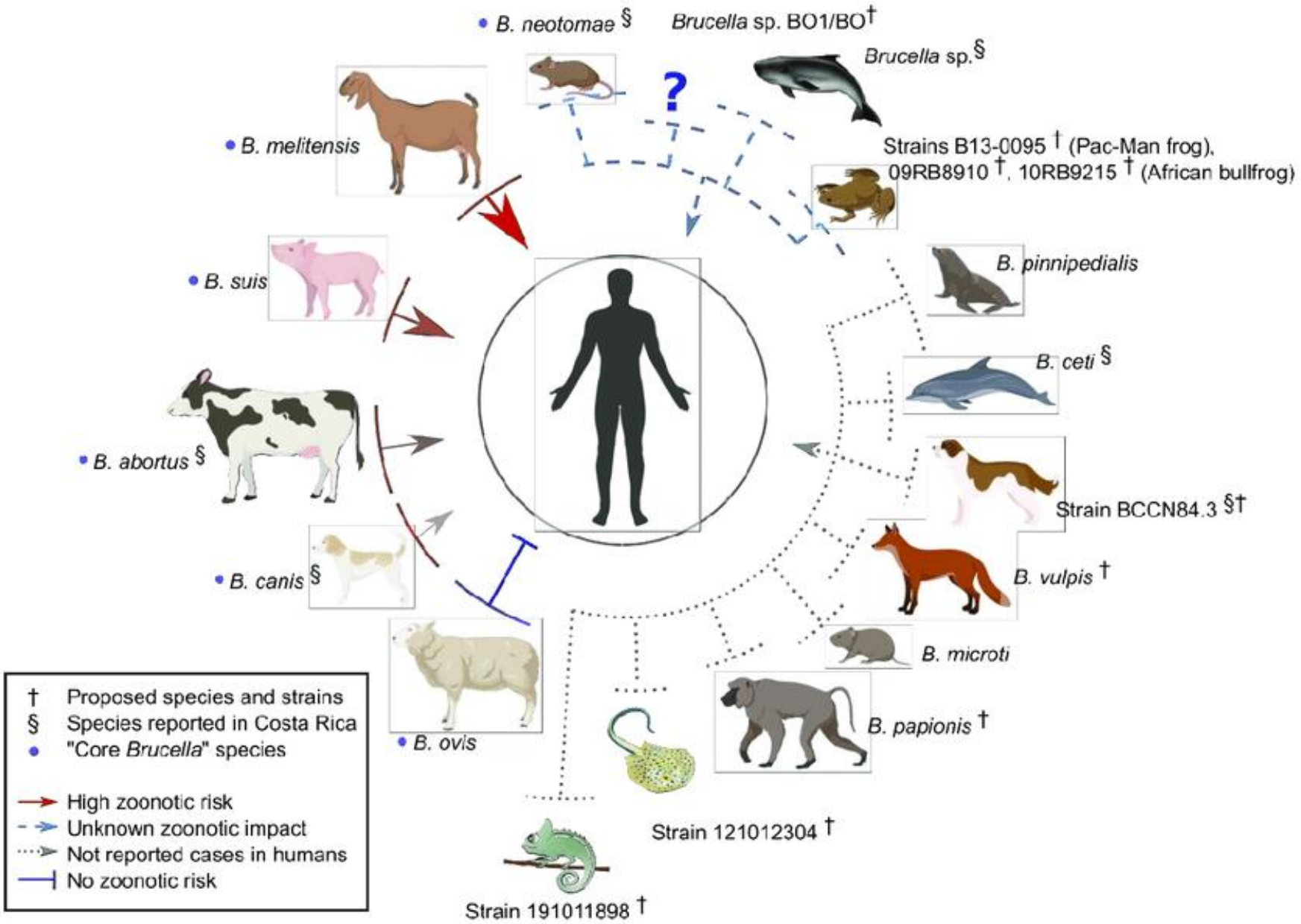
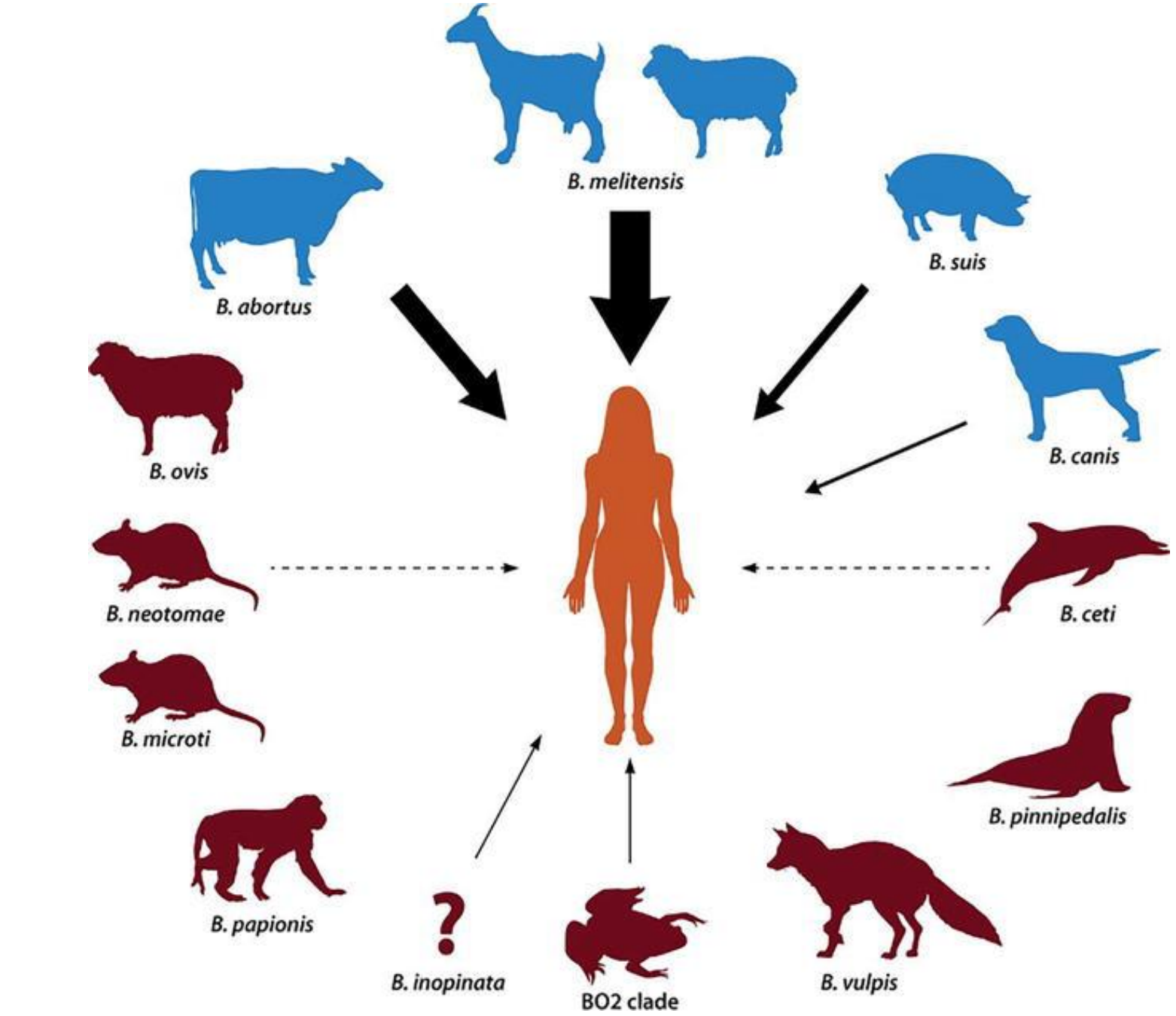
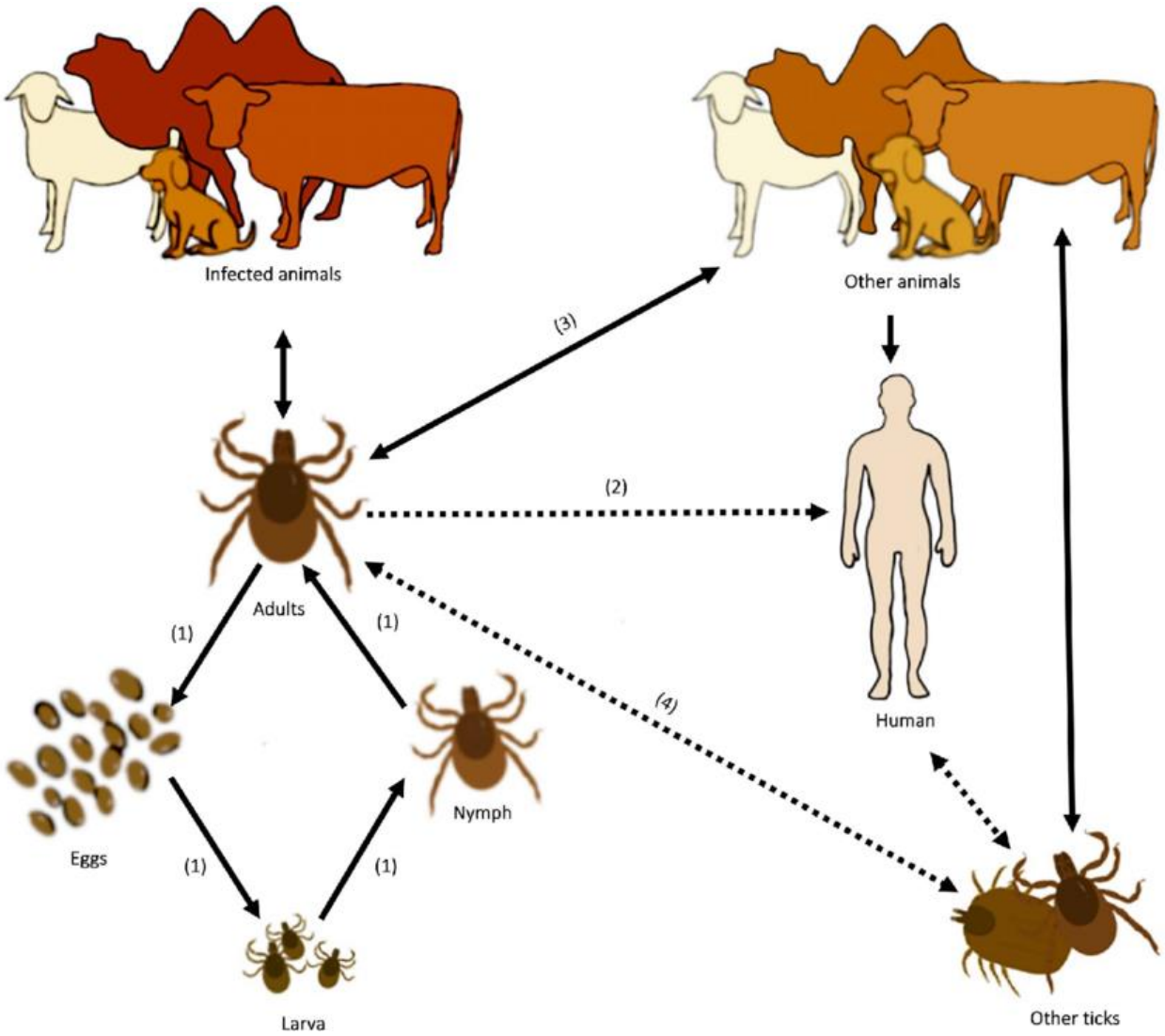


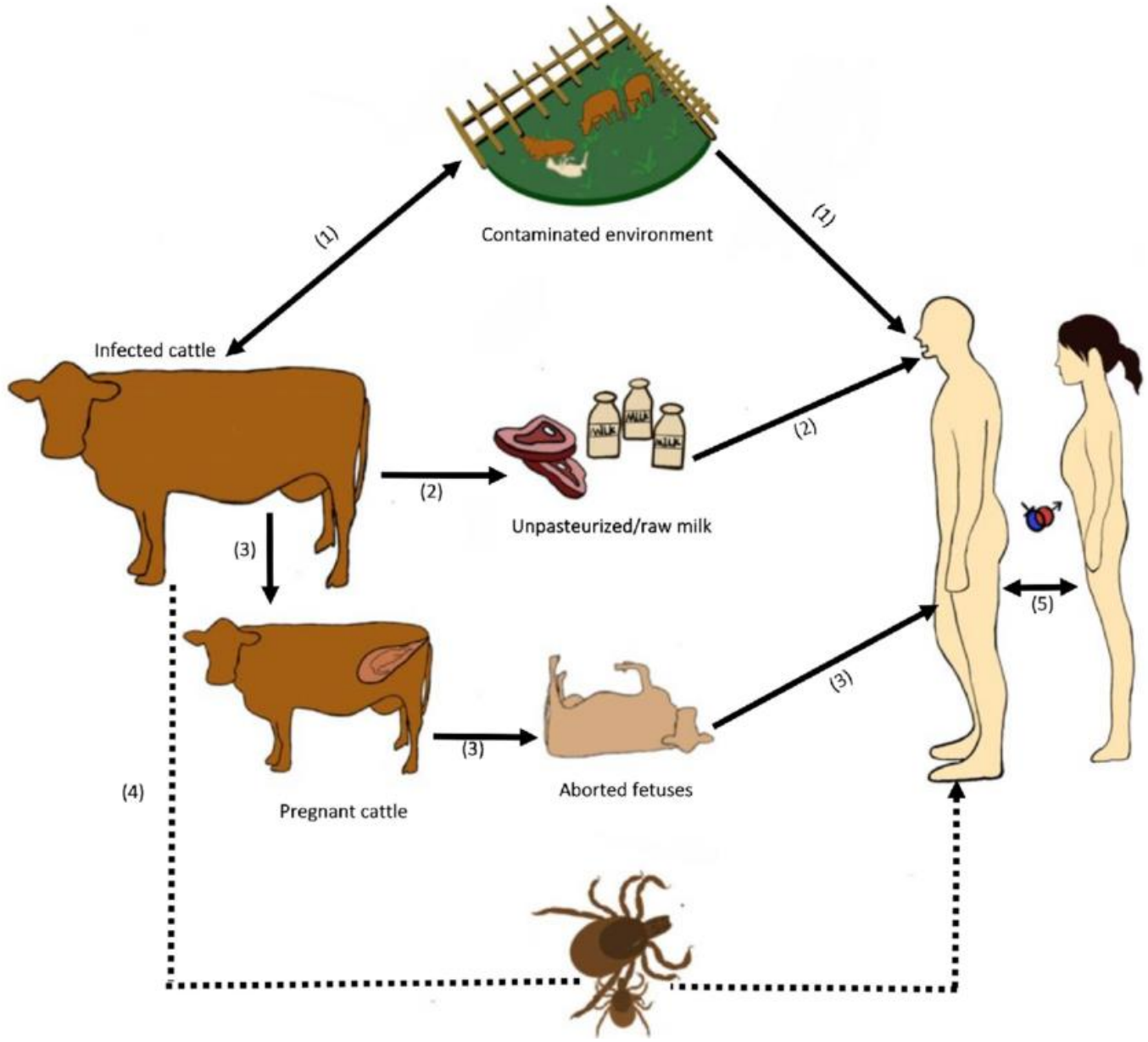
Suárez-Esquivel, Marcela & Chaves-Olarte, Esteban & Moreno, Edgardo & Guzmán-Verri, Caterina. (2020). Molecular Sciences Brucella Genomics: Macro and Micro Evolution. International Journal of Molecular Sciences. 21.



M. Jawad S (2024) Brucellosis: Infectious Disease. Current Topics in Zoonoses. IntechOpen. Available at: http://dx.doi.org/10.5772/intechopen.114141.



Ma, R., Li, C., Gao, A. *et al.* Evidence-practice gap analysis in the role of tick in brucellosis transmission: a scoping review. *Infect Dis Poverty* **13**, 3 (2024). https://doi.org/10.1186/s40249-023-01170-4



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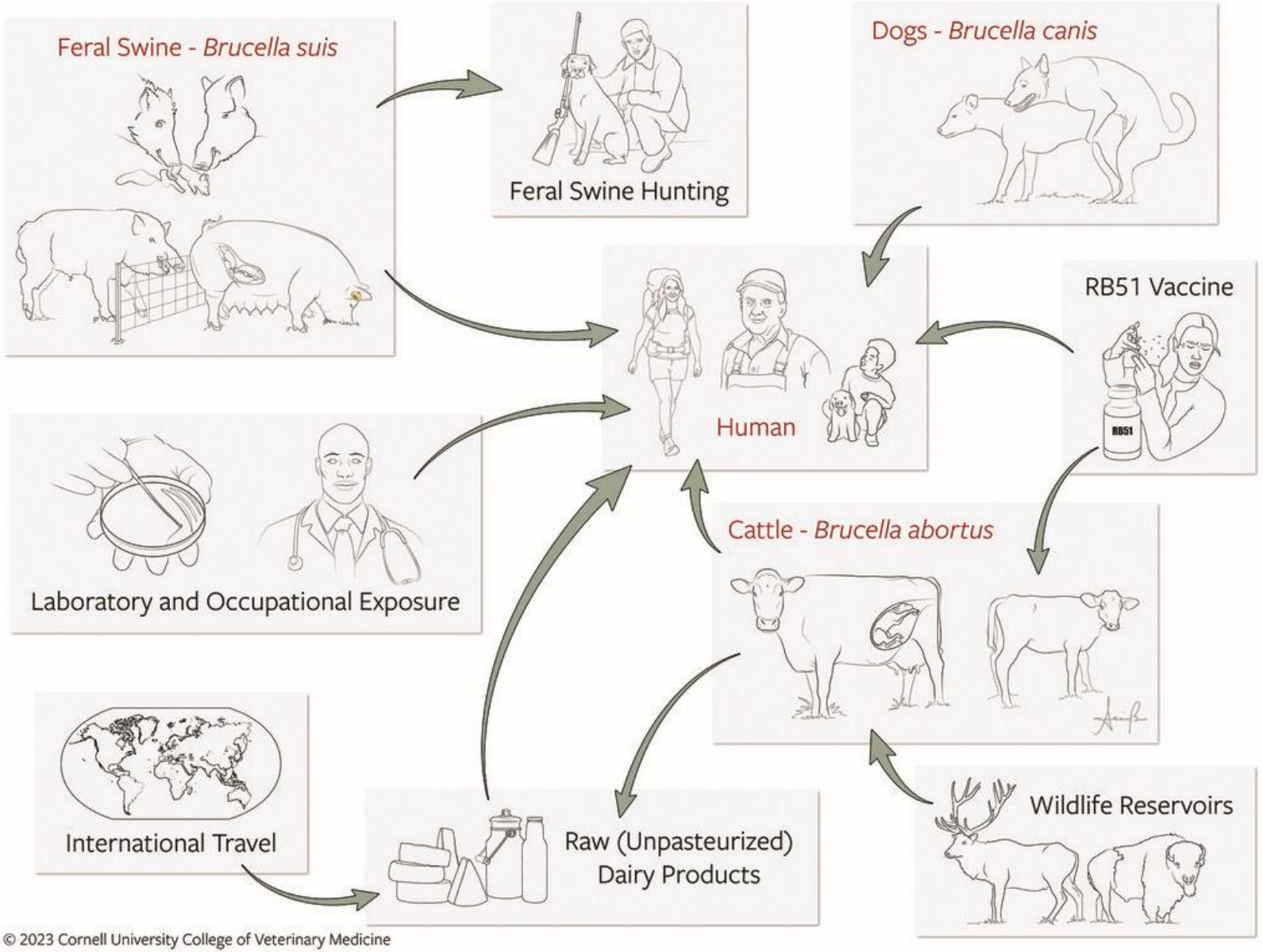
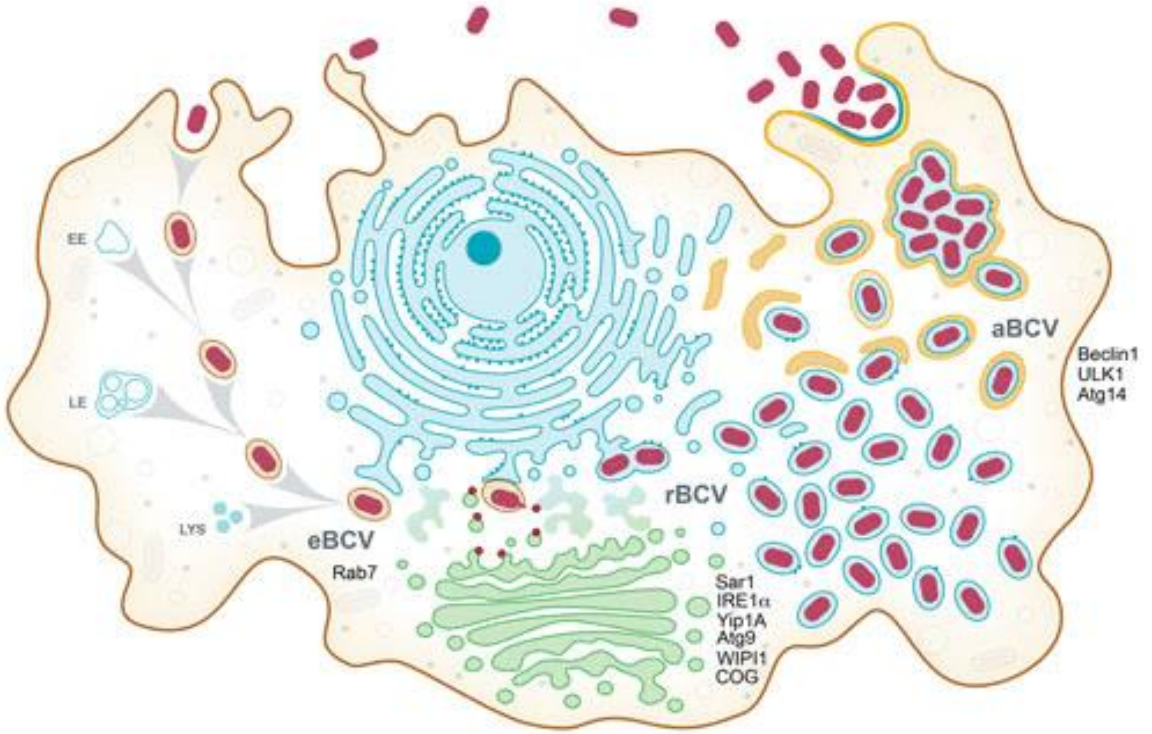
Brucellosis Transmission in the United States



Part 2:
One Health Control and eradication strategies



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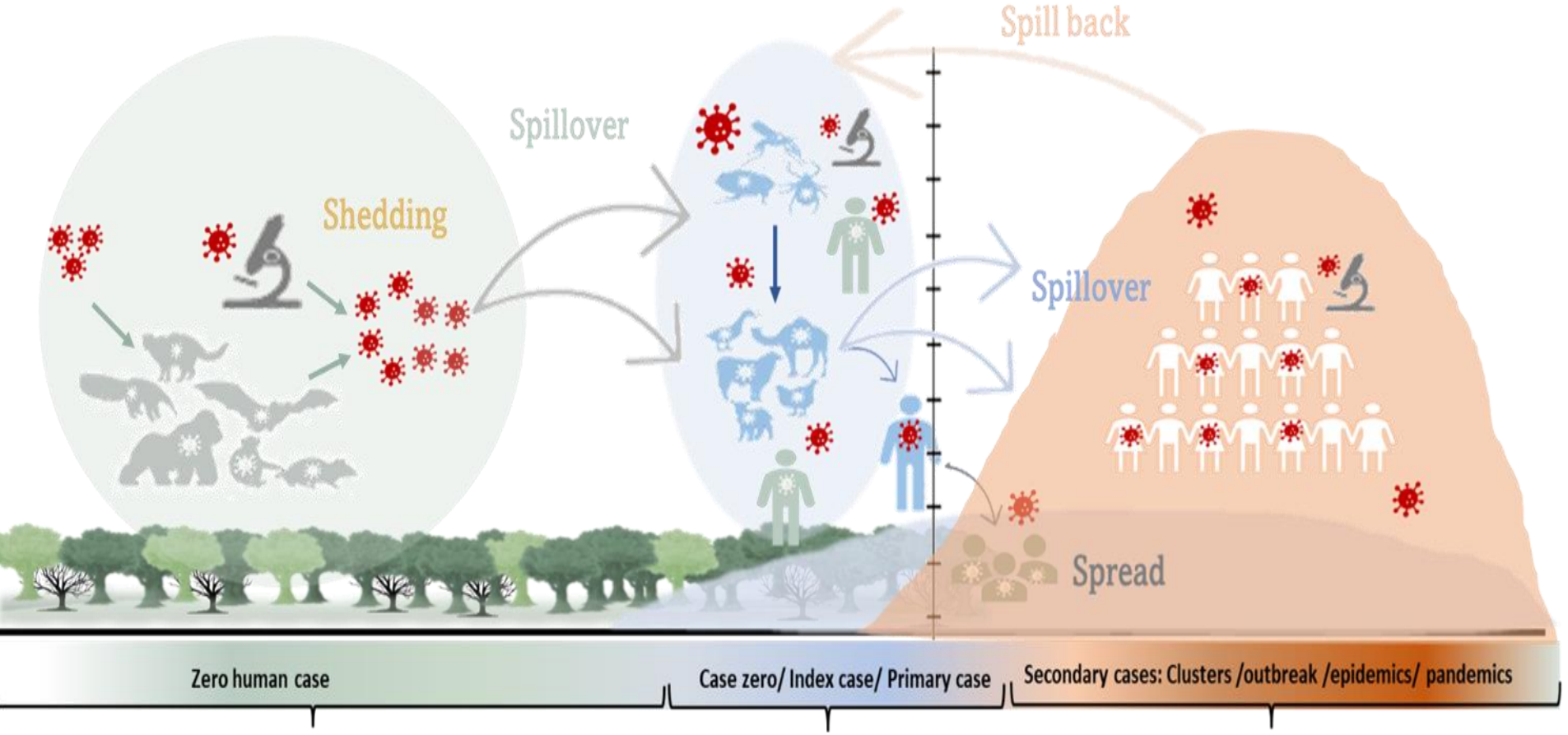
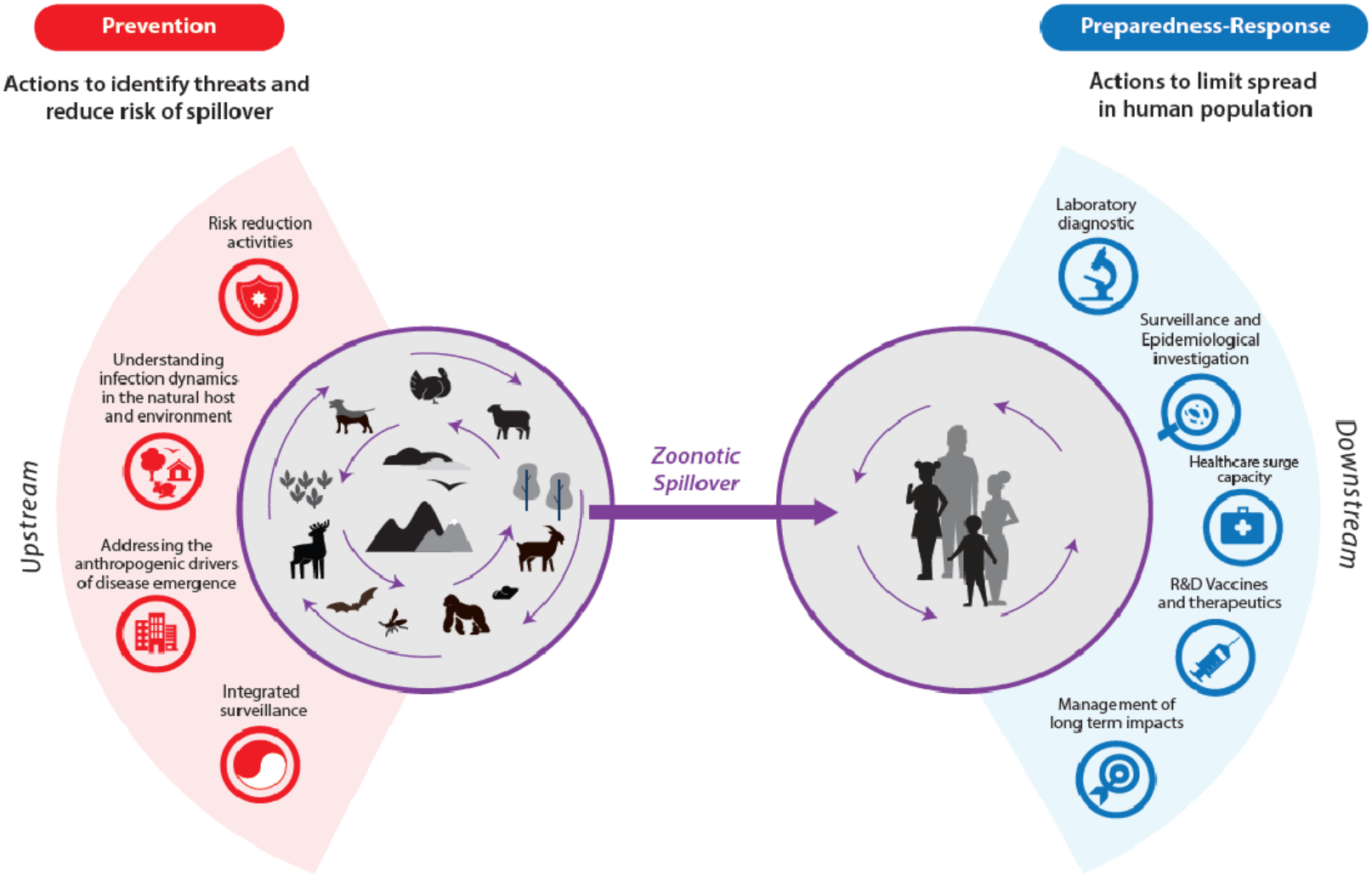
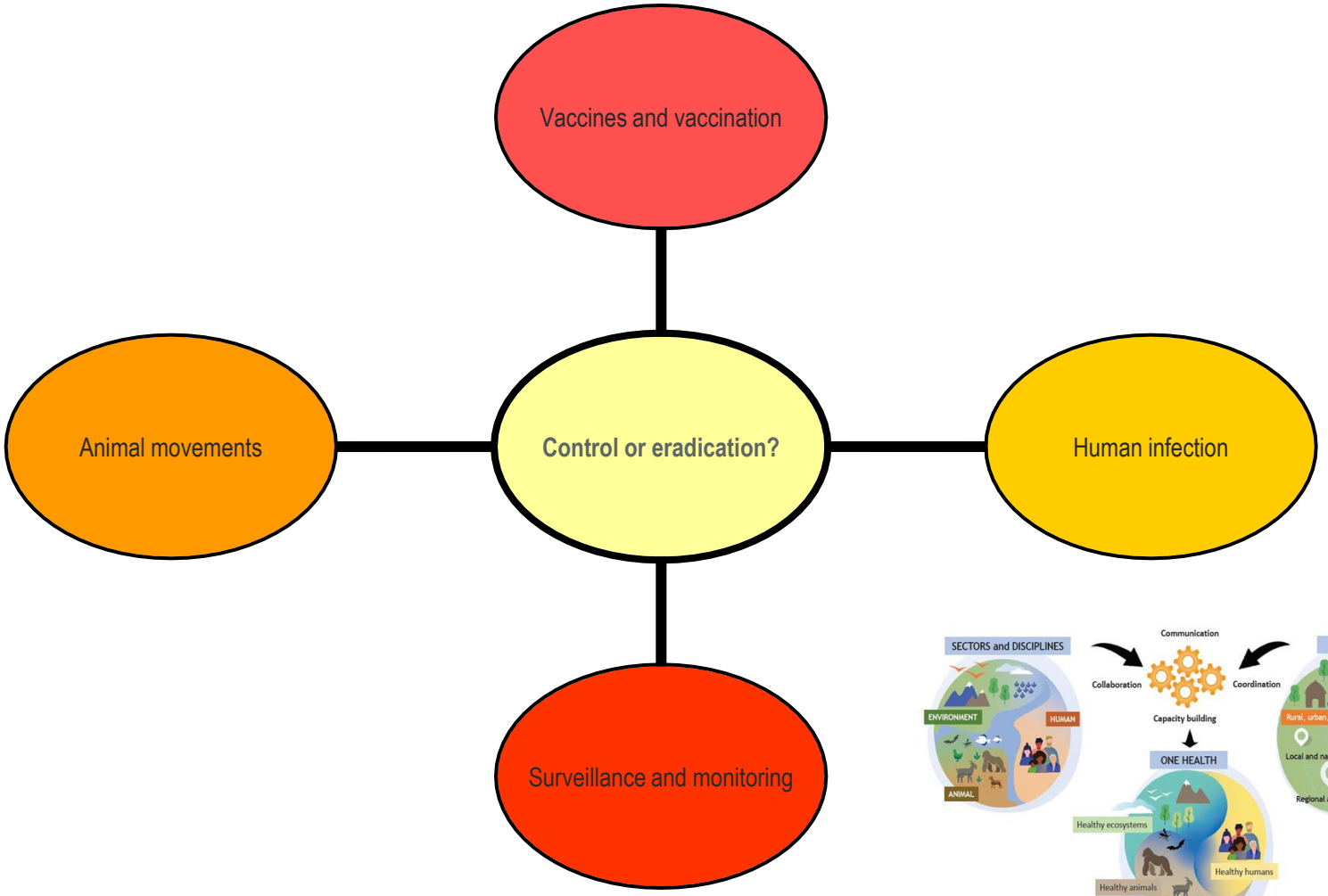

Spill back
Spillover
Shedding
Spillover
Spread
Zero human case
Case zero/ Index case/ Primary case
Secondary cases: Clusters /outbreak /epidemics/ pandemics

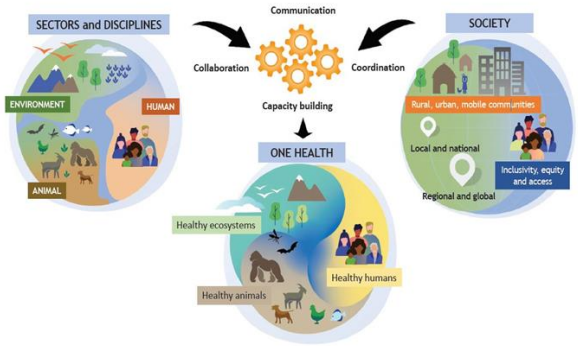
Prevention of Brucellosis



PLoS Pathogens, submitted

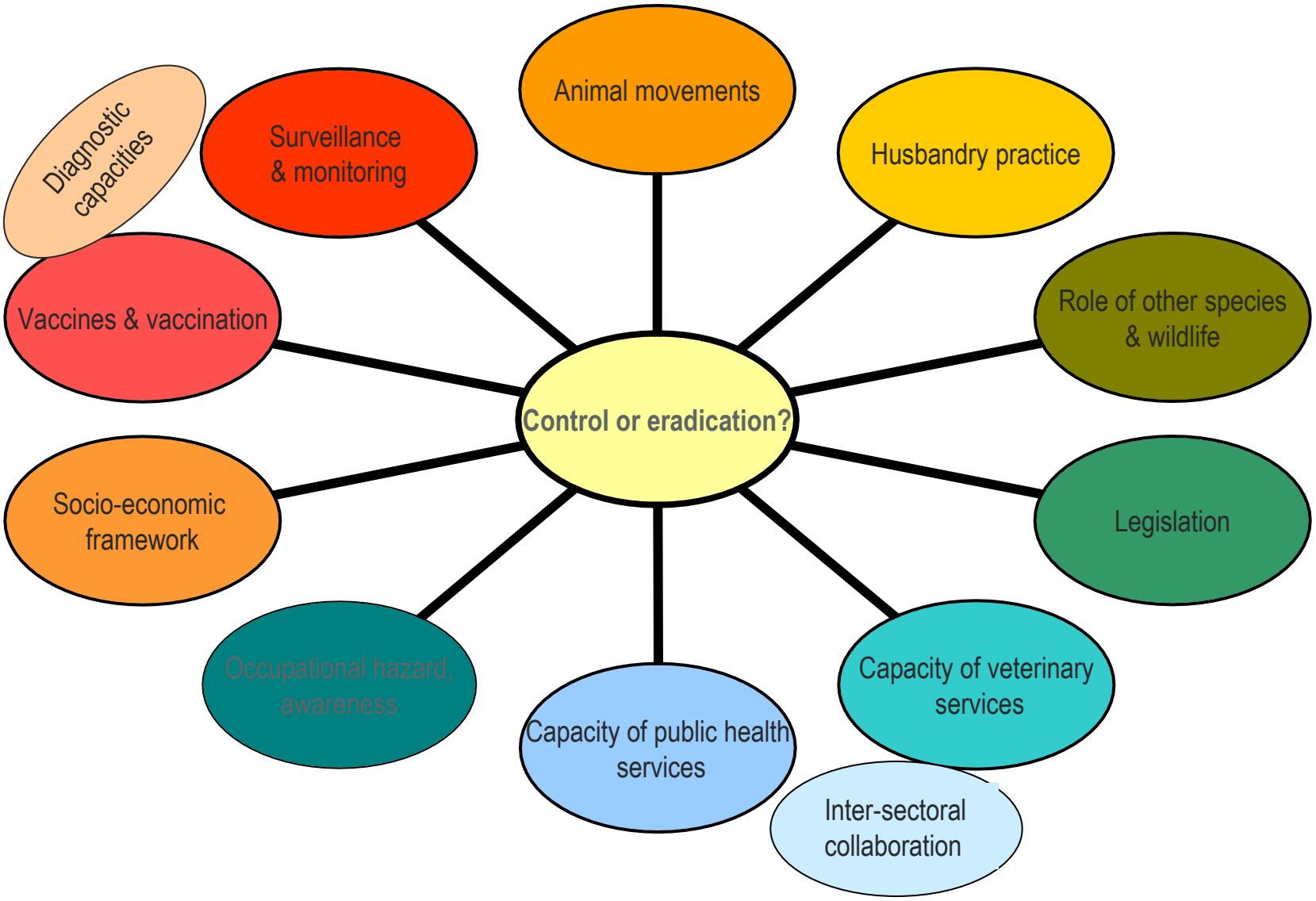
Control and eradication strategies





1 The One Health definition developed by the OHHLEP states

Key components of disease control or eradication strategy

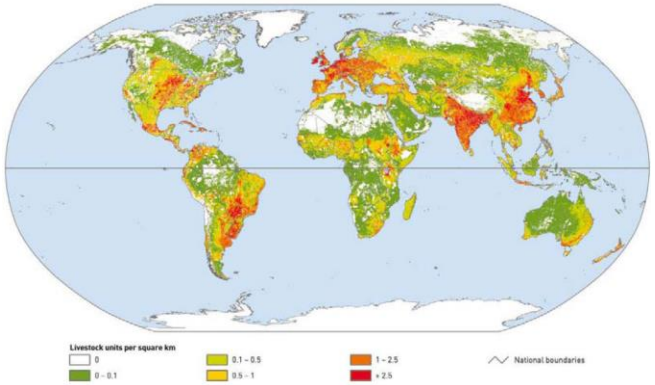


Key points of brucellosis control

- Control programme must be properly planned, coordinated and ressourced
- Control and prevention require effective collaboration within and between sectors
- Eradication can only be achieved by test & slaughter + preventive measures + animal movement control
- Vaccination as prevention and control
- Selection of an effective vaccine and vaccination strategy
- Continued surveillance (presence, efficacy control programme)
- Herd management and food/occupational hygiene
- Education and awareness programmes

Other facts of control programmes
national/regional level

- **Adapted to the local, specific conditions**
- National/regional priorities and capacities
- Information and data ressources
- National legislation and implementation
- Animals, their products and pathogens ignore borders
- Huge amounts of small ruminants are traded accross the globe, legally or without precautions
- Collaboration between neighbours and sectors could be improved



Role of international organsations in control programmes

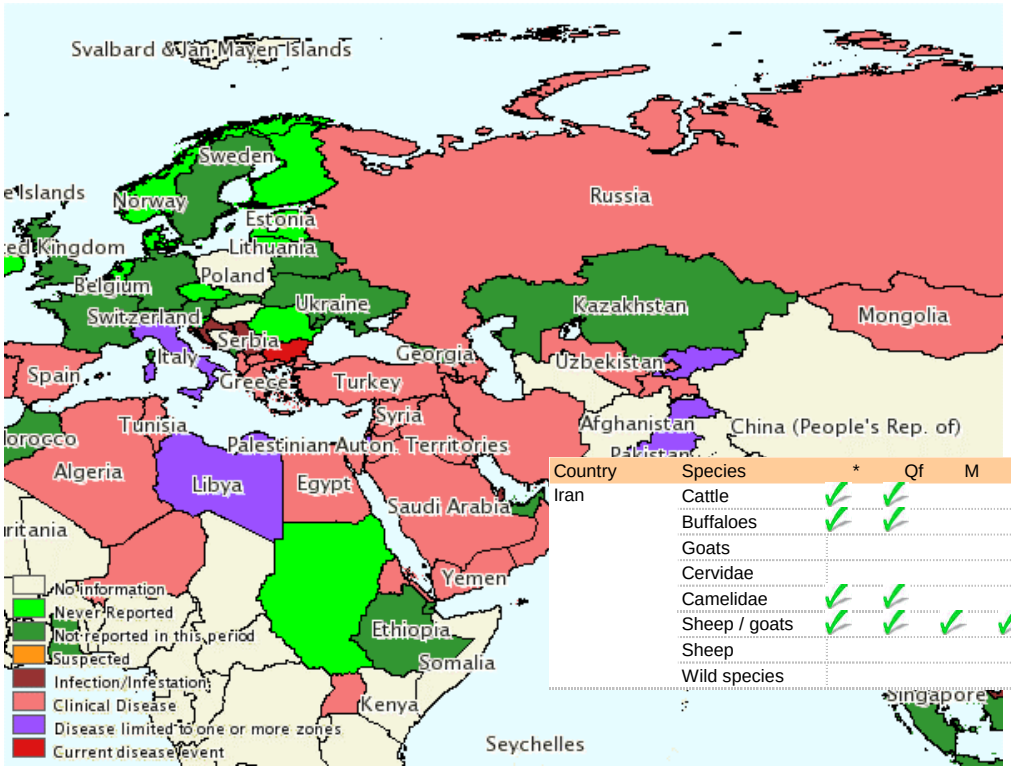
- Set standards and promote the capacity to control animal diseases and zoonosis worldwide
  - Codex alimentarius
  - WOHA,FAO and WHO standards
  - Assist Member Countries to enhance their veterinary governance

- Disease data collection, dissemination and early warning
  - GLEWS
  - WAHID

- Technical and/or financial assistance
  - In planning and conducting of programmes
  - Reference laboratories
  - Capacity building programmes
  - OWOH initiative (FAO/WHO/WOHA/UNICEF + WB)

Example 1

Disease occurrence, off. reporting

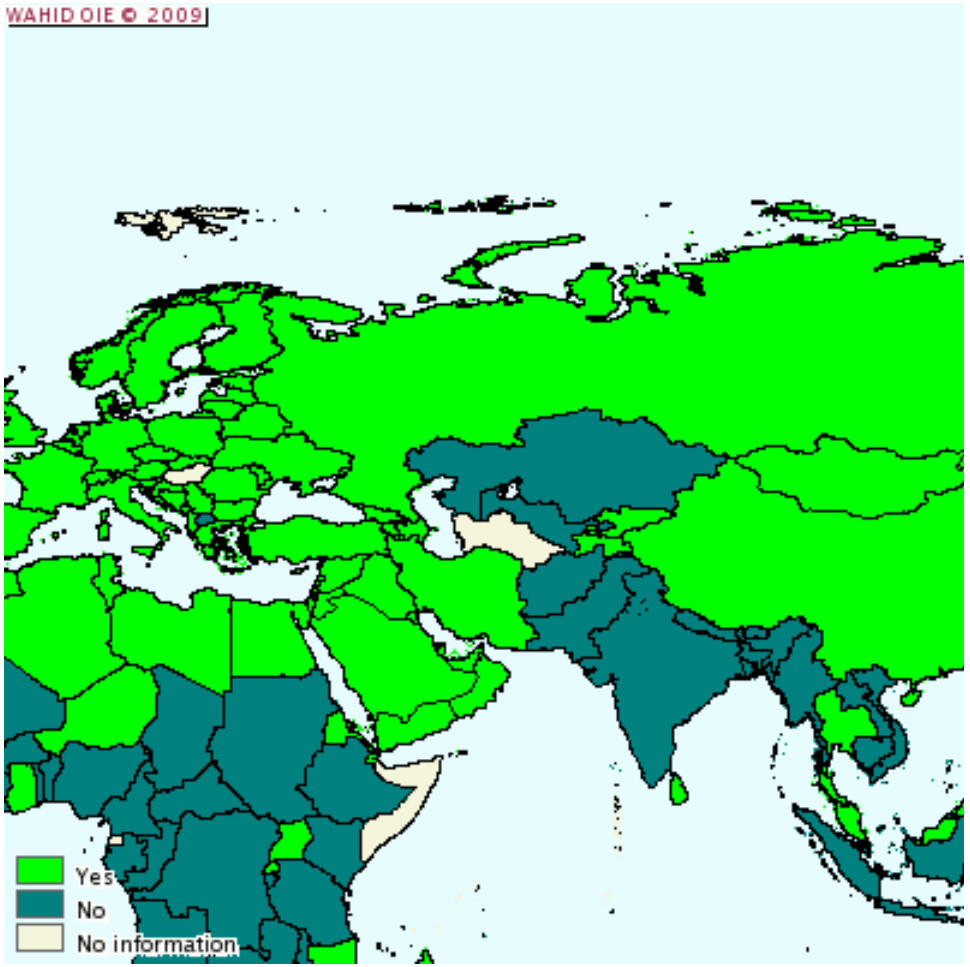


Country	Species	*	Qf	M	Te	GSu	TSu	Qi	S	Sp	Z	Vp	V	T
Iran	Cattle	✓	✓											
	Buffaloes	✓	✓											
	Goats													
	Cervidae													
	Camelidae	✓	✓											
	Sheep / goats	✓	✓	✓	✓		✓			✓			✓	
	Sheep													
	Wild species													

Example 2 :One Health

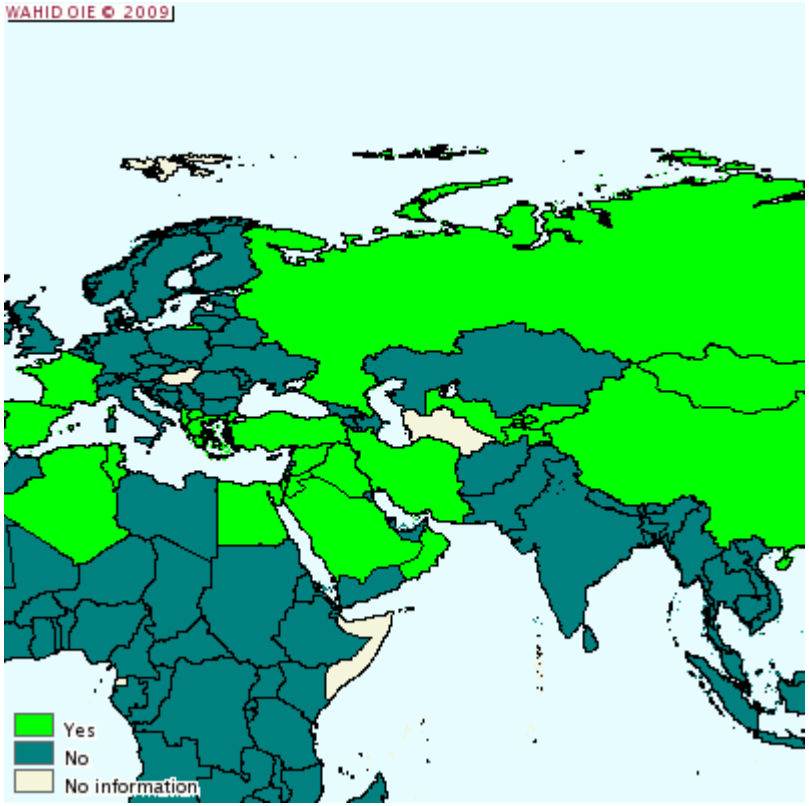
Disease notification, legislation

Countries where *B.melitensis* is a notifiable disease



Example 3 **One health : vaccination practised y or n?**

- Which species
- Which subpopulation



Disease control and disease eradication policy: One health

Generic aspects

- Use standardized **definitions** and concepts – promote harmonization and equivalence
- Surveillance – to know what is the status quo
- **Transparency in notification** (humans, domestic and wild animals)
- Application of **minimum standards** for diagnostic techniques and vaccines that meet WOHA and/or WHO criteria
- **Scientifically based criteria** for disease control programs and (national) legislation
- Application of **ethical principles** in trade and animal disease control
- Zoning / compartmentalization where appropriate
- Import risk analysis and **evaluation of veterinary services**
- **Protect human health** through control of disease/zoonosis in animals

One Health Surveillance standards :

A One health surveillance system should be in place under the responsibility of the Human and administration administrations

- Detecting and investigating an outbreak
- Procedure for rapid collection and transfer of samples from suspect cases
- Recording, managing and analyzing the diagnostic and surveillance data (also across sectors)
- An early warning system throughout the whole production, marketing and processing chain (abattoirs!)
- Immediate clinical **and** laboratory investigation of all suspected cases
- Regular and frequent inspections and testing of risk flocks
- Consideration of seasonal and husbandry factors

One Health Aligned Surveillance System

Defining an optimal One Health surveillance system

Review of the current existing One Health surveillance systems

Key components of an optimal One Health surveillance

Step 1

Develop the surveillance system scope

- Develop and agree the One Health scope
- Preliminary system mapping to include all stakeholders and policy makers and obtain consensus on the scope

Step 2

Identify the data requirements

- Include disease/pathogen-based surveillance
- Include driver-based surveillance

Step 3

Develop the system design

- Develop 'whole of system' approaches to identify points of commonality and feedbacks
- Incorporate flexibility to cope with change, including novel pathogens, disasters, and technological advances

Step 4

Develop the system's governance

- Consider all political, ethical, administrative, regulatory and legal (PEARL) aspects

Step 5

Develop integrated protocols

- Develop a strategy for collaboration across fields and domains.
- Perform multisectoral exercises, including considering feedback loops and impacts on all the One Health domains.

Step 6

Develop a joint implementation roadmap

- Develop an implementation roadmap dependent on the current capacity.
- Build communities of practice for networking, partnership building, and collaboration.
- Develop communication strategies about the approach and the societal benefits

Monitoring and Evaluation

- Identify important and most relevant indicators
- Alignment with global and regional indicators
- Country based indicators
- Process vs Impact indicators
- Reporting arrangement by the countries
- Baseline vs targets at regional and country level

Rationale

1-

2-

3-

4-

Significance of Using One health approach

Improve the understanding of the pathogen's origins.

Improve preparedness and response

Improve the speed, quality, consistency, coordination, and comprehensiveness of investigations

Foreground the commitment of PPR

???????

Where are the problems?

- The main challenges in applying One Health approaches in brucellosis are not the adoption of the concept itself, as the history of the disease proves.
- Instead, they relate to a series of issues, both general and specific. Some are inherited;
- the fast-evolving political and socio-economic factors and climate changes create others.
- The deficiencies in Public Health and Veterinary Services and their cooperation.
- Insufficient awareness.
- The challenges related to geography and climate.
- The intensification of issues to meet food demands.
- Misconceptions about the disease, diagnostic tools and vaccines.
- Research on diagnostics and vaccines for water buffaloes, camels, yacks, etc.
- Capacity-building.
- The human condition: care for others, building trust and social justice.

What is need for the efficient and effective one health implementation ?

Capital

- **Efficient multidisciplinary team structure**
- **Adequate resources**
- **Governance , TORs ,Roles and Responsibilities**
- **Global parternships**
- In advance Country Quadripartite agreement and endorsements
- In advance ethical approval form both the human and Animal health

Support

- **Logistical**
- **Political**
- **Use of technology**
- **Accessibility**
- **Data sharing**
- **One Bucket approach**
- **Laboratory**

Operation

- **Joint and Timely investigation and analysis**
- **Community engagement and participation**
- **Collaborative approach to teamwork**
- **Systematic approach to investigation**
- **High quality and valid samples**
- **Investigation Quality measures**
- **Early notification to international agencies**
- Piloting ,training , top tabletop exercise , integration to RRT ,FETP

Summary : one Health Focus Areas

- Public Health Preparedness
- Multisectoral collaboration and coordination
- Surveillance for early detection
- Rapid laboratory diagnosis
- Rapid Response capacities
- Emergency Risk Communication
- Knowledge gaps and research

Organisation Mondiale de la Santé Animale
World Organisation for Animal Health
Organización Mundial de Sanidad Animal

Brucellosis: recent developments towards 'One Health'

Brucellose : évolutions récentes sur la voie d'« Une seule santé »

Brucelosis: últimos avances hacia el planteamiento de "Una sola salud"

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Thank you so much