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Biosafety as a Cornerstone of One Health: Bridging Disciplines for Safer Systems

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Biosafety

- Principles, practices, and systems designed to prevent unintentional exposure to or release of biological agents
- Not only in laboratories but across all environments where humans, animals, and ecosystems may interact with infectious materials

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Biosafety is a shared responsibility and an enabling system for effective One Health implementation

Biorisk Management Responsibilities

Keeping nasty bugs away from people

BIOSAFETY
The containment principles, technologies, and practices implemented to prevent unintentional exposure to, or accidental release of, biological agents.

Do no harm – accidentally or on purpose

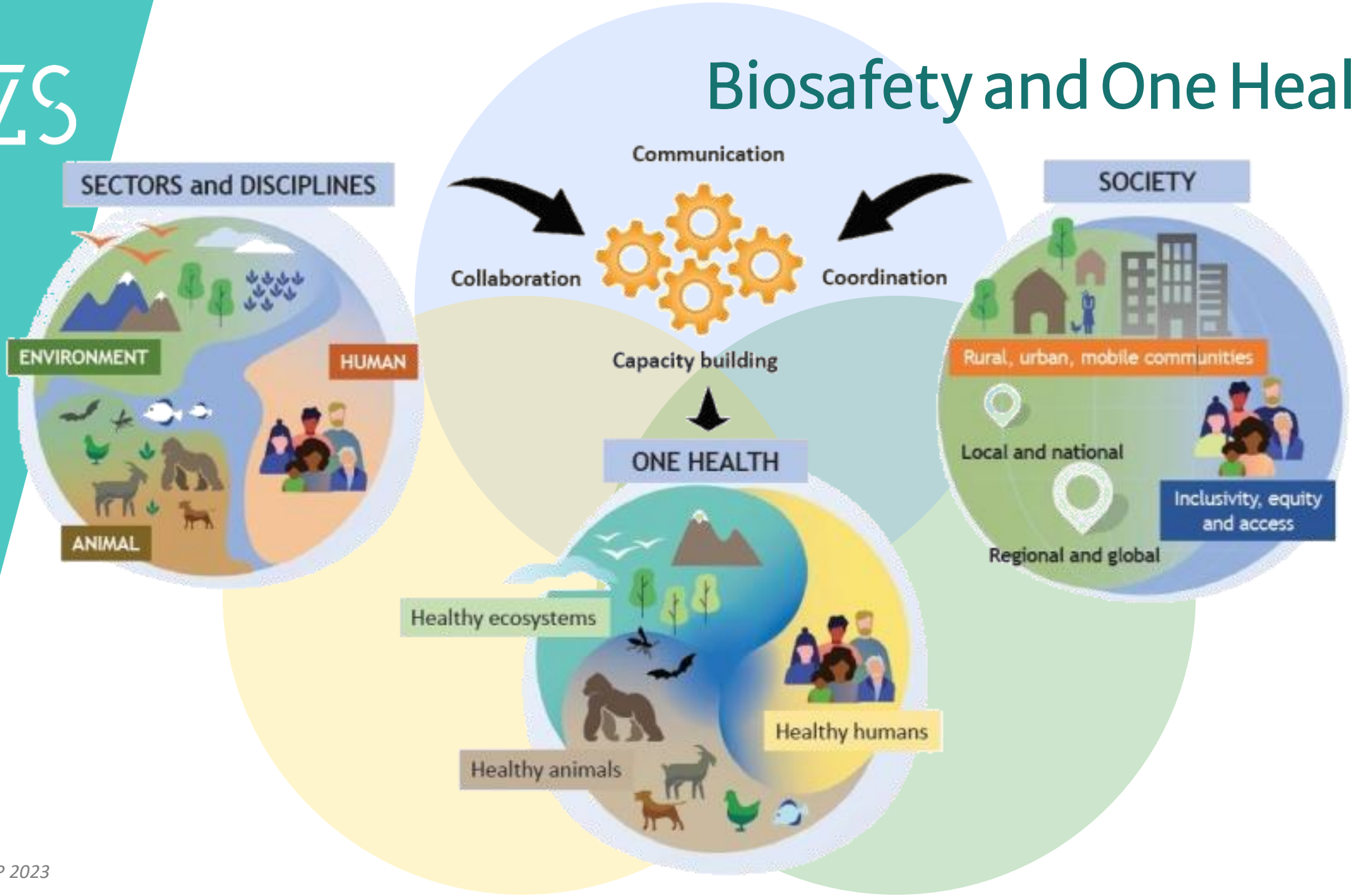
BIOSECURITY
The protection, control, and accountability measures to prevent loss, theft, misuse, diversion, or intentional release of biological agents and related resources.

BIORISK

BIOETHICS
The ethical evaluation of life science research, particularly regarding its potential for misuse, including dual use and gain-of-function studies, to ensure that scientific advancement does not cause harm.

Keeping nasty people away from bugs

Biosafety and One Health

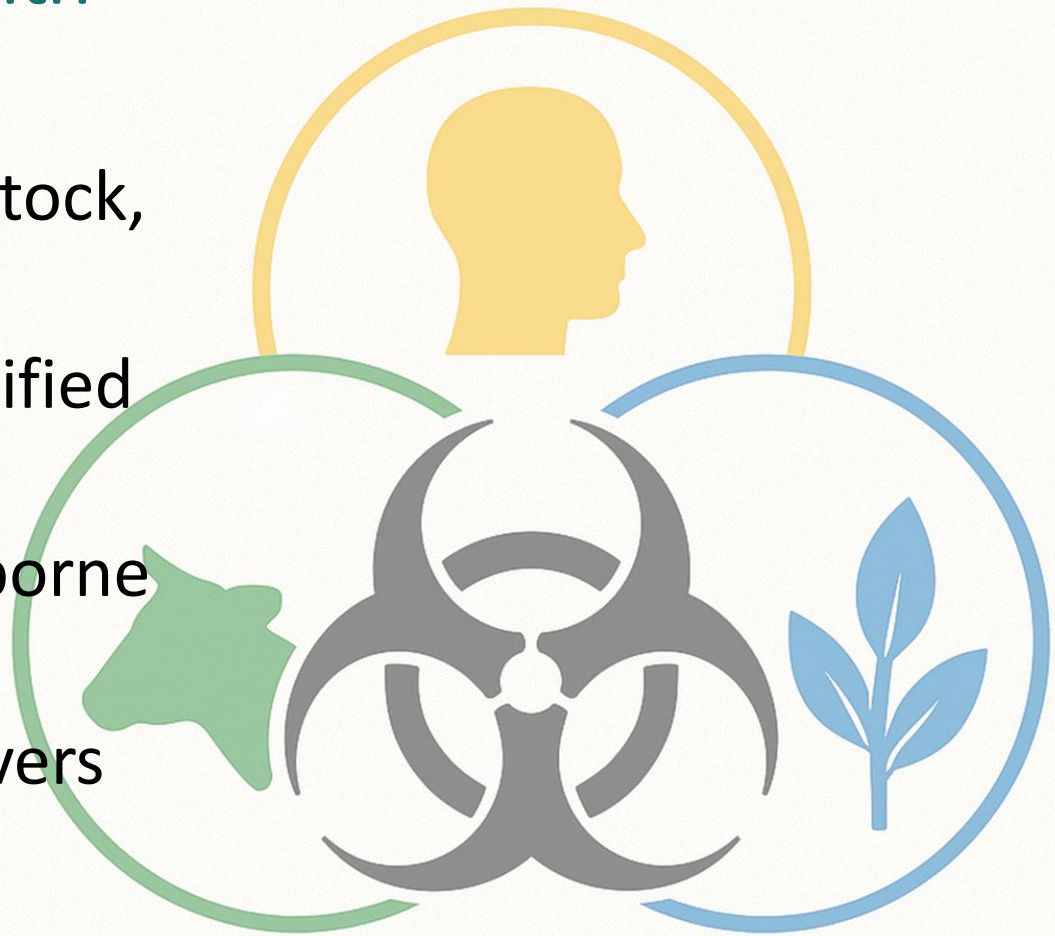


The Hidden Backbone

Why Biosafety Matters in One Health

One Health Challenges:

- Zoonotic spillover from wildlife, livestock, and companion animals
- Antimicrobial resistance (AMR) amplified by misuse in health and agriculture
- Climate-driven outbreaks of vector-borne and foodborne diseases
- Unsafe food and feed systems as drivers of biological hazards



The Hidden Backbone

Why Biosafety Matters in One Health

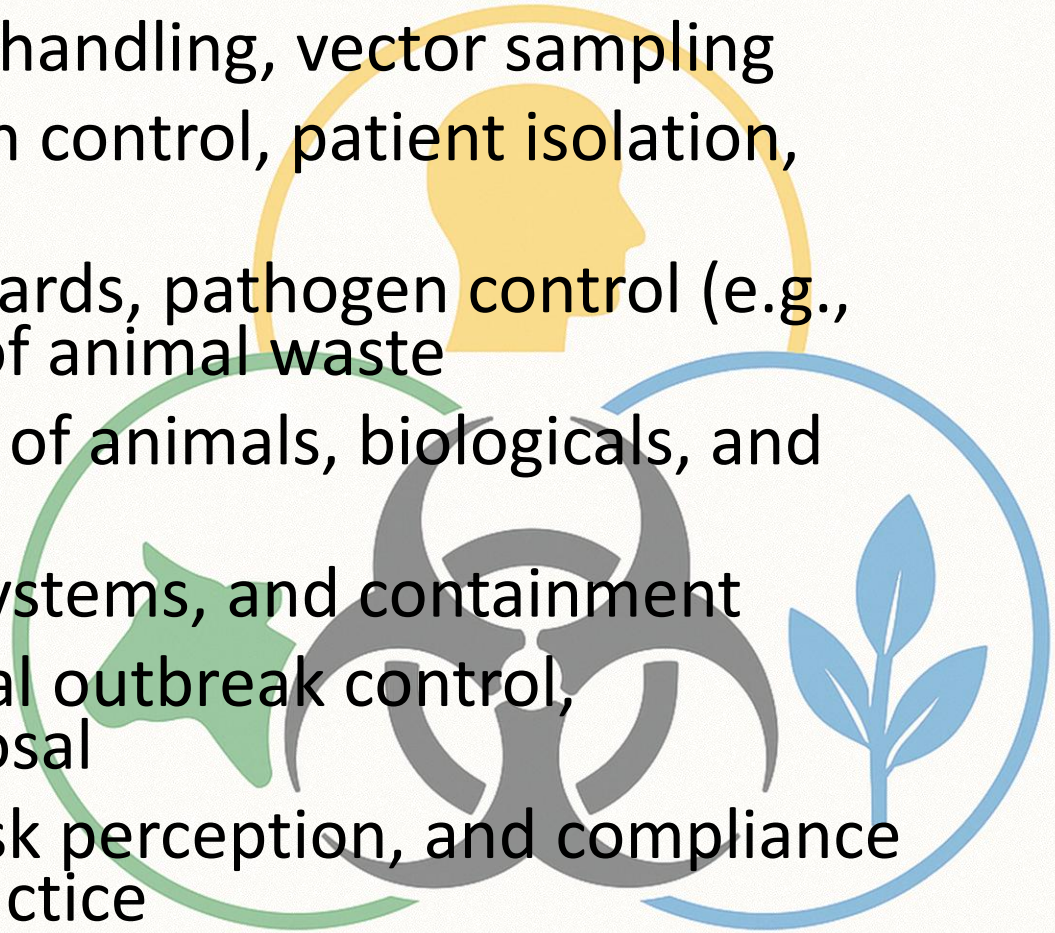
One Health Challenges:

- Healthcare and veterinary care
- Agriculture and aquaculture
- Wildlife trade and ecological research
- Food and feed production and distribution
- Environmental monitoring and waste management

The Hidden Backbone

Where Biosafety Matters in One Health

- **Fieldwork** – wildlife capture, animal handling, vector sampling
- **Clinical & Veterinary Care** – infection control, patient isolation, zoonotic case management
- **Food & Feed Chains** – hygiene standards, pathogen control (e.g., Salmonella, Brucella), safe disposal of animal waste
- **Transport & Trade** – safe movement of animals, biologicals, and food products
- **Laboratories** – diagnostics, quality systems, and containment
- **Emergency Response** – cross-sectoral outbreak control, vaccination campaigns, carcass disposal
- **Social systems** - community trust, risk perception, and compliance are essential components of safe practice



Cross-Sectoral Realities: Barriers & Gaps

Sectoral Fragmentation in Biosafety

Each sector tends to operate in its own silo with:

- **Different terminology** (e.g., "exposure" means different things to medics vs. veterinarians)
- **Distinct training structures** (sector-specific biosafety education)
- **Diverse risk perceptions** (e.g., infection control vs. environmental containment)
- **Lack of social science integration** (no structured understanding of behavior, trust, communication, or community response in biosafety planning)

Cross-Sectoral Realities: Barriers & Gaps

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Cross-sectoral biosafety integration is **not a luxury**.
It's essential to respond effectively, safely, and coherently across One Health systems.

Integration in Action

- Health workers not trained to suspect or recognize anthrax
- Poor lab coordination: samples sent without triple packaging
- Health workers lacked PPE during necropsy and patient contact

- Carcasses handled and buried without protective equipment or disinfection
- No vaccination records; informal slaughtering
- Lack of cold chain for vaccine storage = cold chain failure risks

Anthrax Outbreak in a Pastoralist Community

- Contaminated soil near water sources (spores persistent)
- No environmental decontamination or post-outbreak monitoring

Integration in Action

- Cross-train health staff on zoonotic disease recognition, especially cutaneous anthrax
- Include biosafety training for field necropsy and community outbreak settings
- Implement shared protocols for triple packaging and safe sample transport

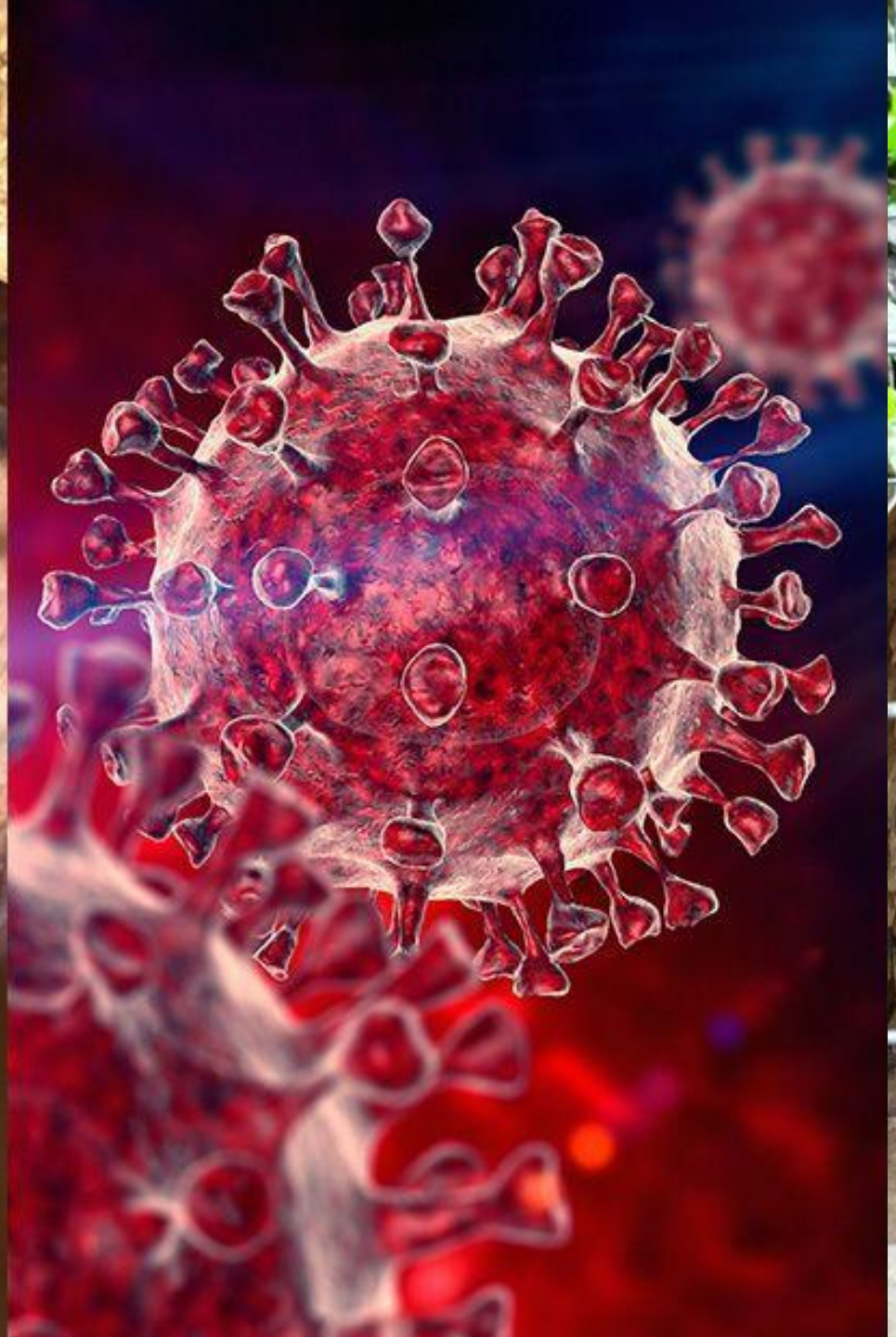
- Train community animal health workers in safe carcass handling & PPE use
- Introduce coordinated vaccination campaigns with cold chain support
- Develop simple, illustrated SOPs for farmers and slaughterers

Anthrax Outbreak in a Pastoralist Community

- Pre-identify burial sites away from water sources
- Deploy environmental decontamination kits and rapid response SOPs
- Monitor contaminated zones with joint One Health teams

One Health Integration Actions

- Conduct joint risk assessments before and during outbreak response
- Establish multi-sectoral outbreak response teams with clear biosafety roles
- Share reporting lines, SOPs, and training across sectors



Integration in Action

- Samples sent to central lab without disinfection of transport containers
- Field team unaware of BSL-3 requirements for novel respiratory virus testing
- No occupational health screening for frontline workers

- Confiscated animals handled with bare hands; no biosafety SOPs in place
- No quarantine or safe euthanasia procedure
- Field officers lacked training in zoonotic spillover risks

Illegal Wildlife Trade and SARS-CoV-2–like Virus Detection

- Disposal of confiscated animals without regard for ecosystem or pathogen spillover risk
- No environmental sampling for possible contamination (e.g., market cages, transport vehicles)

Integration in Action

- Provide pre-deployment biosafety briefings for all border and surveillance teams
- Establish protocols for sample decontamination and safe transport to BSL-3 labs
- Implement occupational health monitoring for exposed staff, including respiratory surveillance

- Develop and enforce biosafety SOPs for wildlife handling (including gloves, containment, disinfection)
- Introduce protocols for quarantine, euthanasia, or safe rehabilitation of confiscated animals
- Train field officers on zoonotic risks and proper PPE use during wildlife encounters

Illegal Wildlife Trade and SARS-CoV-2–like Virus

- Mandate disinfection of vehicles, cages, and facilities involved in confiscation
- Conduct environmental sampling to detect contamination at holding sites
- Include ecologists in outbreak response teams to assess risks of reintroduction or environmental persistence

One Health Integration Actions

- Create joint biosafety response plans for wildlife trade interdictions
- Establish shared chain-of-custody and incident reporting tools across sectors
- Organize simulation exercises and cross-training between customs, public health, veterinary, and environmental teams

Integration in Action

- Delays in diagnosis due to lack of BSL-3 access and staff training on zoonotic hemorrhagic fevers
- Sample handling and transport posed infection risk

- Livestock handlers and vets exposed to infected blood without proper PPE
- Vector control measures not implemented (lack of coordination with environment sector)

Rift Valley Fever (RVF) Outbreak After Flooding

- No vector surveillance or habitat mapping to anticipate mosquito blooms
- Lack of early warning system linking rainfall data with RVF risk

Integration in Action

- Establish BSL-3 referral agreements or mobile diagnostic units
- Train healthcare workers on recognition, triage, and PPE protocols for viral hemorrhagic fevers
- Develop safe sample handling and transport SOPs, especially in emergency and mobile settings

- Provide PPE kits and biosafety training for livestock handlers and veterinarians
- Create guidelines for safe handling of aborted materials and carcasses
- Integrate animal surveillance data into human outbreak alerts

Rift Valley Fever (RVF) Outbreak After Flooding

- Implement vector surveillance and habitat mapping in flood-prone areas
- Use climate and rainfall data to trigger vector control and public alerts
- Coordinate with veterinary and health sectors to guide timely larviciding and spraying

One Health Integration Actions

- Develop RVFV Early Warning System integrating meteorological, veterinary, and health data
- Conduct joint risk assessments and drills before flood season
- Use shared communication channels and SOPs for outbreak alerts and PPE distribution

Integration in Action

- Lack of biosafety training in recognizing and managing rabies exposure
- Medical staff treat bites but do not report to veterinary authorities
- No SOPs for safe handling or transport of clinical samples from suspected human rabies cases
- No occupational health protection or rabies PEP plans for staff

- Community members and local vets handle suspected rabid animals without PPE
- No standard procedures for safe euthanasia and brain sampling
- Dead dogs often buried or burned informally, posing environmental and human risk
- Veterinary staff may lack pre-exposure vaccination

Rabies in a Peri-Urban Community

- Improper disposal of animal remains; potential contamination of soil and water
- Lack of dog population control or animal waste management
- No municipal or environmental oversight of animal carcass handling or stray dog management

Integration in Action

- Train frontline workers on rabies risk, post-exposure prophylaxis (PEP), and sample handling
- Establish referral protocols for neurological cases suspected to be rabies
- Provide PEP for exposed workers, including waste handlers and healthcare staff

- Equip vet services with PPE, safe euthanasia tools, and protocols for brain sampling
- Implement pre-exposure rabies vaccination for at-risk personnel
- Conduct routine vaccination campaigns and stray dog monitoring

Rabies in a Peri-Urban Community

- Introduce safe carcass disposal SOPs, including disinfection and incineration
- Engage municipal authorities in coordinating animal waste management
- Launch public campaigns on dog bite prevention and reporting suspected rabid animals

One Health Integration Actions

- Establish a joint rabies task force (health, vet, municipal)
- Develop a shared reporting platform for bite cases and suspected animal rabies
- Conduct joint outbreak simulations and community awareness events
- Develop cross-sector SOPs for bite response, sample handling, and case reporting

Practical Tools for One Health Professionals

What One Health teams can do to bring biosafety into their work:

- Include biosafety in project design and implement biosafety focal points in project
- Integrate biosafety modules into training curricula
- Incorporate risk communication, behavioral drivers, and cultural context into biosafety training leveraging social science approaches to improve uptake and adherence
- Capacity Building Across Sectors via joint biosafety training for:
  - Public health staff
  - Vets and field workers
  - Environmental researchers
- Promote cross-sectoral biosafety literacy
- Interdisciplinary risk assessments
- Shared SOPs

Key Takeaways

- **Biosafety is foundational** - it underpins effective and ethical One Health action
- **Biosafety is a shared responsibility** - cross-sectoral collaboration starts with a common safety culture
- **Investing in awareness, planning, and training** across disciplines is essential to make biosafety work in practice

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PASTEUR NETWORK

Murakoze

Danke

Webale

Erokamano

Apwoyo

Asante

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Thank

Thank you

you

Call to Action

Ask yourself:

- Where is biosafety missing in your work?
- Who else needs to be at the table?
- Let’s build safer, more connected systems—together!