World Organisation for Animal Health

Australian Government
Department of Agriculture, Fisheries and Forestry

UNIT 5
Other risk factors

Department of Emerging diseases and Global health

Animal Health Research Centre (CISA)

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PART 1
THE ROLE OF WILDLIFE

Outline

- The role of wildlife
- The role of the environment
- Sociocultural factors

The role of wildlife

Wildlife plays a significant role in the occurrence, spread, and maintenance of animal diseases. Wildlife can act as reservoirs and vectors, introducing diseases to regions where they were previously absent or contributing to their maintenance in existing areas.

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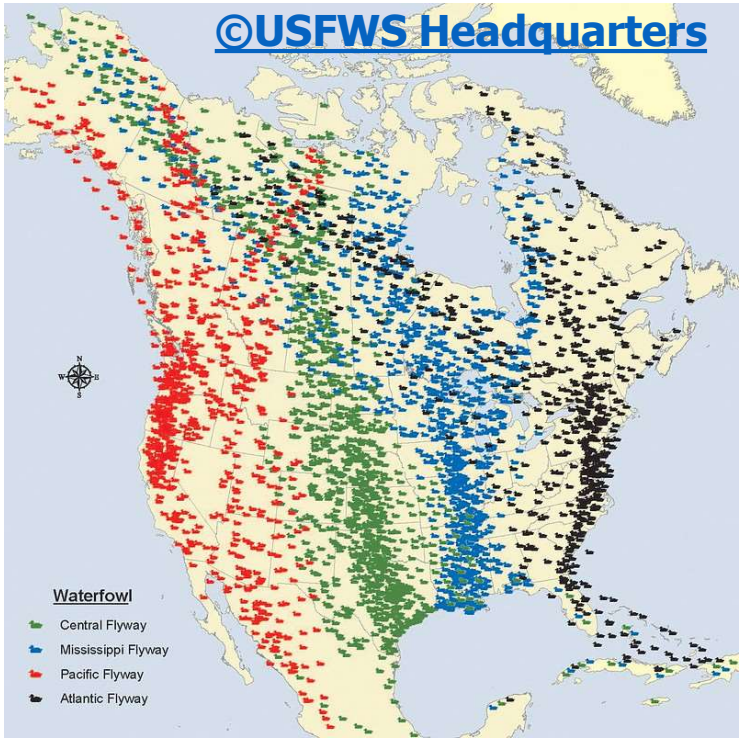
The role of wildlife

Many bird and mammal species travel long or medium distances between their breeding grounds and non-breeding areas. Waterfowl are perhaps the most familiar. As natural reservoirs or known hosts for viruses, the **migratory movements** of wild species can play an important role in the maintenance and spread of viruses, contributing to their transmission.



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The role of wildlife

Human-wildlife interactions allow contact between species and promote pathogen transmission between humans and animals. Population density, modifications to the habitat of wild species, and behavioral changes can increase human contact with wildlife and exacerbate the emergence and spreading of pathogens.

The role of wildlife: examples

2003 - Hong Kong: The H5N1 strain of avian influenza was first detected in wild waterfowl (specifically in geese) in Hong Kong in 2003.

2020 - Mongolia: ASF was confirmed in wild boars in Mongolia in 2020.

The role of wildlife: relevant questions for RA

- What wildlife species are known or suspected reservoirs or vectors of the disease?
- What is the distribution and abundance of these species?
- Are the species resident, or are they migratory species that may arrive from areas affected by the disease?
- Can wildlife sustain the pathogen independently, or do they require interaction with other hosts?
- Are there known cases of disease spillback (from domestic animals to wildlife)?
- What surveillance data exist to monitor pathogen circulation in wildlife?

PART 2
THE ROLE OF THE ENVIRONMENT

The role of the environment

The environment **plays a crucial role** in the emergence and spreading of pathogens by influencing the interactions between hosts, vectors, and pathogens.

Bioclimatic factors such as temperature, humidity, precipitation and vegetation can directly impact pathogen survival, vector activity and host habitat.

The role of the environment

Climate changes directly impacts pathogen persistence in the environment by influencing their life cycles, reproduction, and survival. Indirectly, it alters their habitats, which can also affect their geographical distribution.

The increase in global temperature or the length of seasons also affects the geographic distribution and density of hosts and vector species. More specifically, it influences the transmission dynamics of vector-borne diseases, promoting the survival, reproduction, and abundance of vector populations.

The role of the environment

The distribution and migration patterns of hosts, including birds and mammals, are also affected by **climate change**. As migratory routes change, new geographic areas may become exposed to wild animals-borne pathogens, increasing the risk of outbreaks in previously unaffected regions.

The role of the environment

Similarly, **land-use change** including deforestation, urbanization and agricultural expansion and intensification, can alter habitats, bringing wildlife, domestic animals, and humans into closer contact and facilitating the spillover of zoonotic diseases such as avian influenza and African swine fever.

The role of the environment

Contaminated water and feed sources are also critical transmission routes for various pathogens affecting both animals and humans. Poor biosecurity, animal manure runoff, urban waste disposal and agricultural waste contribute to the spread of waterborne diseases, while shared water points among wildlife, livestock, and human populations increase the risk of cross-species infections.

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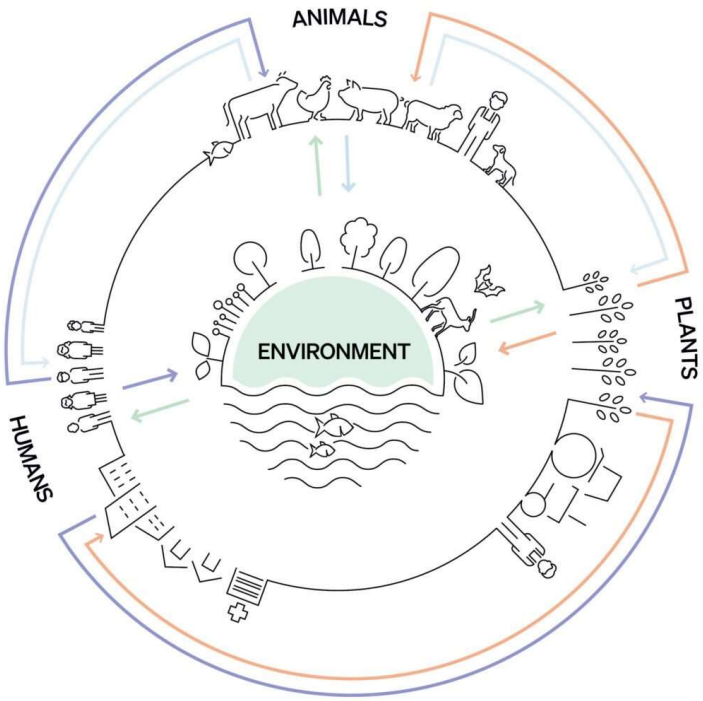
The role of the environment

Other anthropogenic physical structures can also play a crucial role in shaping the dynamics of infectious diseases. **Roads, dams, irrigation systems, and urban infrastructures** can fragment ecosystems, limiting the movement of hosts and vectors, but they can also create new pathways for disease transmission by disrupting natural habitats and providing breeding sites for pathogens.

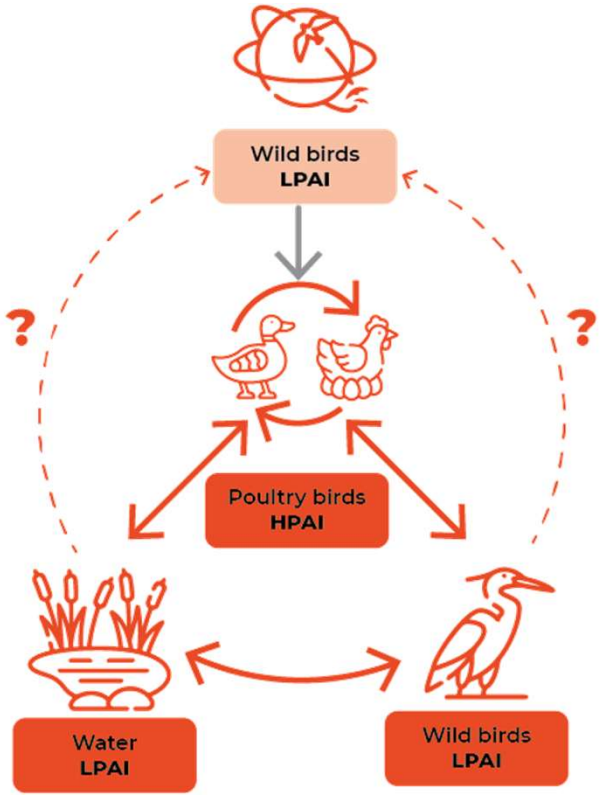
The role of the environment



The **One Health** multidisciplinary strategy recognizes the interconnectedness of human, animal, and environmental health. Emerging infectious diseases like avian influenza, Nipah virus, and African swine fever have demonstrated the need for coordinated efforts between veterinarians, public health officials, ecologists, and policymakers. By integrating surveillance, biosecurity measures, and sustainable agricultural practices, One Health helps prevent disease spillover, ensuring food security, economic stability, and public health resilience in Asia's rapidly evolving landscape.

The role of the environment: examples

Infected wetlands and contaminated water sources facilitate HPAI virus transmission among bird populations.



Warm and humid conditions often enhance the breeding and survival of mosquitoes, increasing the risk of vector-borne diseases like West Nile Virus.

The role of the environment: relevant questions for RA

- Which bioclimatic factors influence the survival and spread of pathogens?
- Which natural ecosystems, such as forests, wetlands, and grasslands, and agrarian ecosystems contribute to the presence and movement of host or disease vectors?
- Can seasonal fluctuations in climate and agricultural activities, changes in vegetation cover and vector population cycles influence disease spread?

PART 3
SOCIOCULTURAL FACTORS

The role of sociocultural factors

Cultural practices and traditions can play a significant role in disease transmission.

The practice of selling and slaughtering animals in crowded, unsanitary conditions, the large gatherings during religious or cultural celebrations, the hunting and consumption of meat and the wildlife trade and consumption, increase the risk of disease transmission and the risk of zoonotic spillover from wildlife to humans.

The role of sociocultural factors

High population density, particularly in peri-urban livestock farming areas, creates environments where diseases can spread more easily, increasing the risk of zoonotic outbreaks due to poor biosecurity on farms, inadequate sanitation, limited healthcare access, and close human-animal interactions.

The role of sociocultural factors

Limited access to veterinary services and distrust in authorities can hinder disease prevention and control efforts, particularly in rural and underserved communities. A lack of veterinary care for livestock and domestic animals increases the risk of uncontrolled disease transmission between animals and humans. Furthermore, communities where is less likely to follow vaccination campaigns, quarantine measures, or biosecurity recommendations, outbreaks are harder to contain.

Communication and community engagement is essential for effective disease management.

The role of sociocultural factors: examples

Live animal markets increases the risk of disease transmission, as animals from various regions may come into contact with one another and humans, facilitating the spread of viral infections.

Keeping large numbers of unvaccinated cattle in close proximity for **religious purposes** in India can increase the risk of viral outbreaks like foot-and-mouth disease

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Sociocultural factors: relevant questions for RA

- **How do cultural practices influence disease transmission?**
- Are there cultural behaviors, such as hunting, consumption of wild animals, or close contact with animals, that increase the risk of zoonotic diseases?

- **What role does public health education play in disease prevention?**
- How does the level of health literacy and public awareness affect the success of disease prevention measures?
- How do attitudes towards vaccination, sanitation, and disease control strategies influence their effectiveness in different regions or communities?

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Sociocultural factors: relevant questions for RA

- **How does socioeconomic status influence vulnerability to disease?**
- How do disparities in income, access to healthcare, and education contribute to varying levels of disease risk within a population?
- What impact does poverty or limited access to basic sanitation have on disease transmission in urban and rural areas?

- **How does mobility and migration contribute to disease spread?**
- What is the impact of cross-border trade, tourism, and global supply chains on the spread of infectious diseases?

- **How do social networks and community structures affect disease control?**
- Are there specific cultural practices that facilitate or hinder the containment of diseases during outbreaks?

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Data for analysis

BioClimatic data:

- Climate factors

Wildlife data:

- Host population abundance and density
- Migratory routes

Habitat:

- Land use in surroundings
- Vegetation index
- Distance to points of interest (e.g. roads, villages, farms, etc.
- Distance to natural interest points: pounds, comederos, etc.

Practical assignment: Part 1

1. Go to: https://datazone.birdlife.org
2. Click on: Data EXPLORER
3. Search for: Your country or location of interest in the search bar
    - Report the available information on:
    - Total number of bird species in the selected country/location
    - Percentage of threatened bird species from the total
    - Percentage of bird species with declining global populations from the total
    - List of ongoing threats to globally threatened species
    - Map of IBAs (Important Bird Areas) and protected areas

Practical assignment: Part 2

1. Go to: https://biodiversitymapping.org/
2. Click on: Global terrestrial and expand the "+" sign.
3. Click on: Birds to visualize the bird map and Mammals to visualize the mammal map.
4. Go to Download GIS map. Select the Zip files containing GeoTIFFs/shapefiles for the global terrestrial maps.
5. Open the map on your computer using a GIS program (like QGIS or ArcGIS).
6. Select a country or location on the map.
7. Report the bird and mammal richness for the selected location.

Practical assignment: Part 3

https://cdn.download.ams.birds.cornell.edu/api/v1/asset/241966011/1800

1. Go to: https://esa-worldcover.org/en
2. Enter the name of the location where the H5N8 strain of avian influenza was reported in Bar-headed geese in January 2021, leading to the culling of around 40,000 domestic birds to prevent the spread of the disease: Kerala state (India), particularly in Alappuzha district.
3. Describe the predominant land cover type in the area.

If you want to see photos or listen to this species, you can visit: Bar-headed Goose - eBird

References

- IPBES (2020) Workshop Report on Biodiversity and Pandemics of the Intergovernmental Platform on Biodiversity and Ecosystem Services. Daszak, P., Amuasi, J., das Neves, C. G., Hayman, D., Kuiken, T., Roche, B., Zambrana-Torrelio, C., Buss, P., Dundarova, H., Feferholtz, Y., Földvári, G., Igbinosa, E., Junglen, S., Liu, Q., Suzan, G., Uhart, M., Wannous, C., Woolaston, K., Mosig Reidl, P., O'Brien, K., Pascual, U., Stoett, P., Li, H., Ngo, H. T., IPBES secretariat, Bonn, Germany, DOI:10.5281/zenodo.4147317. https://ipbes.net/sites/default/files/2020-12/IPBES%20Workshop%20on%20Biodiversity%20and%20Pandemics%20Report_0.pdf

- United Nations Environment Programme and International Livestock Research Institute (2020). Preventing the Next Pandemic: Zoonotic diseases and how to break the chain of transmission. Nairobi, Kenya. https://www.unep.org/resources/report/preventing-future-zoonotic-disease-outbreaks-protecting-environment-animals-and

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