Zoonoses

Origins and Health Impacts

This section provides an overview of the origins and ecology of zoonoses, along with their impacts on human health, healthcare systems, and populations.

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Zoonoses

Zoonotic Infectious Diseases (ZIDs)

Diseases that spread between animals and humans, with causal agents being pathogenic microorganisms such as viruses, bacteria, fungi, or parasites.

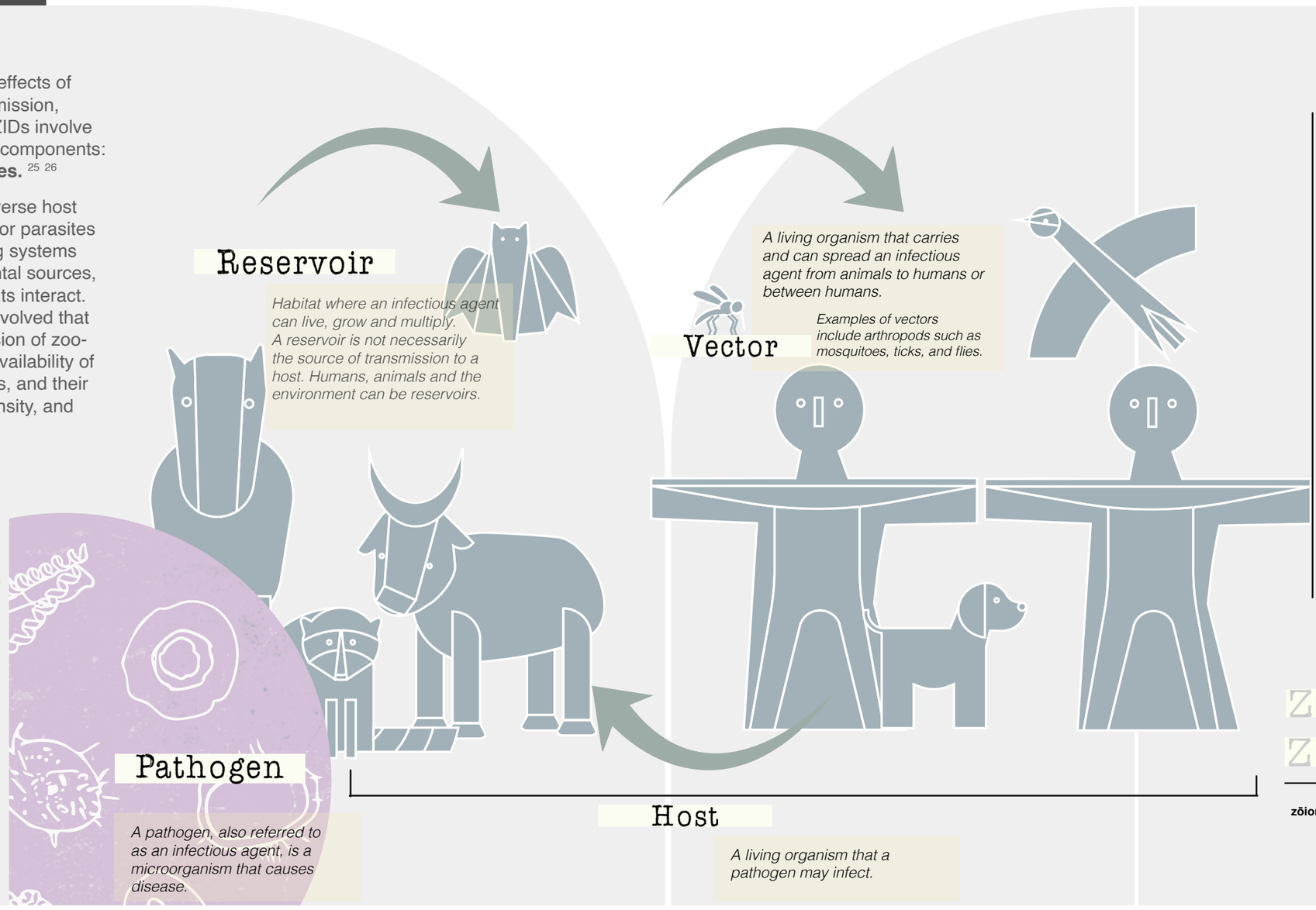
Origins and Health Impacts

Developed from the combined effects of microbial amplification, transmission, and host-pathogen interactions. ZIDs involve interactions among at least three components: **a pathogen and two host species.** [25] [26]

Zoonotic infections often span diverse host species and may include vectors or parasites with complex life cycles, reflecting systems where multiple hosts, environmental sources, and even multiple infectious agents interact. As well, multiple factors can be involved that shape the diversity and transmission of zoonotic agents, including the local availability of potential animal hosts and vectors, and their spatial distribution, population density, and population dynamics. [27] [28]

For example, directly transmitted zoonoses can have diverse reservoir hosts, serving different roles in pathogen dynamics, such as amplification or transmission to humans. For vector borne diseases, ecology is complex, as vector and reservoir host species and other factors can change transmission dynamics. [21]

When conditions support pathogen amplification and transmission, infectious diseases can expand in scale, progressing from localized outbreaks to epidemics and pandemics. [22]



SARS-CoV-2 (Covid-19)

The emergence of SARS-CoV-2 (Covid-19), provides an example of how pathogen transmission from other species reflects human–animal–environment relationships.

Initially circulating in wildlife, the virus exploited ecological niches created by wildlife trade and live animal markets, adapting to humans as novel hosts. These conditions, driven by human activity such as globalization, urbanization, population density, and habitat encroachment, opened pathways for spillover and facilitated rapid spread.

Adding to this complexity, as the disease progressed, evidence suggests SARS-CoV-2 was later able to spill back from deer to humans, creating new transmission pathways and highlighting the dynamic, bidirectional nature of pathogen ecology and evolution. [23] [24]

Zoonoses (pl.)

Zoonosis (sing.)

From Greek

zōion = animal **nosos = disease**

Zoonoses Names

Zoonotic disease names follow the International Classification of Diseases (ICD), which was developed to prevent naming practices that stigmatized people, regions, or animal species. Such naming practices often produced misleading and epidemiologically inaccurate information, given that zoonoses emerge from complex interactions. [29]

*Consult the **Key Terms** section for definitions used throughout the materials.*

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Zoonotic spillovers, the transmission of a pathogen from one species to another, are driven by complex interactions among hosts, microorganisms, and the environment. [30] [31]

The frequency of spillovers of zoonotic diseases is increasing and not expected to decline, in part due to unsustainable human activities, projected growth in human and animal populations, environmental changes, and ongoing biodiversity loss. [40] [41]

Stay informed about zoonoses to strengthen identification, prevention, management, and response in health practice.

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Health Impacts

Zoonoses Emergence and Re-emergence

Once a pathogen crosses the species barrier, infection can result in isolated cases that go no further (dead-end host) or in spread among humans through human-to-human transmission or via a vector, sometimes resulting in spread back to animals. For the latter to occur, social, biological, and environmental conditions must be favourable both within the human host and across the wider population.[36]

The emergence of zoonoses tends to follow a phased pattern: after a pathogen spills over from an animal reservoir to humans, it may cause small-scale outbreaks before eventually adapting to enable sustained human-to-human transmission. [37]

Emerging and/or re-emerging zoonoses are those identified as occurring in new geographic areas, or new populations, increasing in incidence, diseases that may be reappearing after a long period of time without events, exhibiting novel genetic characteristics, or infecting humans for the first time. [38]

The amplification of an outbreak can lead to an epidemic or pandemic. A rising incidence of disease is often a key indicator for early recognition. [39]

Health Outcomes

For an infectious disease to continue to spread among people, certain conditions must be in place: the pathogen must possess sufficient infectivity to enable transmission, sufficient virulence for increases in disease incidence to be detectable, and the host population must have sufficient susceptibility to allow ongoing transmission and amplification of the organism. [32]

The extent and severity of an epidemic are determined by complex interactions between the infectious agent and the host. [33]

Pandemics arise when zoonotic pathogens become established in humans and spread internationally, across multiple countries and continents, often affecting a large number of people.[34]

In some cases, zoonoses transition into an endemic state, where they persist within human and/or animal populations and pose a continuous risk of future epidemic resurgence. [35]

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