

# Routes of Transmission

Last Updated: March 17, 2005

Pathogenic agents can be spread from animal-to-animal or animal-to-human and vice versa, through a variety of transmission routes. For the purposes of the biological risk management resources, a definition is provided so participants can understand how and why materials were grouped accordingly.

## Aerosol transmission

Occurs when pathogenic agents contained in aerosol droplets are passed from one animal to another, or from animal-to-human. Most pathogenic agents do not survive for extended periods of time within the aerosol droplets and as a result, close proximity of infected and susceptible animals is required for disease transmission.

## Oral transmission

Involves the consumption of pathogenic agents in contaminated feed, water or licking/chewing on contaminated environmental objects. Feed and water contaminated with feces or urine are frequently the cause of oral transmission of disease agents. Contaminated environmental objects could include equipment, feed bunks, water troughs, fencing, salt and mineral blocks, and other items an animal may lick or chew.

## Direct contact transmission

Requires the presence of an agent or organism in the environment or within an infected animal. A susceptible animal becomes exposed when the agent directly touches open wounds, mucous membranes, or the skin through blood, saliva, nose to nose contact, rubbing, or biting. It is important to note that depending on the disease agent, it is possible for direct contact transmission to occur between animals of different species, as well as to humans.

### *Reproductive transmission*

This route of transmission is a subtype of direct contact that encompasses those diseases spread through venereal and in-utero routes. Venereal transmission is the spread of pathogenic agents from animal-to-animal through coitus. In-utero transmission is the spread of pathogenic agents from dam to offspring during gestation.

## Fomite transmission

This route requires an inanimate object to carry a pathogen from one susceptible animal to another. Fomite transmission often involves a secondary route of transmission such as oral or direct contact for the pathogen to enter the host. Examples of fomites include contaminated vehicles, shovels, clothing, bowls/buckets, brushes, tack, and clippers.

### *Traffic transmission*

A subtype of fomite transmission, involves a vehicle, trailer, or human, which causes the spread of a pathogenic agent through contaminated tires, wheel wells, undercarriage, clothing, or shoes/boots by spreading organic material to another location.

## Vector-borne transmission

This occurs when an insect acquires a pathogen from one animal and transmits it to another. Diseases can be transmitted by vectors either mechanically or biologically. Mechanical transmission means that the disease agent does not replicate or develop in/on the vector; it is simply transported by the vector from one animal to another (flies). Biological transmission occurs when the vector uptakes the agent, usually through a blood meal from an infected animal, replicates and/or develops it, and then regurgitates the pathogen onto or injects it into a susceptible animal. Fleas, ticks, and mosquitoes are common biological vectors of disease.

## Zoonotic transmission

This route occurs when diseases are transmitted from animals to humans. Human exposure will actually occur through one of the other five routes of transmission, but because of its importance it is addressed as a separate route of transmission.

Many disease agents can survive for extended periods of time in soil or other organic material and can then be acquired by animals or humans through inhalation (aerosol), oral consumption, direct contact, or via fomites. While not a route of transmission, environmental contamination must always be taken into consideration.

## Biological Risk Management



IOWA STATE UNIVERSITY®

Center for Food  
Security and Public Health  
College of Veterinary Medicine  
Iowa State University  
Ames, Iowa 50011

Phone: (515) 294-7189

FAX: (515) 294-8259

E-mail: [brm@iastate.edu](mailto:brm@iastate.edu)

Web: <http://www.cfsph.iastate.edu/BRM>