RESERVOIRS OF PATHOGENS
Reservoir

- **Natural reservoir or nidus** (Latin: "nest")
  - refers to the long-term host of the pathogen of an infectious disease.
  - It is often the case that hosts do not get the disease carried by the pathogen or it is carried as a subclinical infection and so asymptomatic and non-lethal.
  - A **fomite** is any inanimate object or substance capable of carrying infectious organisms, such as germs or parasites.
Living Reservoirs

- **Carrier** – an individual who inconspicuously shelters a pathogen and spreads it to others; may or may not have experienced disease due to the microbe

- **Asymptomatic carrier** –
  - *incubation carriers* – spread the infectious agent during the incubation period
  - *convalescent carriers* – recuperating without symptoms
  - *chronic carrier* – individual who shelters the infectious agent for a long period

- **Passive carrier** – contaminated healthcare provider picks up pathogens and transfers them to other patients
Animals as Reservoirs and Sources

- A live animal (other than human) that transmits an infectious agent from one host to another is called a vector.
- Majority of vectors are arthropods – fleas, mosquitoes, flies, and ticks.
- Some larger animals can also spread infection – mammals, birds, lower vertebrates.
- Biological vectors – actively participate in a pathogen’s life cycle.
- Mechanical vector – not necessary to the life cycle of an infectious agent and merely transports it without being infected.
Example

- Field mice, for hantaviruses and Lassa fever
- Armadillos for Chagas disease
- Ticks for Rocky Mountain spotted fever
- Pigs for cestode worm infections
- Raccoons, skunks, foxes and bats for rabies
- Shellfish for cholera
- Fowl for avian influenza
- Bats, the reservoir for nipah, hendra, rabies and severe acute respiratory syndrome (SARS)
An infection indigenous to animals but naturally transmissible to humans is a **zoonosis**.

Humans don’t transmit the disease to others.

At least 150 zoonoses exist worldwide; make up 70% of all new emerging diseases worldwide.

Impossible to eradicate the disease without eradicating the animal reservoir
Nonliving Reservoirs

- Soil, water, and air
TRANSMISSION OF DISEASE
Pathogens can be transmitted to a host from a reservoir four main ways:

1. By direct contact; exchange of body fluid especially during sexual intercourse
2. By an object; people handle contaminate objects then touch face, nose, eyes, etc…
3. Through the air; person coughs or sneezes spreading droplets which are then inhaled
4. By a vector; insects such as mosquitos, ticks spread pathogens between hosts or reservoirs
Five Modes of Transmission

• Waterborne transmission
  - drinking water or swimming (usually via ingestion)
  - fecal-oral route
  - fecal contamination of drinking water from municipal wastewater sources or animal feedlots

• Foodborne transmission
  – ingestion of infectious agents in food
  – poor sanitation, hygiene (fecal-oral route)
  – insufficiently cooked fish and shellfish
  – in US there are 76 million cases/yr with 325,000 hospitalizations and 5000 deaths

• Person to person transmission
  – requires direct physical contact between hosts
  – sexually-transmitted diseases
  – respiratory infections (coughing, sneezing)
Modes of Transmission (cont.)

• Airborne Transmission
  – inhalation of pathogens in aerosols
  – aerosols created at wastewater treatment plants, land application of sludge, showers
  – legionellosis, fungal infections

• Vector-borne transmission
  – transmission by the bite of an animal host
  – malaria, sleeping sickness, yellow fever
Entry & Exit Portal

- **PORTAL OF ENTRY**
  - Pathogen is where it enters the host’s body. The most common portals of entry are the same anatomical surfaces colonized by pathogen.

- **PORTAL OF EXIT**
  - The anatomical route through which a pathogen leaves the body of its host.
  - E.g. respiratory pathogens, -the nose.
  - Gastrointestinal pathogens - anus.
  - Most STD - genital mucous membranes.
  - Pathogens transmitted by arthropod vectors exit the same way, in a small amount of blood.
Establishment, Spread, and Pathologic Effects

Patterns of infection:

- **Localized infection** – microbes enters body and remains confined to a specific tissue
- **Systemic infection** – infection spreads to several sites and tissue fluids usually in the bloodstream
- **Focal infection** – when infectious agent breaks loose from a local infection and is carried to other tissues
Patterns of Infection

- **Mixed infection** – several microbes grow simultaneously at the infection site - polymicrobial
- **Primary infection** – initial infection
- **Secondary infection** – another infection by a different microbe
- **Acute infection** – comes on rapidly, with severe but short-lived effects
- **Chronic infections** – progress and persist over a long period of time
Frequency of Cases

- **Prevalence** – total number of existing cases with respect to the entire population usually represented by a percentage of the population.

- **Incidence** – measures the number of new cases over a certain time period, as compared with the general healthy population.
Mortality rate – the total number of deaths in a population due to a certain disease

Morbidity rate – number of people afflicted with a certain disease
- **Endemic** – disease that exhibits a relatively steady frequency over a long period of time in a particular geographic locale
- **Sporadic** – when occasional cases are reported at irregular intervals
- **Epidemic** – when prevalence of a disease is increasing beyond what is expected
- **Pandemic** – epidemic across continents
Is there something you're not telling me, Doctor?