How infection moves

A pathogen is a disease-causing agent, such as a bacterium, virus or parasite. Infectious disease results from infection, not from exposure to a toxic chemical.

1. TRACE THE TRANSMISSION PATHWAY

RESERVOIR

Where a pathogen normally persists

→

ROUTE

Air, water, contact or a living vector

→

HOST

An organism that can become infected

A vector carries a pathogen between hosts: a mosquito can transmit a virus or parasite, but the mosquito is not that pathogen. An infected host can become a source for further transmission; the route depends on the disease.

2. APPEARANCE DOES NOT PROVE SAFETY

Clear water and a tidy-looking environment can still contain pathogens. Where investment in safe drinking water, sanitation and healthcare is inadequate, infections can spread more easily. Poverty is not an infectious agent: the relevant mechanisms are unsafe exposure and limited access to protection.

3. ENVIRONMENTAL CHANGE CREATES OPPORTUNITIES

Pathogens can adapt, and changes in travel, land use or animal contact can open new transmission routes. Warming can shift suitable conditions for some vectors toward higher latitudes or elevations and change transmission seasons. Rainfall, habitat, pathogen introduction and public-health measures also matter. Warmer conditions do not guarantee an outbreak everywhere: explain the full chain from environmental change to exposure.

Cycle example: infected people shed cholera bacteria in feces; contaminated water or food carries them to another person. Safe waste disposal and safe drinking water interrupt this fecal-oral pathway.

Environmental opportunities and sanitary conditions: College Board APES CED, EIN-3.D.1-4.
Vectors, climate and changing distribution: WHO, Vector-borne Diseases.
Fecal-oral transmission and sanitation: WHO, Cholera.

Scope: College Board APES CED, Topic 8.15, EIN-3.D.1-12, pp. 174-175.

Vector-borne disease examples

Separate the disease, its causative agent and the animal that transmits it. These four examples all involve vectors, but some also have other transmission routes.

1. PLAGUE | BACTERIUM: YERSINIA PESTIS

Plague bacteria circulate among rodents and fleas. An infected flea can transmit the bacteria when it bites a human; contact with infected animal tissues or fluids is another route. Pneumonic plague can also spread through infectious respiratory droplets.
Pathway: infected rodent → flea → human.

2. MALARIA | PARASITE: PLASMODIUM

An infected female *Anopheles* mosquito transmits *Plasmodium* parasites through a bite. A mosquito can acquire the parasites from an infected person and later infect another person. The greatest disease burden is in sub-Saharan Africa, but malaria also occurs elsewhere.
Prevention link: insecticide-treated bed nets reduce mosquito bites.

3. WEST NILE | VIRUS

Mosquitoes acquire West Nile virus when they feed on infected birds. Infected mosquitoes can then pass the virus to people through bites. Humans generally do not pass enough virus back to feeding mosquitoes to sustain this cycle.
Main cycle: bird → mosquito → bird; humans are incidental hosts.

4. ZIKA | VIRUS

Zika virus is mainly transmitted by infected Aedes mosquitoes. It can also spread through sexual contact and from a pregnant person to the fetus; infection during pregnancy can cause congenital abnormalities.
Key distinction: a mosquito is the vector, not the cause of every route of Zika transmission.

Plague transmission and rodent-flea ecology: CDC, How Plague Spreads.
Malaria agent, distribution and bed nets: WHO, Malaria.
Bird-mosquito cycle and human infection: CDC, West Nile: Causes and How It Spreads.
Mosquito, sexual and fetal transmission: WHO, Zika Virus.

Scope: College Board APES CED, Topic 8.15, EIN-3.D.1-12, pp. 174-175.

Air, animal contact and water

A prevention measure works when it interrupts the actual transmission route. Water treatment cannot substitute for controlling airborne infection or mosquito exposure.

1. TUBERCULOSIS (TB) | BACTERIUM

Mycobacterium tuberculosis usually attacks the lungs. Someone with active TB in the lungs or throat can release bacteria into the air by coughing, speaking or singing; another person may inhale them. Latent (inactive) TB does not spread to others.
Prevention link: ventilation and appropriate diagnosis and treatment reduce spread.

2. SARS | CORONAVIRUS

Severe acute respiratory syndrome is caused by SARS-CoV and can cause pneumonia. People can become infected by inhaling infectious respiratory particles. Contaminated hands or surfaces can also transfer material to the eyes, nose or mouth.
Distinction: SARS is not the same disease as COVID-19, caused by SARS-CoV-2.

3. MERS | CORONAVIRUS

Middle East respiratory syndrome is caused by MERS-CoV. Dromedary camels are the main animal reservoir; direct or indirect camel contact can introduce the virus into humans.
Close-contact spread between people can follow, especially in healthcare settings.
Prevention link: animal-contact precautions and healthcare infection control.

4. CHOLERA | BACTERIUM: VIBRIO CHOLERAE

Cholera follows ingestion of water or food contaminated with *Vibrio cholerae*. It can cause severe watery diarrhea and dehydration. Infected people can release bacteria in feces, allowing unsafe waste disposal to contaminate another water or food supply.
Prevention link: safe water, sanitation and hygiene break this cycle.

TB airborne spread and latent infection: CDC, Tuberculosis: Causes and How It Spreads.
SARS overview: WHO, Severe Acute Respiratory Syndrome.
Camel reservoir and human transmission: WHO, MERS-CoV Fact Sheet.
Cholera transmission and prevention: WHO, Cholera.

Scope: College Board APES CED, Topic 8.15, EIN-3.D.1-12, pp. 174-175.