

Activity 3.1.3

Modes of Transmission

DATE	PORTAL DAY	LESSON	TURN IN
Thursday 2026-11-18	Infection-control case	Lesson 3.1 Nosocomial Nightmare	Pre-lab

Where this sits. Single day. Day 3 of Lesson 3.1. It ends with the paper practice that is your pre-lab gate for Monday's bench work.

01 Why today matters

A pathogen has to physically get from somewhere to someone, and that journey has exactly six links you can cut. Today you plot where all eleven patients actually went inside the hospital, which is the first time the map itself becomes evidence.

02 What you already know

- You have a hypothesis about the category of agent, and the evidence you used to rule the others out.
- You know which part of the body each patient's new infection is in.
- From Unit 1 you know that where something was found is often worth more than what it was.

WHAT THIS SHEET WILL NOT TELL YOU

- This sheet does not tell you the mode of transmission at the hospital, or where the pathogen is coming from.
- It gives you the six links in the chain. Which link is broken at Garcia-Newgard is yours to find.

03 Vocabulary

TERM	WHAT IT MEANS, PLAINLY
chain of infection	The six-step path a pathogen takes from where it lives to the next person it infects. Break any one link and the spread stops.
reservoir	Where the pathogen normally lives and multiplies between hosts. A person, an animal, water, soil, a surface, a piece of equipment.
portal of exit	The way out of the reservoir. A cough, a wound, the gut, a leak.
mode of transmission	How the pathogen travels from the exit to the next host.
portal of entry	The way in to the new host. Broken skin, the nose, the mouth, the urinary tract, a surgical site, an IV line.
susceptible host	A person whose defences are weak enough that this pathogen can take hold. Age, illness, surgery, and medication all move a person along this scale.
direct contact	Transmission by touching an infected person or their body fluids.
indirect contact	Transmission through something in between: air, an object, or an insect.

vehicle	A non-living in-between object that carries a pathogen. A doorknob, a shared cart, a piece of equipment, food, water.
vector	A living in-between carrier, usually an insect.
infectious dose	How many individual particles or cells it takes to make a person sick. Some agents need under ten. Others need a million.
innate immunity	The defences you are born with, which do not care what the invader is. Skin, stomach acid, mucus, cilia, fever.
acquired immunity	The defences your body builds against one specific invader, using antibodies, and remembers.
active immunity	Acquired immunity where your own body made the antibodies, after an infection or after a vaccine.
passive immunity	Acquired immunity where the antibodies were made by someone else and given to you, usually from a mother across the placenta or in breast milk.
herd immunity	When enough of a population is immune that the pathogen runs out of new hosts and dies out before it reaches the ones who are not immune.
R-naught	Written R_0 . The average number of new infections one infected person causes in a population where nobody is immune. Above 1 the outbreak grows; below 1 it dies out.

Every term on this list is flagged for the illustrated glossary, scoped to this activity only. Terms are not shared forward or backward between activities, because a definition from a later activity can hand you an answer you were supposed to derive.

04 How to do the work

- 1 Draw the chain of infection in your notebook, all six links, big enough to write on.
- 2 Trace one worked example onto your drawing. Influenza: the reservoir is an infected person, the portal of exit is a cough, the mode of transmission is droplets through the air, the portal of entry is another person's nose or mouth, and the new host is susceptible if their defences are down. Label every link.
- 3 Now do one on your own for a stomach illness spread by undercooked food, and label whether the transmission is direct or indirect. If you had to put a non-living object in the middle, it is indirect.
- 4 Answer in your notebook: what makes a host more susceptible? Then answer the harder version. Are hospital patients more susceptible because of why they are in the hospital, or less susceptible because they are surrounded by medical care? Argue it with reasons.
- 5 For each agent category you have not ruled out, fill in a small table: possible reservoir inside a hospital, possible portal of exit and entry, and likely mode of transmission. There will be more than one row. That is fine.
- 6 Get the Garcia-Newgard hospital map, on paper or in the app.
- 7 Using Hospital Hub, go back to the messages and the patient details and pull the locations each of the eleven patients visited during their stay.
- 8 Plot every patient's locations on the map. Use a different colour or symbol per patient so overlap is visible at a glance. Do not summarise as you plot; plot everything, then look.
- 9 Now step back and read the map. Write down every pattern you see: rooms shared, floors shared, departments visited, patients who never overlapped with the others.
- 10 List all six ways the chain could be cut at this hospital, one per link, with a specific action for each. 'Better hygiene' is not an action. 'Change gloves between patients at the shared supply cart' is.
- 11 Run the NetLogo Virus with Vaccinations and Immunity model. First run: 100 people, infectiousness 50 percent, chance-recover 99 percent, duration 52 weeks, vaccination-rate 0 percent, immune-time 52 weeks. Record percent

infected and percent immune at one year.

- 12 Now change one parameter at a time and record what happens. Raise the vaccination rate in steps and write down the point where the outbreak stops taking off. Then answer: how did vaccination rate change the numbers of sick, healthy, and immune people, and what is this model leaving out about real people?
- 13 Pre-lab gate for Monday. Get the Isolation Streak Practice sheet and draw a four-quadrant isolation streak on every empty plate outline. Get it checked and initialled before you leave. No initials, no bench work Monday.

05 Where students get stuck

- A correction you need before you use the number. This course computes an R_0 stand-in by dividing new cases by total cases, and for 35 new out of 600 total that gives 0.06. Treat that as a classroom stand-in for how fast cases are being added right now, and label it that way in your notebook. It is not an R -naught estimate. R -naught is the average number of people one infected person infects when nobody is immune, and epidemiologists estimate it from contact patterns and how long a person stays infectious, not from a ratio of two case counts. If you carry the new-over-total version into AP Biology you will be marked wrong, so learn both and keep them apart.
- Calling a doorknob direct contact because you touched it. Direct means you touched the infected person or their fluids. The moment anything non-living sits in the middle, it is indirect.
- Reading infectious dose as a severity score. It is a threshold, not a measure of how bad the disease gets. An agent that needs under ten particles spreads easily; that says nothing about how sick it makes you.
- Plotting only the rooms and stopping. Patients move. Imaging, surgery, therapy, the cafeteria, a hallway they were wheeled down twice. A location that only shows up for some patients is as interesting as one that shows up for all of them.
- Trusting the simulation. It is a grid of dots. It has no hospital, no age, no immune system, no reason people are near each other. Say out loud what it is simplifying before you quote a number from it.

06 What you turn in

PRE-LAB

Two things. The pre-lab: your Isolation Streak Practice sheet, checked and initialled by Mr. Mendoza before you leave, which is what gets you onto the bench Monday. And your notebook: the labelled chain of infection, the plotted hospital map with your written patterns, the six break-the-chain actions, and your NetLogo runs with the numbers you recorded.

07 Check yourself

- ☐ Name the six links in the chain of infection in order, and pick one you could realistically cut in this school building. (Vocabulary and step 10)
- ☐ Give an example of indirect transmission through a vehicle and one through a vector. (Vocabulary)
- ☐ Why is the new-cases-over-total-cases number not an R -naught estimate? Say what R -naught actually counts. (Where students get stuck)