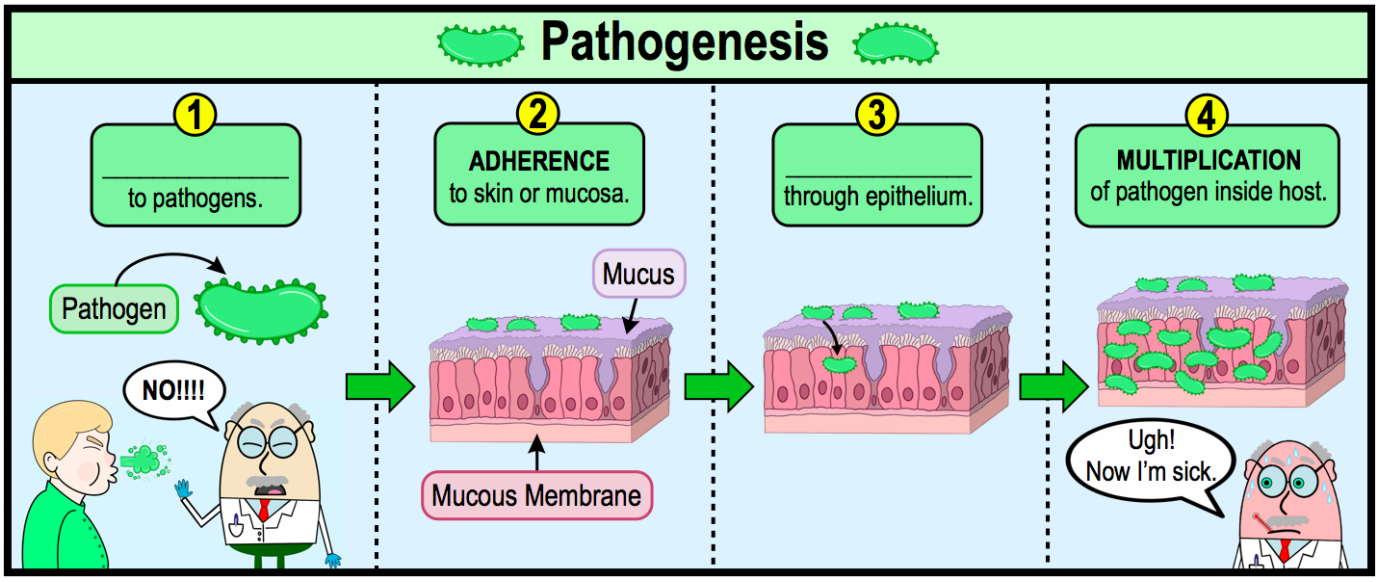
CONCEPT: BACTERIAL PATHOGENESIS

●**Pathogenesis:** the process of disease *development* (infection) in a host.

●Bacterial pathogenesis involves _____ important steps:



PRACTICE: All of the following are phases of bacterial pathogenesis except which of these answers?

a) Bacterial pathogens are destroyed by neutrophils and macrophages of the immune system.

b) Bacterial pathogens are transmitted from an infected host to a healthy susceptible host.

c) Bacterial pathogens multiply inside of the infected host.

d) Bacterial pathogens invade the host's tissues and cells.

1) Exposure to Pathogen

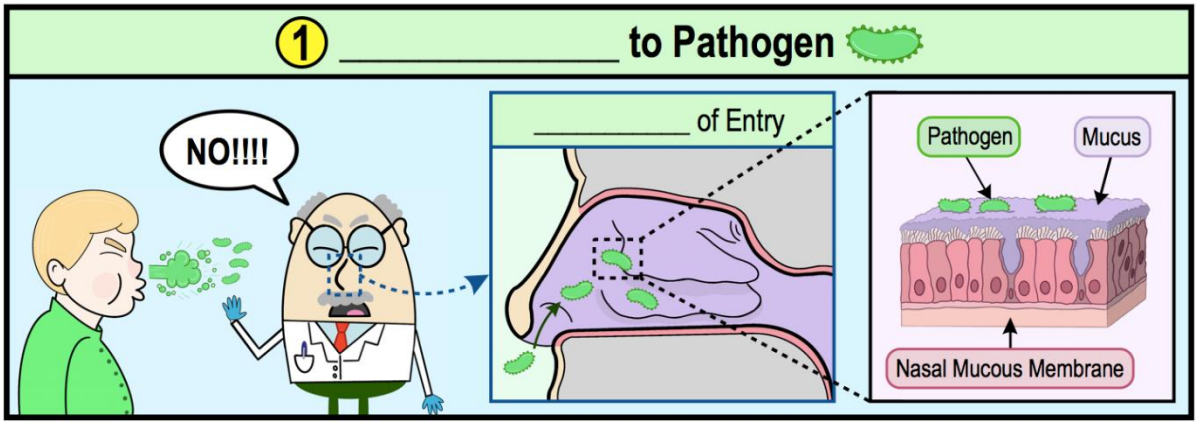
●The _____ step in bacterial pathogenesis is exposure (or an encounter) with the pathogen.

□ Not all exposures result in infection, as the pathogen must enter host tissues via a *portal of entry*.

□ **Portal of _____:** locations where host tissue cells *directly* contact the external environment.

□ Examples: *skin, mucous membranes,* & *parenteral routes* (sites of _____ protective barriers).

□ Most common portal of entry for pathogens is the *respiratory tract* (Ex. spread of COVID-19).



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PRACTICE: During the Covid-19 pandemic, individuals around the world were advised to wear masks covering their nose and mouth. Why is this medical advice important for decreasing the spread of the SARS-CoV-2 virus?

a) Face masks cover the openings to our respiratory system, which is the portal of entry for the SARS-CoV-2 virus.
b) Face masks cover the openings to our respiratory system, which is the portal of exit for the SARS-CoV-2 virus.
c) Face masks cover the openings to our digestive system, decreasing the entry of opportunistic pathogens.
d) A and B.
e) A and C.
f) All of the above.

2) Adhesion to Host

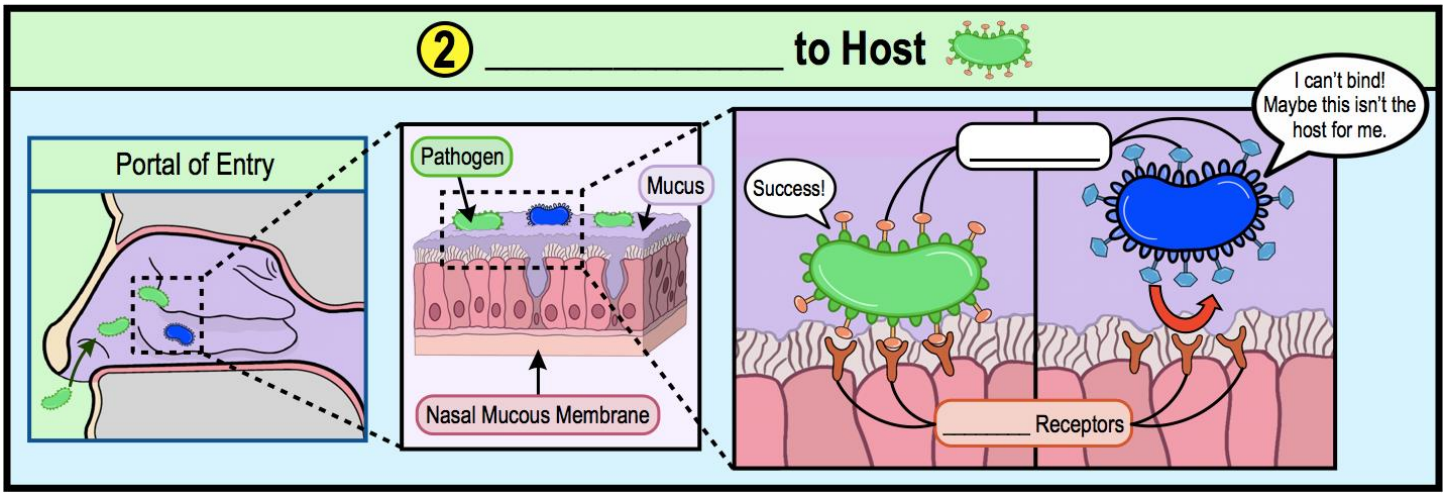
●After pathogen exposure & entry at the portal of entry, the pathogen must properly _____ to the host.

□ **Adhesion:** ability of a pathogen to _____ to host cells using *adhesion factors* (*adhesins*).

□ **Adhesins:** molecules on the surface of pathogens that *bind* specific receptors on host cells.

□ Adhesins can be found on bacterial *pili*, *fimbriae*, & *flagella*.

□ Adhesin-Receptor binding is VERY _____ & controls the cell type a pathogen will adhere to.



PRACTICE: Which of the following is **not** true about adhesin molecules?

a) Adhesin molecules are receptors on the host cell's surface that allows pathogens to enter the cell.
b) Adhesin molecules are found on pili, fimbriae, and flagella of bacterial pathogens.
c) Adhesin molecules allow a bacterial pathogen to attach to the surface of the host's cells.
d) Adhesin molecules bind to receptors on the surface of the host cell.

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3) Invasion into Host Cell or Host Tissues

●Once a pathogen has adhered to the host, it either finds a way to invade a host cell or enter the host's tissues.

□ Invasion of host cell allows pathogen to reduce competition for nutrients & "hide" to _____ immune system.

●Invasion into most types of host cells involves one of _____ mechanisms of *induced endocytosis*:

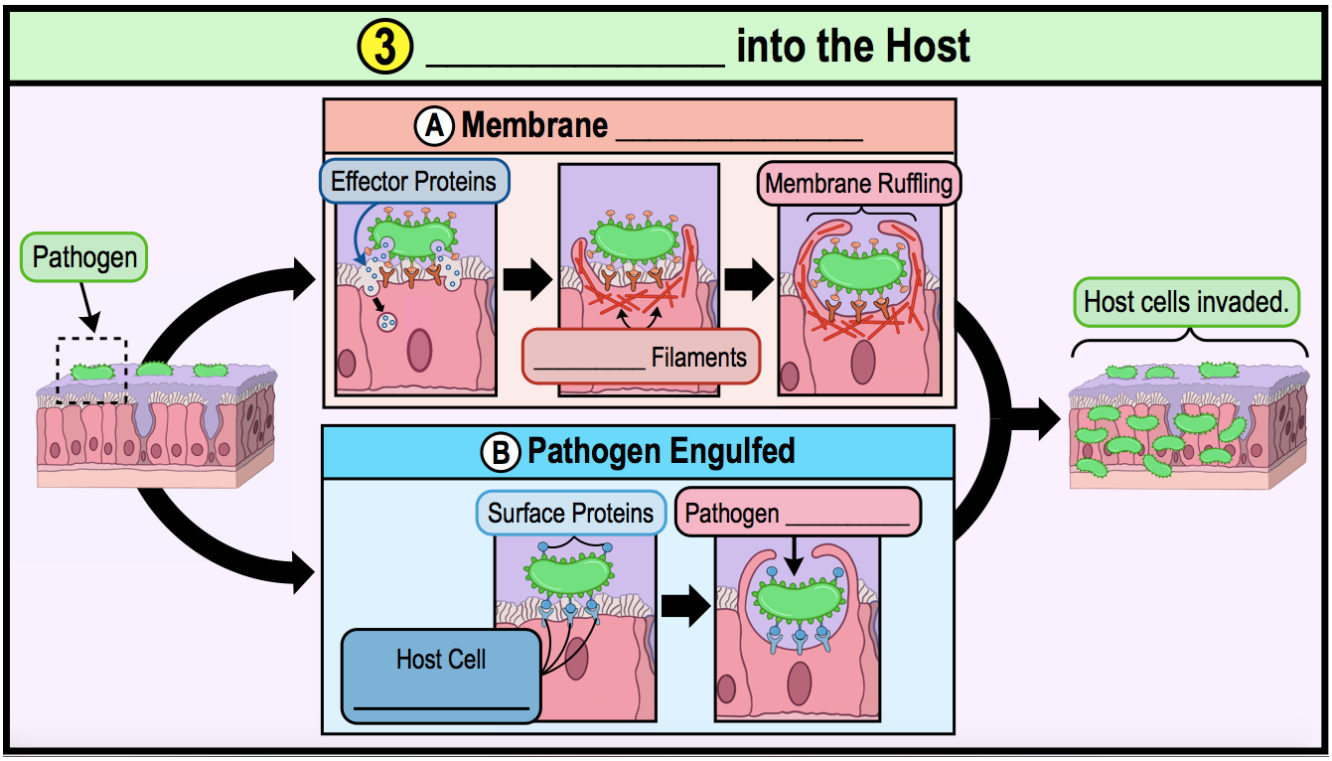
□ **Induced Endocytosis:** bacterial cell "_____" host cell to endocytose when it typically would not.

a) Pathogen contacts epithelial cell & secretes effector proteins causing *membrane* _____ of cell's actin.

□ **Membrane Ruffling:** rearrangement of _____ filaments in host cell resulting in membrane "*ruffles*".

□ Ruffles (or "wrinkles") enclose bacterial cells & bring them into the cell (resembling endocytosis).

b) Pathogen expresses surface proteins that _____ to receptors on a host cell & pathogen is engulfed.



PRACTICE: The process by which infectious agents are ingested by host cells is termed

a) Exocytosis. b) Pinocytosis. c) Endocytosis. d) Phagosome fusion.

PRACTICE: Which of the following is ***not*** a method bacterial pathogens use to invade host cells in pathogenesis?

a) Pathogens induce the host cell to engulf them.

b) Pathogens breaks apart outside of the cell, are phagocytosed, then reassembles once within the host cell.

c) Host cell membrane rearranges after the pathogens bind to the host cell's surface.

d) The pathogens express surface proteins that allow them to bind to the host cell and begin endocytosis.

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4) Multiplication (Colonization) Inside Host

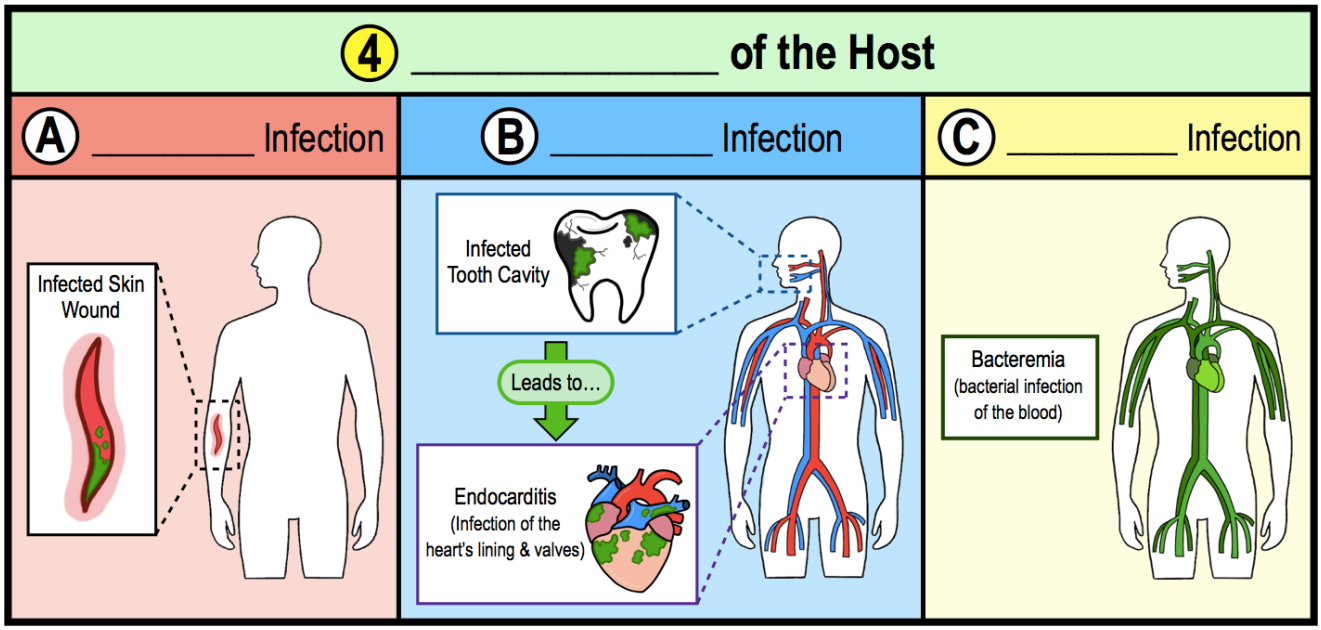
●After entering a host cell or tissues, the pathogen multiplies & begins damaging the host, causing an **infection**.

●Pathogens can cause _____ types of infections:

a) Local Infections: confined to a _____ area of the body near the *portal of entry*.

b) Focal Infections: localized infection *spreads* to a _____ location (usually via the bloodstream).

c) Systematic Infections: infection *disseminates* or widely-*spreads* throughout the _____ body.



PRACTICE: Multifocal tuberculosis is characterized by:

a) A patient with a single lobe of the left lung being infected with *Mycobacterium tuberculosis bacteria.*

b) A patient with damage in their lungs, vertebrae, & CNS caused by *Mycobacterium tuberculosis bacteria.*

c) A patient with *Mycobacterium tuberculosis bacteria circulating throughout the blood stream.*

d) None of the above.

PRACTICE: Sickle cell anemia is a blood disorder where affected individuals have "half-moon" shaped red blood cells. Sickle cell anemia is an example of a _____ disease.

a) Systemic. b) Local. c) Focal. d) Contagious.

PRACTICE: Bacterial pathogen Z has proteins on its surface which bind to receptors on the host cell's surface. After it is bound, the host cell engulfs the bacterium. This means that the proteins on the surface of bacterium Z are:

a) Virulence factors. c) Able to induce endocytosis in the host cell. d) A, B and C.

b) Adhesins. d) A and B only.