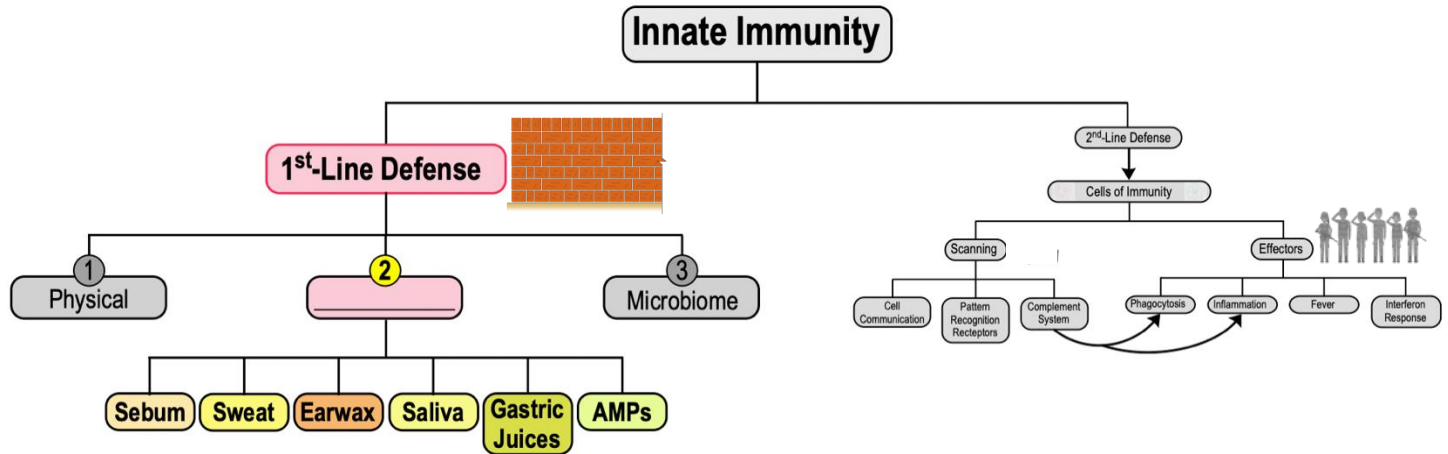


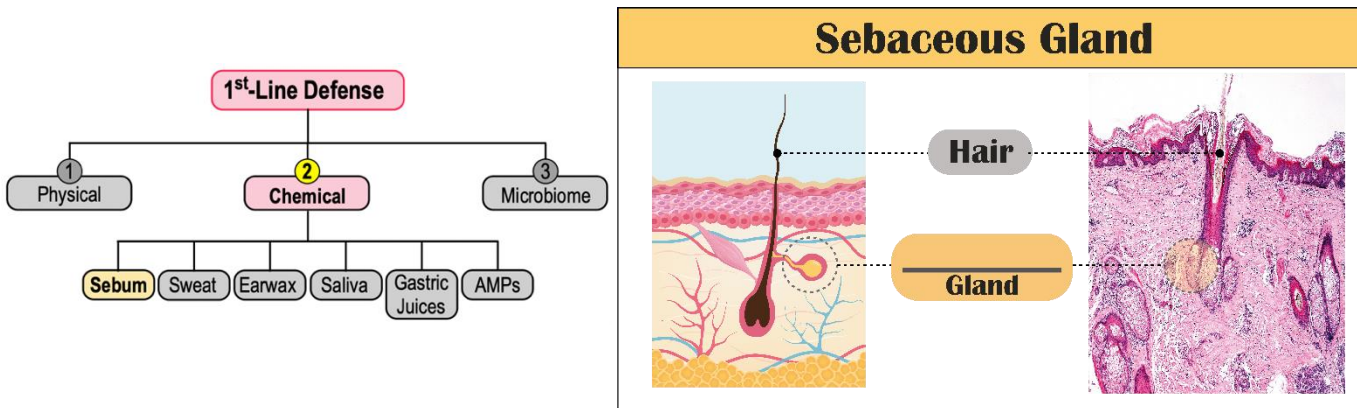
CONCEPT: FIRST-LINE DEFENSES: CHEMICAL BARRIERS

- Certain types of chemical factors play important roles in the first-line defense mechanisms of innate immunity.
- **WARNING:** this part of the lesson may be a little bit gross.



Chemical Defenses: Sebum Prevents Microbial Growth as a Protective Layer

- **Sebaceous glands:** glands on the *skin* that produce an oily substance called _____.
- **Sebum:** chemical barrier that prevents hair from becoming _____ & brittle.
- Contains fatty acids that _____ the pH of the skin thereby preventing growth of certain types of microbes.



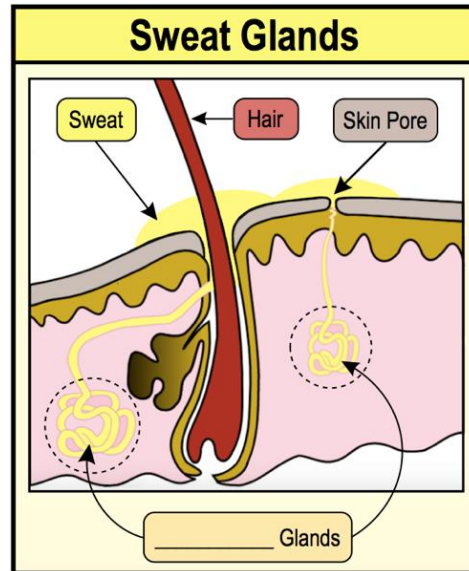
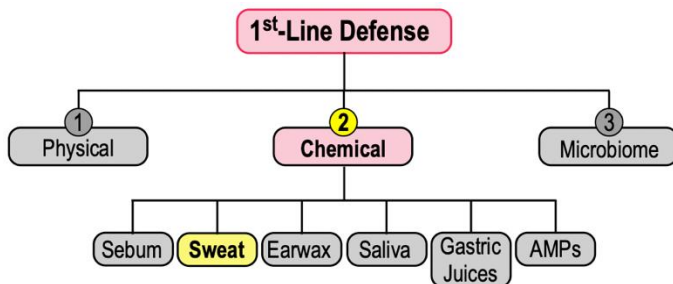
PRACTICE: The _____ glands create sebum which makes the skin more _____ which decreases microbial growth.

- Lacrimal glands; basic.
- Salivary glands; hydrophobic.
- Sweat glands; alkaline.
- Sebaceous glands; acidic.

CONCEPT: FIRST-LINE DEFENSES: CHEMICAL BARRIERS

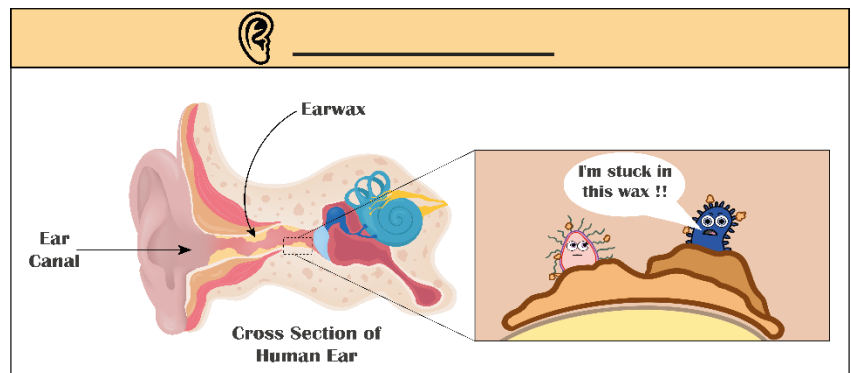
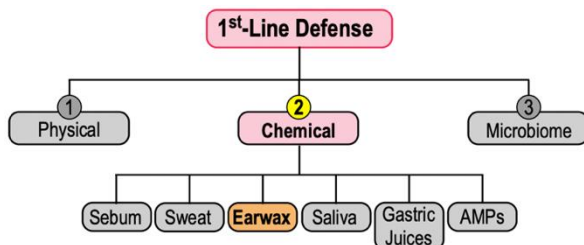
Chemical Defenses: Sweat Glands Prevent Microbial Growth by Perspiration

- **Perspiration:** the process of “_____” or release of *sweat* from sweat glands on the skin.
 - Helps _____ body temperature & *removes* microbes from the surface of the skin.
 - Sweat contains the enzyme _____ that degrades bacterial cell walls.
 - *Lysozyme* is also found in tears, saliva, urine, mucus & tissue fluids.



Chemical Defenses: Earwax Prevents Microbial Growth by Controlling pH

- Earwax can serve as _____ a physical & chemical barrier in the first-line defenses.
 - It can *physically* prevent microbe entry into the ear & it can control the _____ of the environment.
 - **Earwax:** a mixture that contains sebum (rich in fatty acids) that _____ the pH to *inhibit* microbial growth.
 - Also contains many _____ cells from the ear canal that contain keratin.



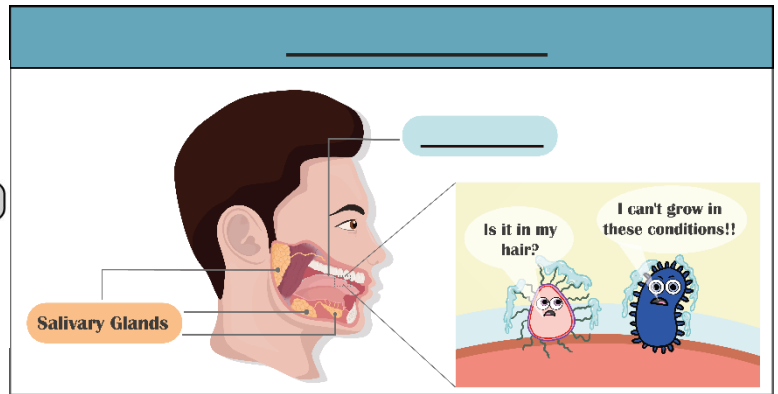
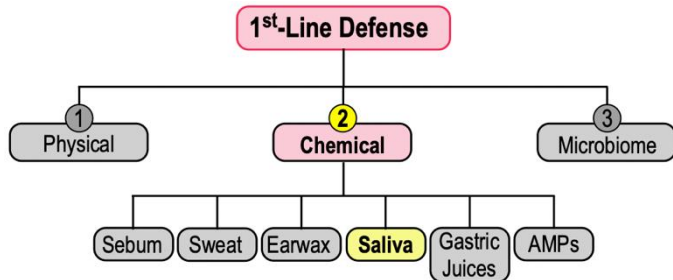
PRACTICE: Lysozyme is effective at destroying bacteria pathogens because it does what?

- a) Waterproofs skin.
- b) Disrupts the bacterial cell membrane.
- c) Hydrolyzes peptidoglycan cell walls.
- d) Propels the cilia of the gastrointestinal tract.

CONCEPT: FIRST-LINE DEFENSES: CHEMICAL BARRIERS

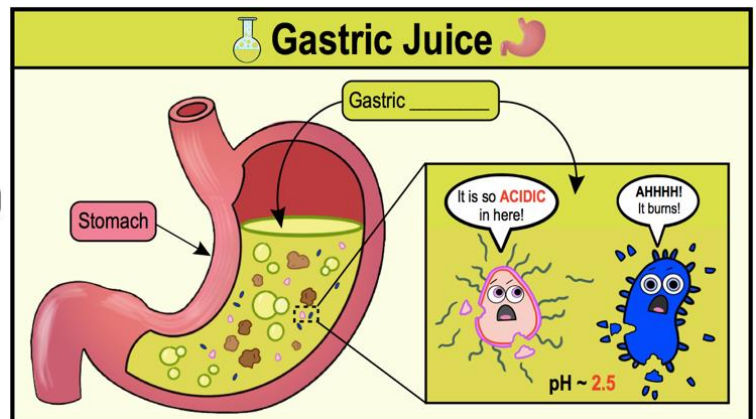
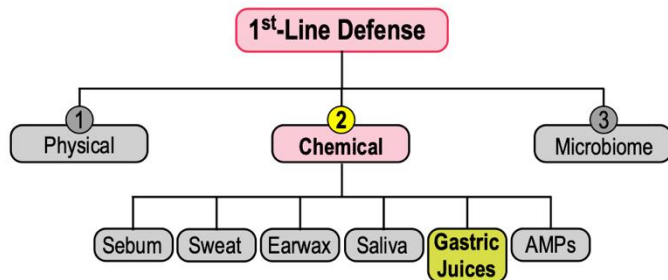
Chemical Defenses: Saliva Can Prevent Microbial Growth

- **Saliva:** a complex mixture containing enzymes that _____ microbial growth (ex. lysozyme).
 - Recall: _____: enzyme that degrades the peptidoglycan layer of bacterial cell walls.



Chemical Defenses: Gastric Juice Prevents Microbial Growth by Lowering pH

- _____ **Juice:** mixture of hydrochloric acid (HCl), enzymes (Ex. lysozyme), & mucous in the *stomach*.
 - Highly _____ solution that lowers the pH of the stomach killing MOST bacteria & inactivating most toxins.



PRACTICE: Which of the following statements about the defensive roles of saliva and gastric juices are true?

- Saliva's main function is to move microbes through and out of the gastrointestinal system.
- Saliva possesses enzymes that inhibit microbial growth and digest microbes.
- Gastric juice's main function is to destroy microbes and toxins eaten by the host.
- Gastric juice is incredibly acidic which breaks down most pathogens.
- All of the above are true statements.

CONCEPT: FIRST-LINE DEFENSES: CHEMICAL BARRIERS

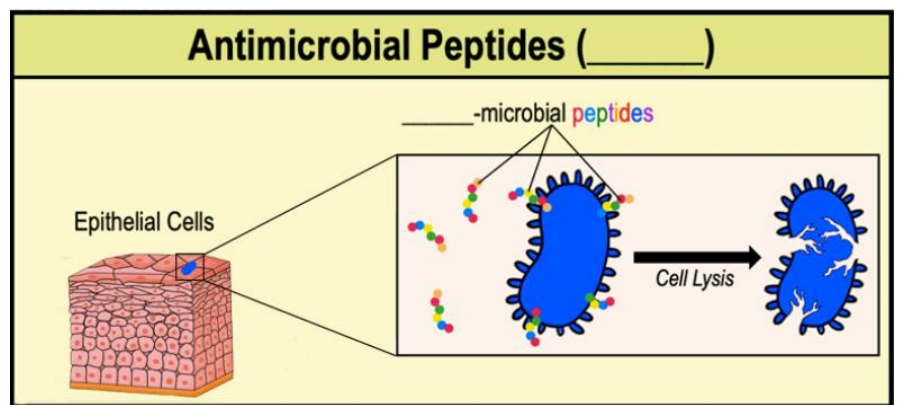
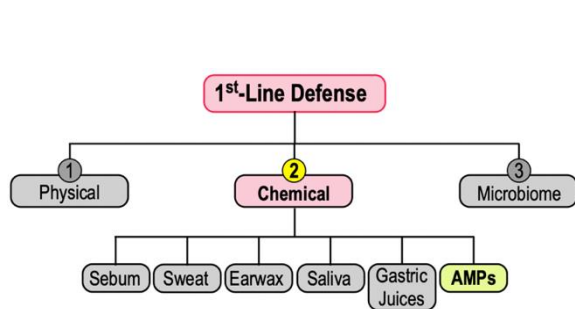
Antimicrobial Peptides

● **Antimicrobial Peptides (AMPs):** _____ chains of amino acids with *antimicrobial* activity.

- Found in *many* organism types & are generally made in response to an invading microbe.
- Many types of AMPs including: *defensins*, *bacteriocins*, *cathelicidin*, *dermicidin*, & *histadins*.

● **Defensins:** positively charged AMPs that damage microbial membranes by inserting into them causing _____.

- Produced by _____ cells to *protect* the skin & mucous membrane to prevent an infection.



PRACTICE: Defensin antimicrobial peptides kill microbes by:

- a) Blocking protein synthesis.
- b) Blocking DNA synthesis.
- c) Lowering cellular pH levels.
- d) Disrupting or destroying the cell membrane.

PRACTICE: All of the following are chemical defenses against microbial infection *except* which of these answers?

- a) Bodily environments with acidic pH to inhibit microbial growth or kill microbes.
- b) Synchronized movement of mucus and microbes within the mucus out of the body.
- c) Bodily fluids containing digestive enzymes to degrade invading microbes.
- d) Positively charged amino acid chains that destroy cell membranes of invading microbes.

PRACTICE: What property of antimicrobial peptide allows them to disrupt bacterial cell surfaces?

- a) Net positive charge.
- b) Presence of disulfide bonds.
- c) Short peptide length.
- d) Large amount of hydrophobic residues.