

Biology of the Salivary Glands 513 (KEY)
MID-TERM Examination
May 24, 1999

TRUE & FALSE (enter "A" for true, and "B" for false)

1. The volume of saliva produced in a day is as much as 3/4 of a liter. (T)
2. The principal components of saliva are salts and proteins. (T/F **The question was ambiguous so I accepted either answer**)
3. The synapses of peripheral parasympathetic ganglia are muscarinic. (T)
4. The function of the rat parotid gland is very similar to the parotid gland in other species. (F)
5. Water enters saliva at the acinar and ductal levels. (F)
6. To secrete a saliva high in protein it is best to use isoproterenol. (T)
7. Parasympathetic secretomotor fibers to the parotid gland travel in the 7th cranial nerve. (F)
8. All salivary glands are innervated by sympathetic fibers. (F)
9. Stimulation of a salivary gland results in a change in its resting membrane potential. (T)
10. The principal buffer of saliva is bicarbonate. (T)

Multiple Choice

11. Which of the following are not functions of saliva or substances present in it?
 - a. solvent, anti-bacterial, digestion
 - b. anti-fungal, buffering
 - c. lubrication, remineralization
 - d. temperature regulation, growth factors
 - e. all of the above are functions or substances present in saliva (E)
12. Which of the following is not one of the general rules common to all salivary glands?
 - a. Secretomotor autonomic nerves invariably control flow.
 - b. Saliva contains a high level of amylase.
 - c. Tonicity of saliva decreases as flow rate increases. (C)
 - d. Saliva contains potassium ions 2-10 the concentration of plasma
 - e. Saliva is usually hypotonic to plasma.

13. In an experiment, the influence of neural activity on salivary flow rate was examined. The results showed that:
- Stimulation of the afferent nerve supply to a salivary gland resulted in the secretion of saliva.
 - Increasing the stimulation rate to the afferent supply was correlated with an increasing flow rate.
 - Only feeding resulted in increases in salivary flow rate.
 - Increasing the stimulation rate to the efferent supply was correlated with an increasing flow rate. **(D)**
 - Saliva flow is the result of hormonal action on the salivary glands.
14. With increasing flow rate the concentration of bicarbonate ions in human parotid saliva
- can exceed the concentration in plasma. **(A)**
 - is always lower than plasma.
 - contributes to a fall in saliva pH.
 - can become as high as 0.6 mEq/l.
 - does not change.
15. During stimulation of the sympathetic supply to the rat parotid gland
- the flow rate can be as high as 120 microliters per minute.
 - maximum flow rate occurs at a stimulation frequency of 200 Hz.
 - maximum flow rate occurs at a stimulation frequency of 10 Hz. **(C)**
 - a very watery saliva is produced.
 - muscarinic ACh are activated on the basolateral membrane of the acinar cells.
16. In Thaysen's two stage hypothesis of salivary secretion
- primary saliva is isotonic with plasma. **(A)**
 - The concentrations of ions in primary saliva are influenced by salivary flow rate.
 - sodium is secreted into the ducts.
 - potassium is resorbed from the ducts.
 - ductal saliva is always isotonic with blood plasma.
17. The cell bodies of the parasympathetic secretomotor nerves are located in the
- intermediolateral nucleus.
 - the salivatory nucleus. **(B)**
 - the spinal cord.
 - the sympathetic trunk.
 - peripheral autonomic ganglia.
18. Which of the following neurotransmitters is not involved in salivary secretion?
- norepinephrine.
 - vasoactive intestinal peptide
 - nerve growth factor **(C)**
 - substance P
 - acetylcholine.

19. In an experiment the pH of dental plaque was measured. The results indicate that
- after a sucrose rinse plaque pH increased.
 - after a sucrose rinse plaque pH initially fell and then returned to control values. **(B)**
 - after a sucrose rinse there was no change in plaque pH
 - after a sucrose rinse in which saliva access to the plaque was prevented the pH initially fell and then returned to control values.
 - after a sucrose rinse in which saliva access to the plaque was prevented the plaque pH increased.
20. In an experiment to measure the influence of taste stimuli on reflex saliva secretion
- all taste stimuli produce a similar flow of saliva.
 - acid stimuli produce the highest flow rate of saliva. **(B)**
 - sweet stimuli produce the highest flow rate of saliva.
 - bitter stimuli produce the highest flow rate on saliva.
 - no correlation was found between taste quality and salivary flow rate.
21. You have an elderly patient who complains of having a dry mouth. He has recently been treated for an oral tumor. You suspect that his dry mouth complaints are the result of:
- the natural aging process.
 - spending too much time chewing sugarless gum.
 - taking a variety of drugs that have xerostomia as a side effect.
 - radiation therapy which damaged the salivary gland.
 - c and d. **(E)**
22. You are evaluating a patient for xerostomia. You check his salivary flow over several visits and find that each time he comes in the parotid flow rate is significantly different than what you measured the previous time. You know that he isn't taking any medications and that you are getting an accurate sampling of his salivary flow since he comes in at noon each time. What do you suspect is giving you these fluctuations in salivary flow measurements?
- You are detecting the normal circadian rhythm of saliva secretion and you wouldn't see such wild variations if you took measurements at different times each day.
 - Saliva flow fluctuates wildly throughout the day and there is no predictable pattern that can be detected.
 - The patient is trying to drive you nuts by spitting a different amount of whole saliva into a tube each time you make a measurement.
 - Because he is hungry, sometimes the patient chews gum just before his office visit. This stimulates salivary flow and gives an elevated parotid flow rate. **(D)**
 - none of the above.

23. A pharmaceutical company has just developed new tooth coating that enhances pellicle formation. What do you anticipate might happen to bacterial colonization of the tooth surface?
- I expect no changes.
 - I expect that colonization by some bacteria might increase because they would not be able to adhere to pellicle proteins which normally adsorb to the tooth surface. **(B)**
 - I expect that colonization by all bacteria might decrease because soluble antimicrobial protein concentrations would increase and enhance clearance of the bacteria in the pellicle.
 - b and c
 - none of the above.
24. You are trying to develop an artificial saliva for use in patients who have undergone radiation therapy. You observe in your clinical trials that patients using your saliva have a significant amount of calculus forming on their enamel. What do you think might need to be adjusted in your recipe?
- I think that inhibitors of calcium phosphate precipitation are too low and allowing supersaturated calcium phosphate to precipitate. **(A)**
 - There is no antimicrobial agent in the saliva and, as a result, the teeth may become highly colonized by acid-producing bacteria.
 - I expect that the calcium phosphate in the artificial saliva is not supersaturated and, as a result, calcium phosphate is leaching out of the enamel
 - b and c.
 - All of the above.
25. There is a common mechanism by which proteins or particulate material (eg. bacteria) are transported through a cell. This mechanism is described in which of the following choices?
- The substance is bound by a receptor and pulled into a vesicle. The vesicle is transported to the cell membrane, fuses with the membrane and the contents of the vesicle released. **(A)**
 - The substances pass through pores in the cell membrane and released.
 - The substances bind to cAMP receptors and are pumped through channels by phosphate pumps.
 - all of the above.
 - none of the above.
26. The reason that numerous distinct stimuli are capable of triggering similar cellular events is because:
- Regardless of the stimulus, the same cellular receptor is triggered.
 - Many different receptors recognize the same ligand.
 - Only one receptor is present on any cell surface.
 - Once a specific receptor is triggered, there is often a common “second messenger” such as cAMP. **(D)**
 - none of the above.

27. Transepithelial transport of proteins not produced by acinar cells is important because:
- Acinar cells tend to produce proteases that destroy proteins that it did not produce.
 - proteins not produced by the acinar cells will clog the ducts and cause damage to the acinar cell.
 - Proteins that are not made by the acinar cells must be able to get into the saliva. **(C)**
 - a and b
 - none of the above
28. What is the significance of the ability of salivary molecules to complex with each other?
- Complexing of salivary proteins results in concentration of antimicrobial proteins on tooth surfaces.
 - Complexing of mucins results in the lubrication and viscoelastic properties of mucins.
 - Complexing of salivary proteins enhances their secretion from helicobacter types of calcium channels.
 - a and b **(D)**
 - none of the above.
29. You have a patient who recently had radiation therapy. He is now experiencing rampant caries, especially on the coronal surfaces. Why is this happening?
- The patient is no longer producing the necessary lubricants and the tooth surfaces are grinding against each other.
 - There are no antimicrobial substances preventing colonization and growth of acid producing bacteria.
 - There is insufficient buffering capacity of acids produced by bacteria and the teeth are being demineralized.
 - all of the above. **(D)**
 - none of the above.
30. Salivary dysfunction can cause significant problems for denture wearers because:
- reduced fluid will affect retention and stability of the denture.
 - there will be a greater chance for *Candida* infection due to low levels of anti-fungal compounds.
 - there will be greater change for taste dysfunction.
 - all of the above. **(D)**
 - none of the above.