Popular Article

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Salivary Secretion and Its Role as Diagnostic Fluid

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Introduction

Saliva, as a diagnostic fluid, provides various advantages over serum as it can be collected non-invasively by individuals with minimal training. Furthermore, salivary diagnosis may also prove to a cost-effective approach for the screening of large number of animals. It can also serve as the main diagnostic fluid for diseases related to salivary glands as well as buccal cavity of the animal. Besides diseases, saliva may also help in detecting the pregnancy or hormonal changes in animals.

Salivary glands and their secretion

Saliva is produced by acinar glands located along the mandible and maxilla of most species (Goff, 2015). The acinar cells secrete a fluid that contains water, electrolytes, mucus and enzymes, all of which flow out of the acinus into collecting ducts. Salivary glands are compound glands as they have more than one tubule entering the main duct, and the architectural arrangement is tubuloacinar. Salivon is the functional unit of a salivary gland and has the following parts :

- **Acini** –It is terminal merocrine secretory unit, made up of different epithelial secretory cells, namely, serous and mucous acini or sometimes a combination of both.
- **Myoepithelial cells** –These are the contractile cells associated with the acinar cells and intercalated ducts of the salivary gland.
- **Ducts**- Numerous intercalated ducts are drained by a striated duct and these empty into fewer excretory ducts. Finally, the excretory ducts converge to form a single main excretory duct, which leads from each gland to the oral cavity.

The converging system beginning with several acini that meets to intercalated duct and further striated and excretory ducts is termed as salivon and is considered the basic structural and functional unit of a salivary gland. The acinar endpiece is responsible for formation of the primary saliva and secretes ions and water from the blood (Argenzio, 2013). The granules present in the acini and granular tubules (the latter especially in rodents) are the proteins for secretion -these include amylase and other proteins such as epidermal growth factor (Argenzio, 2013).

Process of saliva secretion

Salivary secretion takes place in two phases.

Phase 1

- Stimulation of parasympathetic nerves and release of acetyl choline
- Release of intracellular calcium ions
- Opening of chloride channels apically and potassium ions basolaterally
- Movement of chloride ions into lumen
- These ionic gradient pulls sodium ions into lumen via a paracellular pathway
- Change in osmotic pressure results in movement of water into lumen
- Myoepithelial cells contract and put mechanical pressure on acinar cells
- Also, exocytosis of cytoplasmic granuli-containing proteins into the acinar lumen requires Ca^{2+}-mediated degranulation upon β-adrenergic stimulation
- Isotonic plasma like fluid is secreted by acini into lumen

Phase 2

- Active reabsorption of sodium ions
- Passive reabsorption of chloride ions
- Active secretion of potassium ions (aldosterone-controlled K- H ion exchange)
- Active secretion of bicarbonate ions
- Thus, primary secretion is modified into hypotonic solution (Saliva)

Therefore, the composition of the secretion released by the cells of the acini is significantly different than that reaching the oral cavity. The reason for these changes is that the primary secretion more closely resembles the concentration of ions in extra cellular fluid and, if these were maintained in the secreted saliva, the organism could fall into a serious ionic unbalance during periods of copious salivation (Argenzio, 2013).

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The connection between local (salivary glands) and systemic (blood) sources makes saliva an important fluid to search for biomarkers of diseases or to study a physiological status in particular [Kaufman and Lamster, 2002].

The advantages of using saliva as a diagnostic fluid are that it is an easily accessible, non-invasive and relatively stress-free collection. Also the saliva collection is possible by people with only modest training as well as repeated collection of a large number of samples even at short-time intervals **is** possible**.** Steroid hormones can be analyzed in saliva, specifically their free fraction (as they are small lipophilic molecules, able to diffuse into saliva secretion).

Saliva/Oral Fluid Biomarkers	**Possibilities for Use**
DNA	Bacterial infection, Diagnosing carcinomas of the head &neck Forensics
RNA	• Influenza A (Kittawornrat et al., 2010) • PRSSV [Porcine Reproductive and Respiratory Syndrome Virus] (Detmer et al., 2011)
C reactive protein	Detecting inflammation (Gutierrez et al.,2009)
Bovine salivary protein 30 kDa'	Bloat (Clarke and Reid, 1974)
Progesterone	Detecting pregnancy (In sow, Moriyoshi et al.,1996)
Mucins/glycoproteins	Diagnosing carcinomas of the head& neck, Detecting dental caries
Immunoglobulins	Toxoplasmosis in sheep (Riou et al.,2021)
Viruses, bacteria	Epstein-Barr virus reactivation (mononucleosis), *Mycobacterium paratuberculosis, Lyssa* virus etc.
Sulphur level in saliva	Estimating sulphur status in cattle (Dermauw et al., 2012)

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But the challenges are many as the analytes in saliva are very variable and usually found in considerably lower concentrations. Some constituents are only present in plasma and not in saliva (or vice versa). There is lack of normal reference values of various analytes in saliva, due to the great variability of secretion, composition and flow of saliva (Quintana, Palicki et al. 2009, Thomas, Branscum et al. 2009).

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