SALIVARY ANALYTES

ESSAY

Submitted in Partial Fulfilment for the
M.Sc. Degree (Clinical Pathology)

By

Sahar Mohamed Helmy El Assal

M.B., B.Ch.

Under Supervision of

DR. HANZADA IBRAHIM ABDEL FATTAH

Assistant Professor of Clinical Pathology

Faculty of Medicine

Ain Shams University

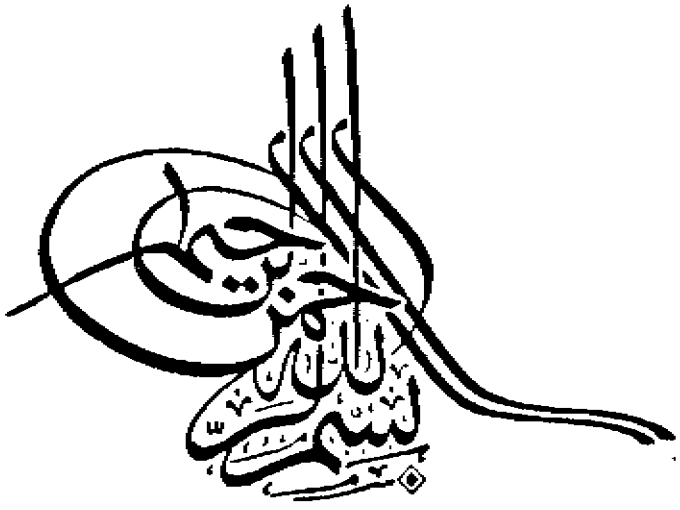
DR. OLA HAMDY DEMERDASH

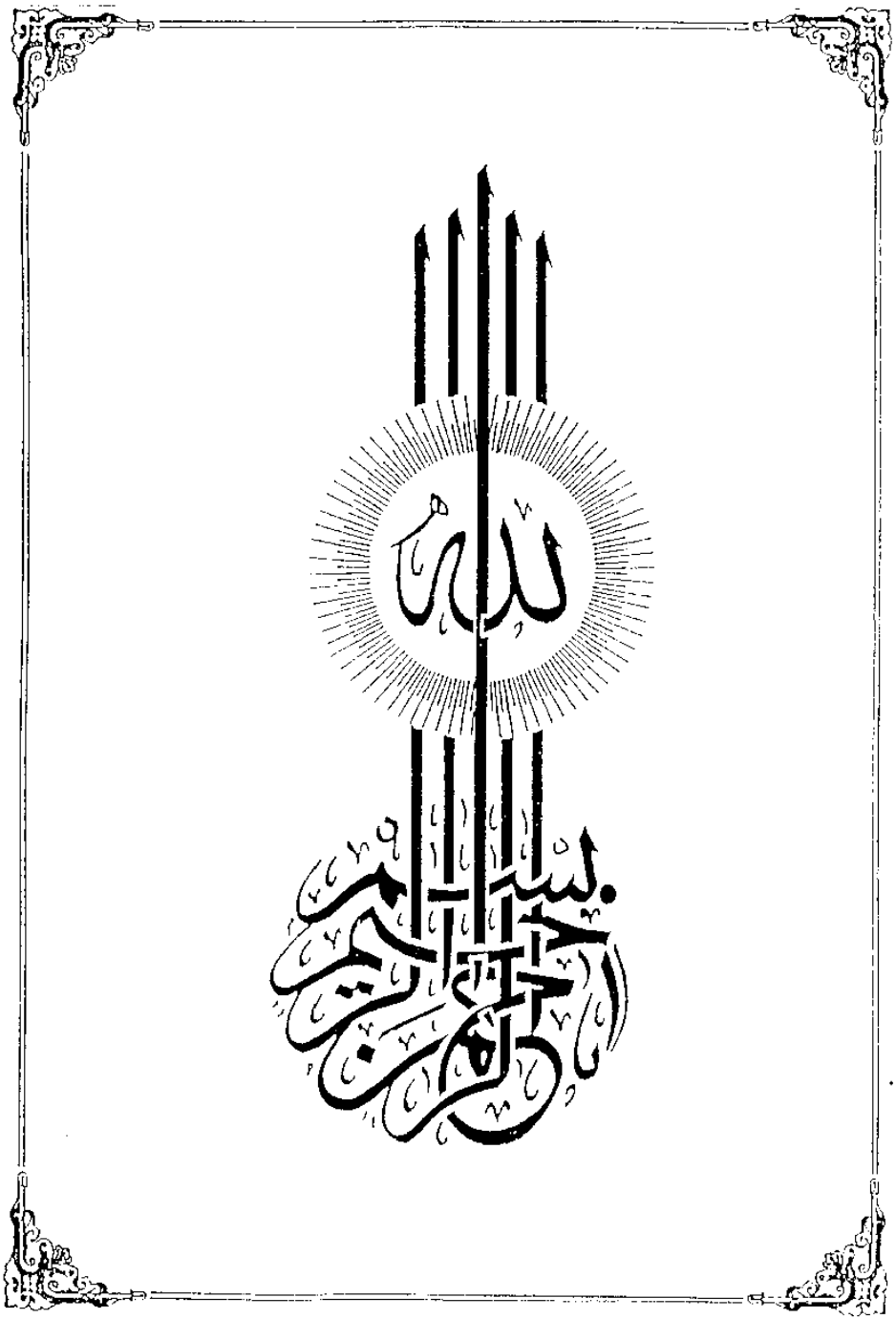
Lecturer of Clinical Pathology

Faculty of Medicine

Ain Shams University

1992





ACKNOWLEDGEMENT

I wish to express my deepest gratitude and sincere thanks to **Professor Dr. Hanzada Abdel Fattah**, Assistant Professor of Clinical Pathology, Faculty of Medicine, Ain Shams University for accepting the supervision of this work. This supervision gave me the invaluable opportunity to benefit from her constant help and faithful guidance.

I will always remember her unforgettable sincere encouragement and kindness.

I also wish to express my sincere gratitude and appreciation to **Dr. Ola Hamdy Demerdash**, Lecturer of Clinical Pathology, Faculty of Medicine, Ain Shams University for her continuous help, advice, encouragement and wise guidance throughout this work.

Finally, my deepest thanks to my family and my colleagues for their good help received in many ways.

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INTRODUCTION

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INTRODUCTION

The use of blood for diagnostic purposes can sometimes be limited instead of its diagnostic validity. Moreover, repeated blood sampling can lead to serious problems in newborns as well as in anaemic and hypovolaemic adults (Haeckel, 1990). On the other hand easy, stress-free, non invasive nature of saliva collection makes it one of the most accessible body fluids. Moreover, saliva is of potential value in studying normal human physiology as well as pathology (Vining et al., 1987).

In the field of endocrinology, the determination of different hormones in saliva provides useful information in the clinical study of various endocrine functions especially in pediatric patients, or in patients requiring frequent sampling (Evans et al., 1983). Also some analytes in saliva may have more significance than their corresponding serum levels, for example salivary testosterone which proved to be of greater diagnostic value in hirsutism than any of the currently used serum androgen assays (Osredkar et al., 1989).

Finally, salivary analysis facilitates short-term dynamic tests, pharmacokinetic analysis as therapeutic drug monitoring

in cases of chronic therapy and investigations of chronological changes (Patrick et al., 1990).

AIM OF WORK

The aim of this study is to review the composition, function and physiology of saliva as well as its potential value and possible role in the diagnosis of different disease states. The value of salivary assays in therapeutic drug monitoring will also be reviewed.

I. PHYSIOLOGY OF SALIVARY SECRETION

Saliva is secreted by three pairs of exocrine glands, the parotid, the submaxillary and the sublingual.

A. Composition of Saliva

About 1500 ml of saliva are secreted per day. The pH of Saliva is about 7.0. Water accounts for 99 percent of the secreted fluid. The remaining 1 percent consists of various salts as calcium and sodium etc., and few proteins.

The major protein of saliva is mucin which contains small amounts of carbohydrates attached to the amino acid side-chains of the protein. When mixed with water, mucin forms a highly viscous solution known as mucus, that lubricates the food. Another protein secreted by salivary glands is the enzyme α amylase = ptyalin, which catalizes the breakdown of polysaccharides into disaccharides (Vanter, 1975).

B. Physical Properties of Saliva

1. Osmolarity

The total osmotic pressure is always hypotonic in man, being at maximal secretory rates, about two thirds that of the plasma

value. Dehydration and repletion lead to corresponding changes in saliva osmolarity.

2. The pH

The pH of saliva secreted by unstimulated human parotid glands ranges from 5.45 to 6.06. On stimulation, the pH of parotid saliva rises by two pH units to a maximum of 7.8 after stimulation (Davenport, 1977).

C. Functions of Saliva

Saliva facilitates swallowing, keeps the mouth moist and serves as a solvent for the molecules that stimulate the taste buds. It also aids speech and keeps the mouth and teeth clean. The saliva may also have some antibacterial action (Miller, 1982).

D. Control of Salivary Secretion

Salivary secretion is under neural control. Stimulation of the parasympathetic nerve supply causes profuse secretion of watery saliva with a relatively low content of organic material. Atropine and other cholinergic blocking agents reduce salivary secretion. On the other hand, stimulation of the sympathetic

nerve supply causes vasoconstriction, and secretion of small amounts of saliva rich in organic constituents from the sub-maxillary glands. However, it has no effect on parotid secretion (Davenport, 1982).

The presence of food in the mouth causes reflex secretion of saliva, and so does stimulation of vagal afferent fibres at the gastric end of oesophagus. Moreover, salivary secretion is easily conditioned. The sight, smell, and even thought of food causes salivary secretion (Davenport, 1982).

Like the thyroid gland, the salivary glands concentrate iodide from the plasma, the salivary/plasma iodide ratio sometimes reaching 60. The physiological significance of this iodide - trapping phenomenon is uncertain.

The salivary glands have also been reported to contain somatostatin, glucagon, and various growth factors. The functions of most of these factors in the salivary glands are unknown, but it has been suggested that glucagon secreted from the salivary glands contributes to the hyperglycaemia in pancreatectomised animals (Davenport, 1978).

E. Causes of Decreased Salivation

Dryness of the mouth from decreased salivation is a familiar transient feature in fear, but it may be more persistent in mouth breathers from nasal obstruction. It may also result from diseases of the salivary glands, for example, Mumps, Sjögren's disease and salivary calculi. Dry mouth is usual in the states of dehydration, causing thirst. In acute illness, such dryness may be a useful indication of the necessity for fluids (Ogilvie, 1936).

F. Causes of Increased Salivation

This occurs in irritant lesions of the buccal mucosa, for example in stomatitis, teething in infants, in Parkinsonism and as an accompaniment of nausea. Salivation is often a distressing symptom of oesophageal obstruction because the normal secretion cannot be swallowed (Ogilvie, 1936).

G. Collection of Saliva

Saliva is an easy fluid to collect. Most subjects can produce sufficient saliva on demand. Stimulation using citric acid crystals or chewing on inert objects is occasionally required to induce a satisfactory flow.

A number of simple precautions are needed when collecting saliva. Ideally, tooth brushing should be avoided and the mouth should be rinsed well with water for 5 minutes before collection. Contamination with gingival blood may give rise to falsely elevated salivary steroid concentration as well as increased concentration of other analytes that are highly bound to proteins. Hence, the method is not suitable if the patient has gum or other mouth diseases. One further pitfall is exogenous steroid in the form of therapy, which can be present in the mouth in high concentration that is sufficient to cross react in the assay. Salivary samples should be collected before the use of any stercidal therapy (Addisson, 1987).

The high viscosity,and food particles, can cause discomfort for the patient during collection and are also a source of interference during processing (Schramm et al., 1991) Addisson (1987) reported that saliva should be centrifuged to remove debris. The high viscosity of saliva can be reduced considerably by freezing and thawing, thereby facilitating pipetting. Attempts to facilitate saliva collection by chewing on parafilm or by collection into cotton plugs can lead to high non specific binding of analytes to be measured (Taylor et al., 1978).