Saliva as a Diagnostic Fluid

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Overview of Lecture

- Applications of Sialochemistry
- Collection of Saliva
- Examples of Clinical Conditions
- Gingival Crevicular Fluid (GCF)
Historical Background: Diagnostic Testing

- Rice Test (anxiety=dry mouth=guilt)
Saliva as a Mirror of the Body

- Tissue fluid levels of natural substances, as well as molecules introduced for therapeutic, dependency or recreational purposes
- Emotional status
- Hormonal status
- Immunological status
- Neurological status
- Nutritional and metabolic influences
Applications of Sialochemistry

- Diseases of the salivary glands
- Systemic diseases where salivary glands are involved
- Clinical situations in which salivary flow and chemistry are helpful in diagnosis or monitoring patient progress
Local Diseases

- Obstructive- neoplastic, mucus plugs, stones
- Inflammatory- acute viral or bacterial, chronic recurrent bacterial, allergic
- Irradiation
- Functional hyper- or hypoactivity
Systemic Diseases

- Sjögren’s syndrome - lymphoepithelial lesions
- Sarcoidosis
- Cystic fibrosis
- Hormonal dysfunction - diabetes, pancreatitis, adrenal-cortex disease, thyroid disease, acromegaly, menopause
- Hypertension
- Obesity and hyperlipidemia
- Alcoholic cirrhosis
- Malnutrition
- Neurologic diseases - Parkinson’s disease, Bell’s and cerebral
- Psychogenic diseases
Clinical Situations Affecting Salivary Secretions

- Digitalis toxicity
- Drug monitoring
- Environmental pollutants
- Ovulation
- Immunodeficiency
- Pharmacologic agents
  - “Dry mouth” side effects, drugs with parasympathetic, sympathetic and ganglionic blocking effects
  - Direct effects- hypersensitivity or idiosyncratic reaction
Methods of Collection of Saliva

- Whole Saliva
- Catheterization
- Parotid Saliva
- Submandibular (Submaxillary) Saliva
Limitations in Use of Whole Saliva

- An admixture of parotid, submandibular and minor gland secretions mixed with food debris, bacteria, shed cells, leukocytes and other particulate matter.
- Compositional studies are affected by proportions of secretions from different glands, as well as chemistry of non-salivary elements.
- In studies examining non-salivary components, must take care to exclude GCF, especially where inflammation is present.
Standardization of Collection

- Resting secretions
  - Need an accommodation period of at least 5 minutes.
    (Influence of collection procedure as stimulus)

- Stimulated saliva
  - Consistent gustatory stimulant throughout the study

- Flow rate
  - Timed, focus on specific gland

- Time of day
  - Circadian rhythm, time of collection is important
Salivary Studies in Cystic Fibrosis (CF)

- CF gene cloned in 1991
- The gene product is a cyclic AMP-regulated chloride ion channel named CFTR
- Cystic Fibrosis Transmembrane Conductance Regulator
- Most investigators felt that chloride and water secretion was the unifying key to explain the abnormalities and consequences of CF.
- A disease of all exocrine glands.
Sialochemistry Studies of CF

- Marked increase in calcium, proteins and phosphate, most evident in submandiular glands
- Turbidity of the submandibular saliva probably due to precipitation of calcium-binding proteins
- Too much overlap in calcium levels between CF and asthmatics to serve as screening test
- Flow rate of saliva from labial salivary glands virtually absent in 90% of CF children, probably due to turbidity and blockage of duct
Diagnostic Aids in Clinical Situations

- Digitalis toxicity (calcium and potassium)
- Affective disorders (prostaglandins)
- Immunodifficiency (sIgA)
- Stomatitis in chemotherapy (albumin)
- Cigarette usage (cotinine)
- Gastric cancer (nitrates and nitrites)
- Forensic medicine (blood group substance)
- Celiac disease (anti-IgA gliadin)
- Liver function (caffeine clearance)
Drug and Hormone Monitoring

- Psychiatrists studying methadone: advantages using saliva
  - humanitarian - less discomfort
  - clinical - patient acceptance of repeated testing
  - children and patients with limiting coping abilities
  - economic (do it yourself tests)

- HIV therapy
- Epilepsy
Salivary Antibodies and Antigens

- Advantages in large scale studies
- Viral Screening
- Antibody Screening
  - rubella
  - hepatitis A and B
Gingival Crevicular Fluid (GCF)

- (E) Cervical enamel
- (OSE) Oral sulcular epithelium
- (JE) Junctional epithelium
- (OE) Keratinized oral epithelium
Collection of GCF

- Static fluid
- Timed crevicular fluid flow
GCF Flow and Inflammation
GCF Flow and Probing Depth
GCF Flow and Menstrual Cycle

- GCF flow highest at ovulation
GCF and Tetracycline Levels

Maximum GCF
Minimum GCF
Blood by finger puncture
Conclusions

- Sialochemistry provides important information in a variety of clinical and disease states
- Greater acceptance by patients
- Non-invasive in most cases