

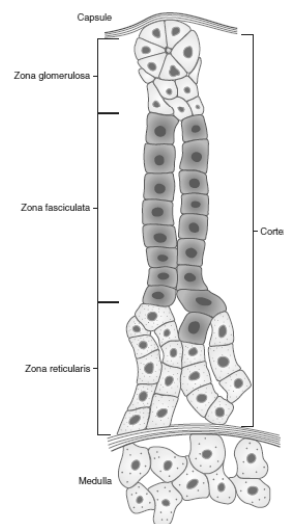
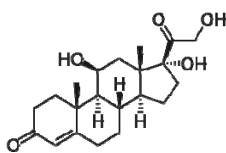
# Salivary Cortisol

## (Clinical Value and Laboratory Considerations)

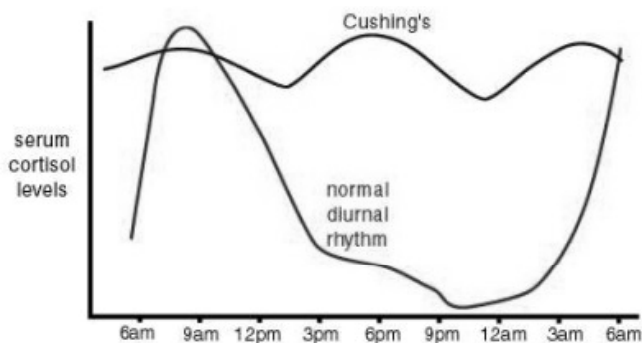
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Biotechnology Department, Iranian Research Organization for Science & Technology (IROST)

## Cortisol

- Formula :  $C_{21}H_{30}O_5$
- Molar mass: 362.460 g/mol
- Adrenal Cortex: Zona Fasciculata
- Synthesis and production are increased under the stimulation of pituitary AdrenoCorticoTropic Hormone (ACTH)
- In response to stress and / or hypoglycemia.



## Cortisol (Diurnal Rhythm)



<http://www.endocrinesurgery.net.au/cushings-diagnosis/>

**TABLE 15-14**

### Tests Used in the Diagnosis and Differential Diagnosis of Cushing Syndrome

#### Diagnosis—Does the Patient Have Cushing Syndrome?

Late night salivary cortisol/circadian rhythm of plasma cortisol  
Urinary free cortisol excretion\*  
Low-dose dexamethasone suppression test\*

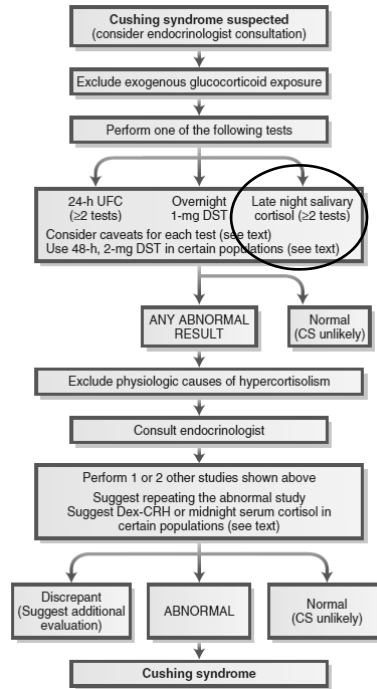
#### Differential Diagnosis—What Is the Cause of the Cushing Syndrome?

Plasma ACTH  
Plasma potassium, bicarbonate  
High-dose dexamethasone suppression test  
Corticotropin-releasing hormone  
Inferior petrosal sinus sampling  
CT, MRI scanning of pituitary, adrenals  
Scintigraphy  
Tumor markers

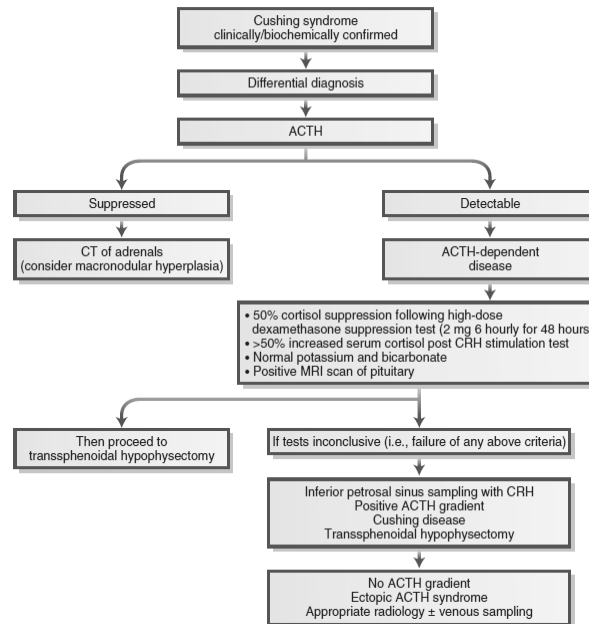
\*Valuable outpatient screening tests (see text discussion).  
ACTH, adrenocorticotropic hormone; CT, computed tomography; MRI, magnetic resonance imaging.

William's Text Book of Endocrinology, 2016

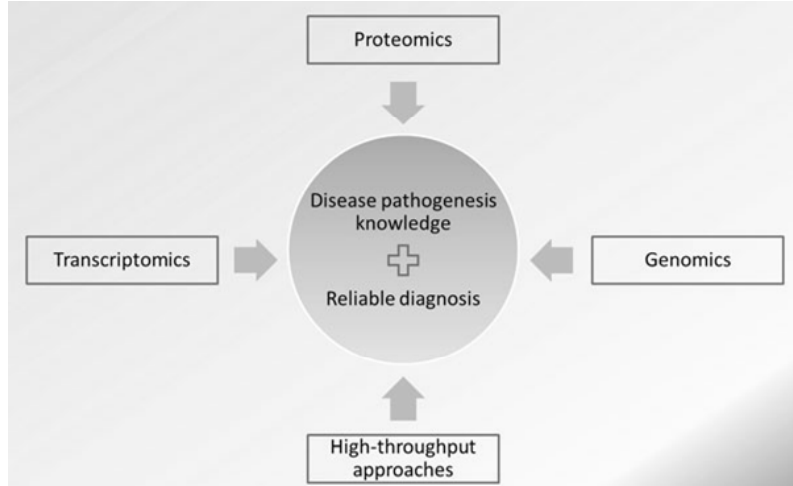
## Hypocortisolism (Screening)



## Cushing (Confirmation)

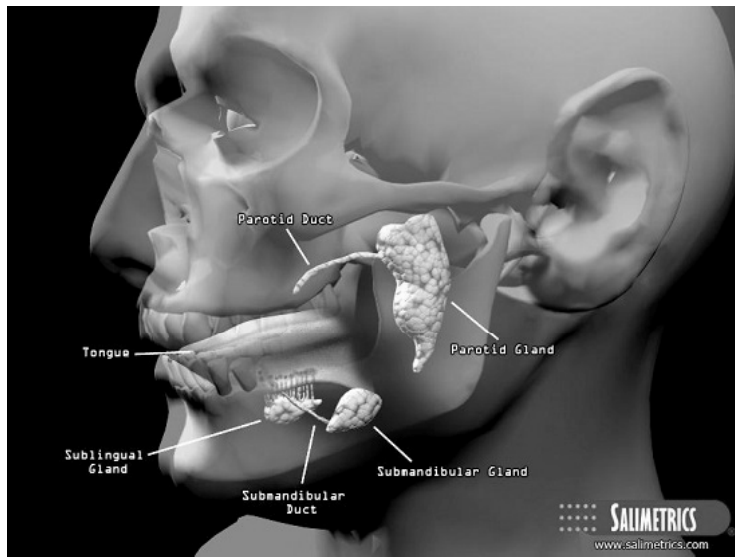


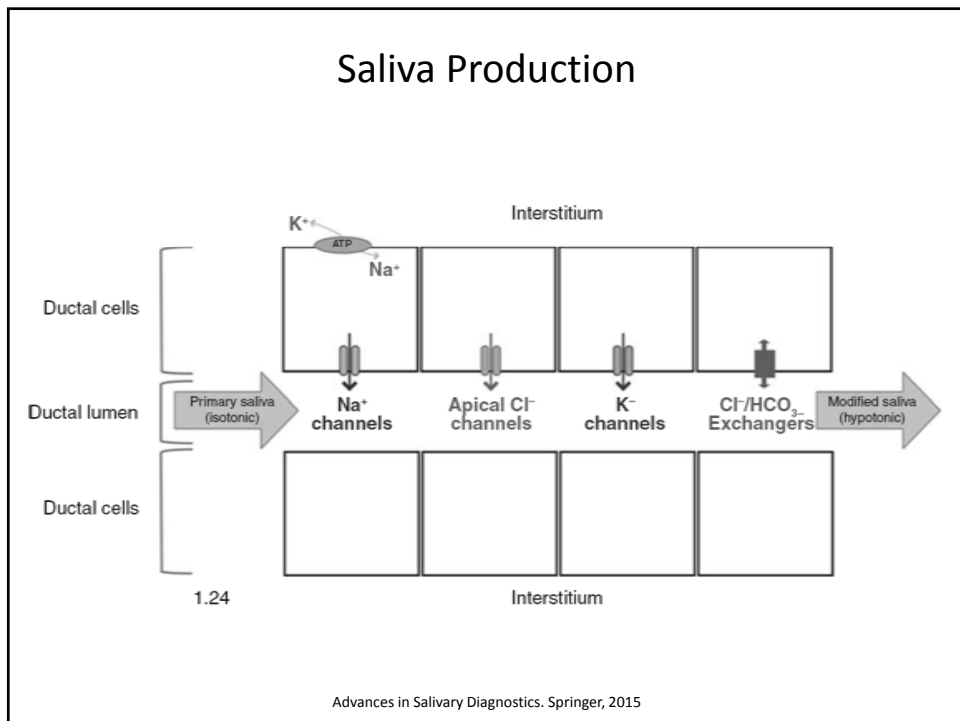
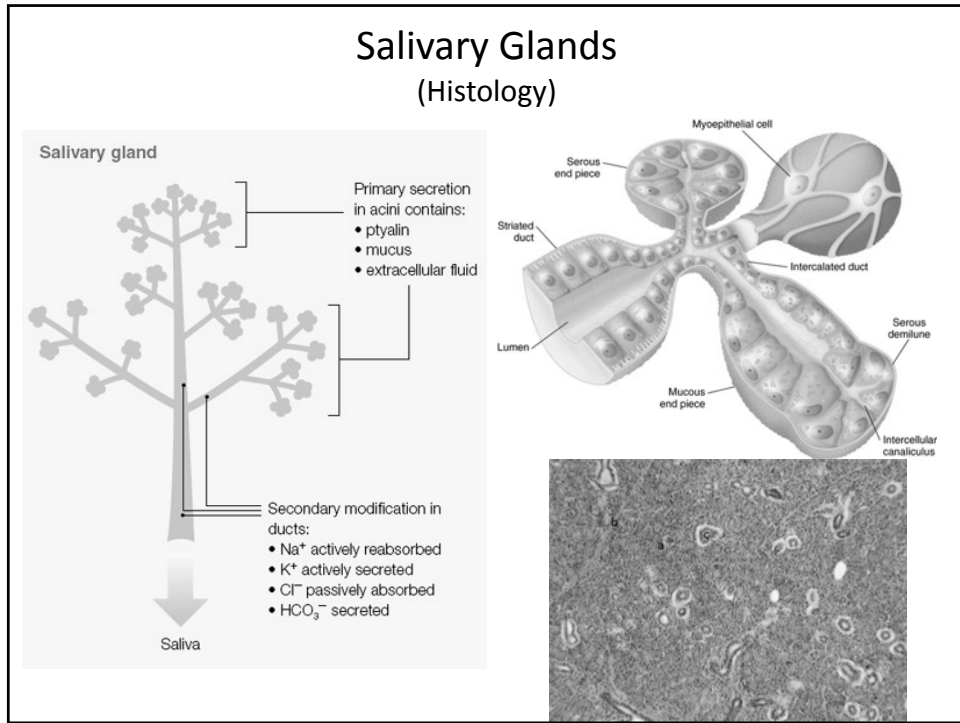
## Future Saliva Diagnostics

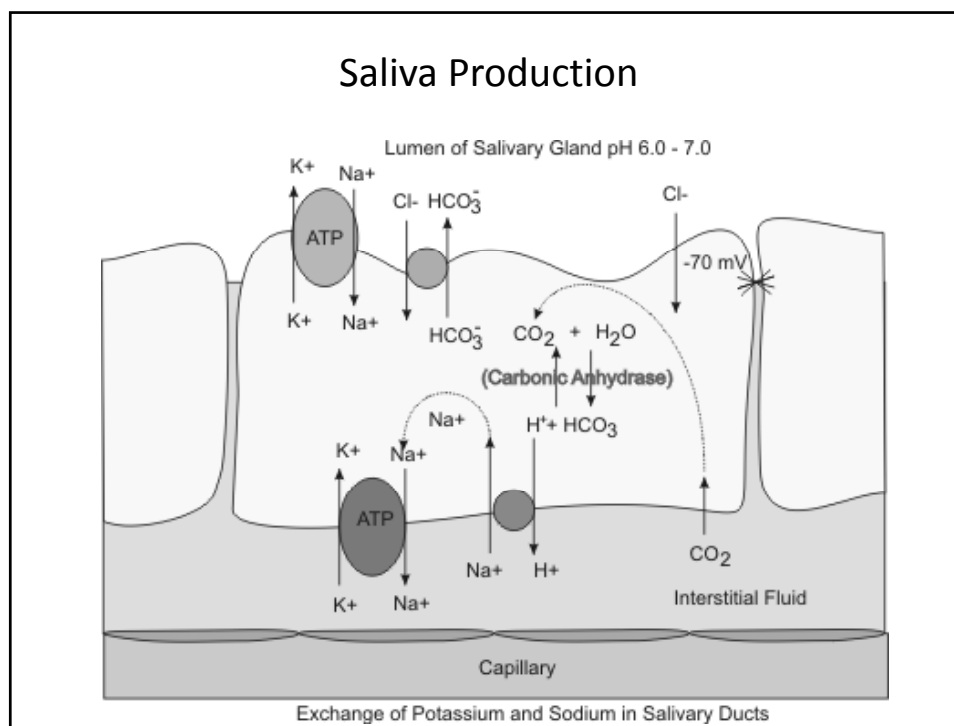


Advances in Salivary Diagnostics. Springer, 2015

## Salivary Glands (Anatomy)







## Saliva Composition

Composition of saliva	
Proteins:	Albumin; amylase; β(beta)-glucuronidase, carbohydrates;
Enzymes	cystatins; epidermal growth factor;
Glycoprotein	esterases; fibronectin; gustin;
Peptides	histatins; immunoglobulin A, G, and M; kallikrein; lactate dehydrogenase; lactoferrin; lipase; lysozyme; mucins; nerve growth factor; parotid aggregins; peptidases; phosphatases, proline-rich proteins; ribonucleases; salivary peroxidases; secretory component; secretory IgA; serum proteins; tyrosine-rich proteins; vitamin-binding proteins
Small organic molecules	Creatinine, glucose, lipids, nitrogen, sialic acid, urea, uric acid
Electrolytes	Ammonia, bicarbonate, calcium, chloride, fluoride, iodide, magnesium, phosphates, potassium, nonspecific buffers, sodium, sulfates, thiocyanate

Advances in Salivary Diagnostics. Springer, 2015

## Saliva Functions

Function: protective	Salivary components involved
Lubrication	Water, mucins, proline-rich glycoproteins coat surfaces of oral mucosa, throat, and food
Antibacterial, antifungal, antiviral	Salivary proteins (e.g., lysozyme, lactoferrin, lactoperoxidase, mucins): histatins, cystatins, secretory IgA, proline-rich glycoproteins
Mucosal integrity	Mucins, electrolytes, water
Lavage, cleansing	Water
Buffering capacity	Bicarbonate and phosphate, proteins
Remineralization	Calcium, phosphate, proline-rich glycoproteins

Advances in Salivary Diagnostics. Springer, 2015

## Saliva Functions

	Salivary components involved
<i>Function: food related</i>	
Preparation for digestion	Water, mucins, proline-rich glycoproteins
Digestion	Amylase, ribonuclease, lipase
Mucosal integrity	Mucins, electrolytes, water
Taste	Water, gustin (zinc-binding salivary protein)
<i>Function: communication</i>	
Speech	Water, mucins

Advances in Salivary Diagnostics. Springer, 2015

## Why Saliva?

- Generally
  - Ease of collection
  - Safety
  - Non-invasiveness
  - Affordability
  - Accuracy
- Cortisol Testing
  - No stress of a needle puncture to raise cortisol levels
  - Hospitalization Not Required
  - Absence of CBG: Eliminates the need to account for within-subject changes or between-subject differences in CBG

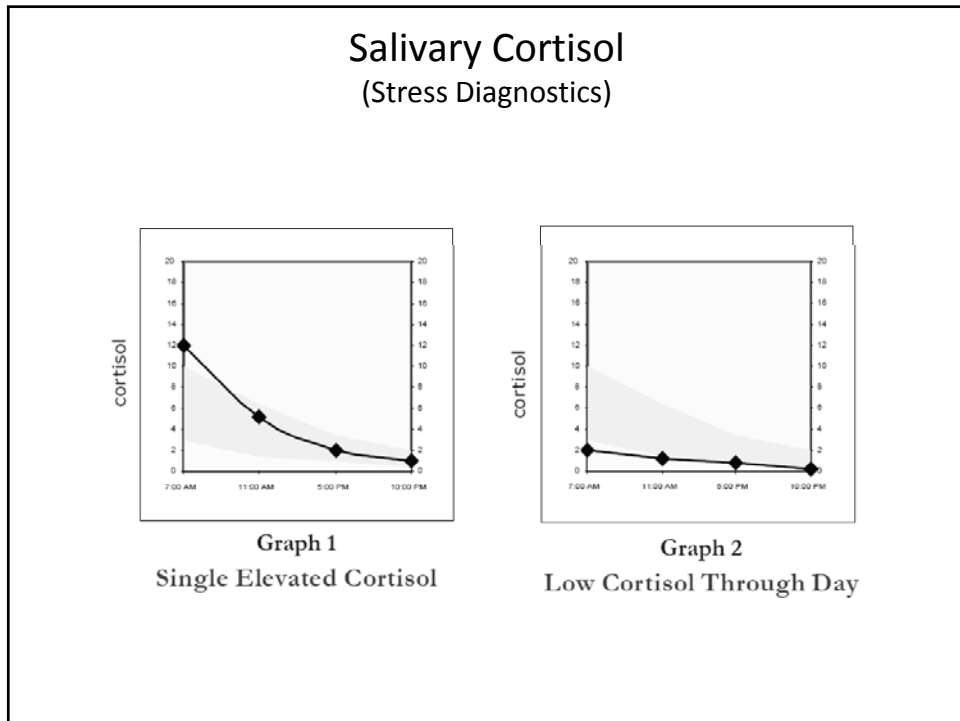
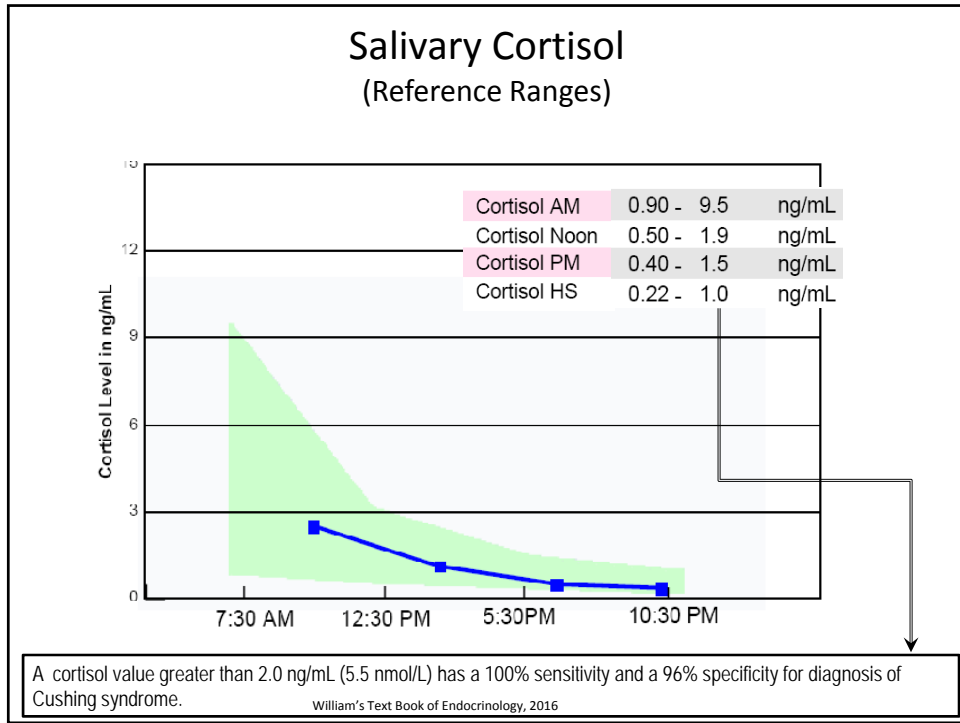
## Salivary Cortisol (Indications)

1. Cushing
2. Stress Monitoring
3. Adrenal insufficiency (+ACTH), in Low CBG
4. Monitoring glucocorticoid treatment of patients with congenital adrenal hyperplasia
5. Monitoring hydrocortisone replacement therapy

- Pregnant women need their own reference ranges for saliva, due to high total and free cortisol levels.
- Age-dependent Variations
- Comorbid Variations: Diabetes, Hypertention

U. Turpeinen, E. Hämäläinen / Best Practice & Research Clinical Endocrinology & Metabolism 27 (2013) 795–801





## Saliva Collection

- Salivette® Cotton Swab without Prep 100/bag
- Unit Price: \$105.00



- Eating, smoking and brushing of the teeth should be avoided 2 h before collection of saliva
- The mouth should be rinsed with water 10–15 min before sampling
- No oral diseases such as bleeding gingivitis
- No conditions with decreased salivary excretion, such as Sjögren's syndrome

## Serum Cortisol (Lab Considerations)

- Sample: Serum
- Preferred Storage:
  - Refrigerated (7 days)\*
  - Frozen (7 days)
- Reject Due To
  - Hemolysis: Mild OK; Gross reject
  - Lipemia: Mild OK; Gross OK
  - Icterus:
- Procedure:
  - ARUP Laboratories: Quantitative Chemiluminescent Immunoassay
  - Mayo Clinic Lab: Immunoenzymatic Assay (Beckman , Access )

## Salivary Cortisol (Lab Considerations)

- Sample: Saliva
- Preferred Storage:
  - Refrigerated (7 days)\*
  - Frozen (60 days)
  - Ambient (7 days)
- Reject Due To
  - Hemolysis: NA
  - Lipemia: NA
  - Icterus: NA
- Procedure:
  - ARUP Laboratories: Quantitative Enzyme Immunoassay
  - Mayo Clinic Lab: Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS)

## Analytical methods

- Immuno Assays
  - Radio Immuno Assays (RIA)
  - Enzyme Immuno Assays (EIA),
  - Luminescence & Fluorescence Assays
- HPLC or LC Tandem Mass Spectrometric assays (LC-MS/MS)

	Detection Limit (nmol/L)	Upper Limit (nmol/L)
Immuno Assays	0.4 – 5.8	3.6 – 15.2
LC-MS	0.07 - 011	2.7 – 3.0

Thank You for Your Attention



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