Adrenal insufficiency

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Physiology of adrenal gland

- Outer cortex
- Inner medulla

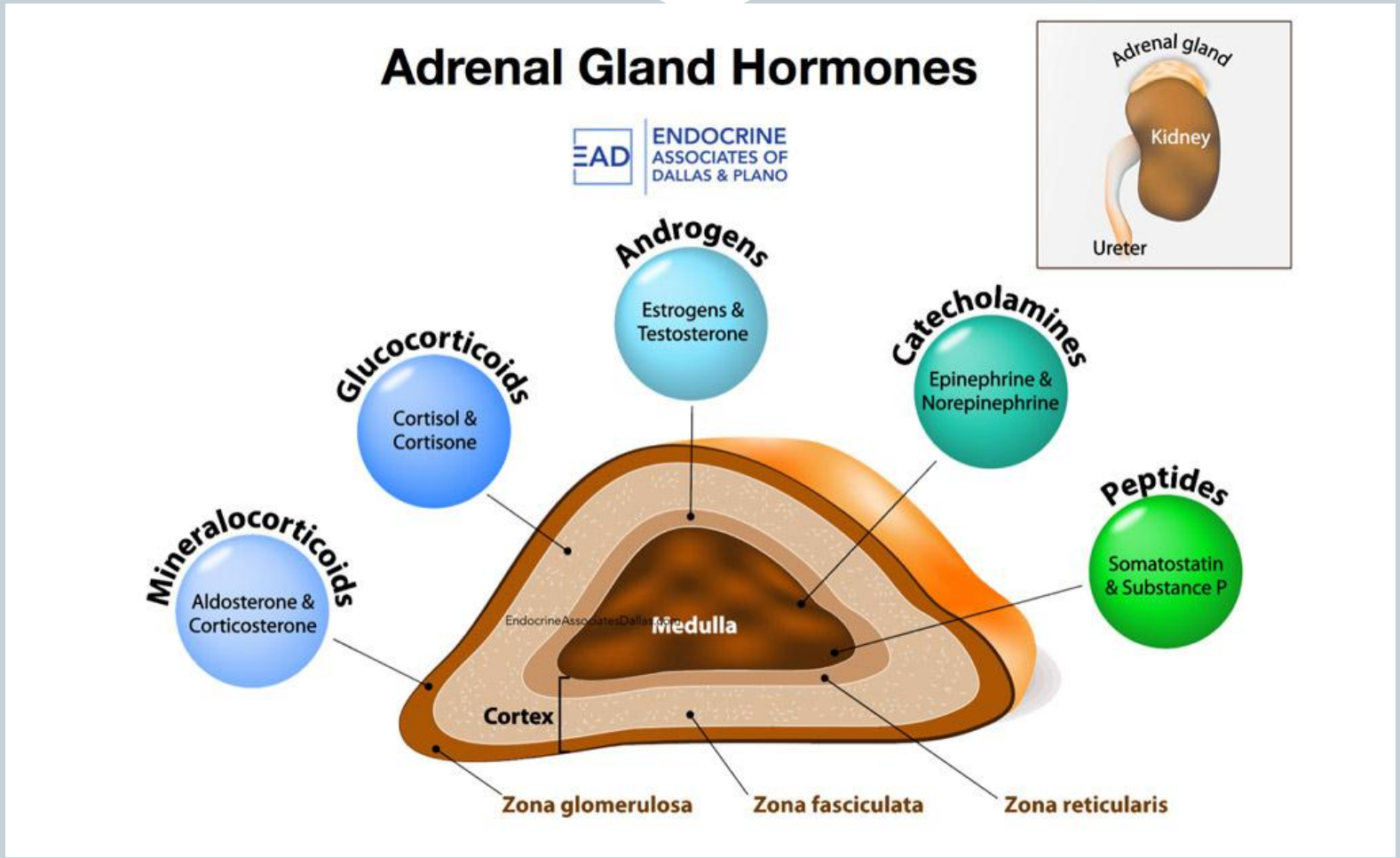
- CRH stimulates the release of ACTH
- ACTH governs the synthesis and release of cortisol and adrenal androgens

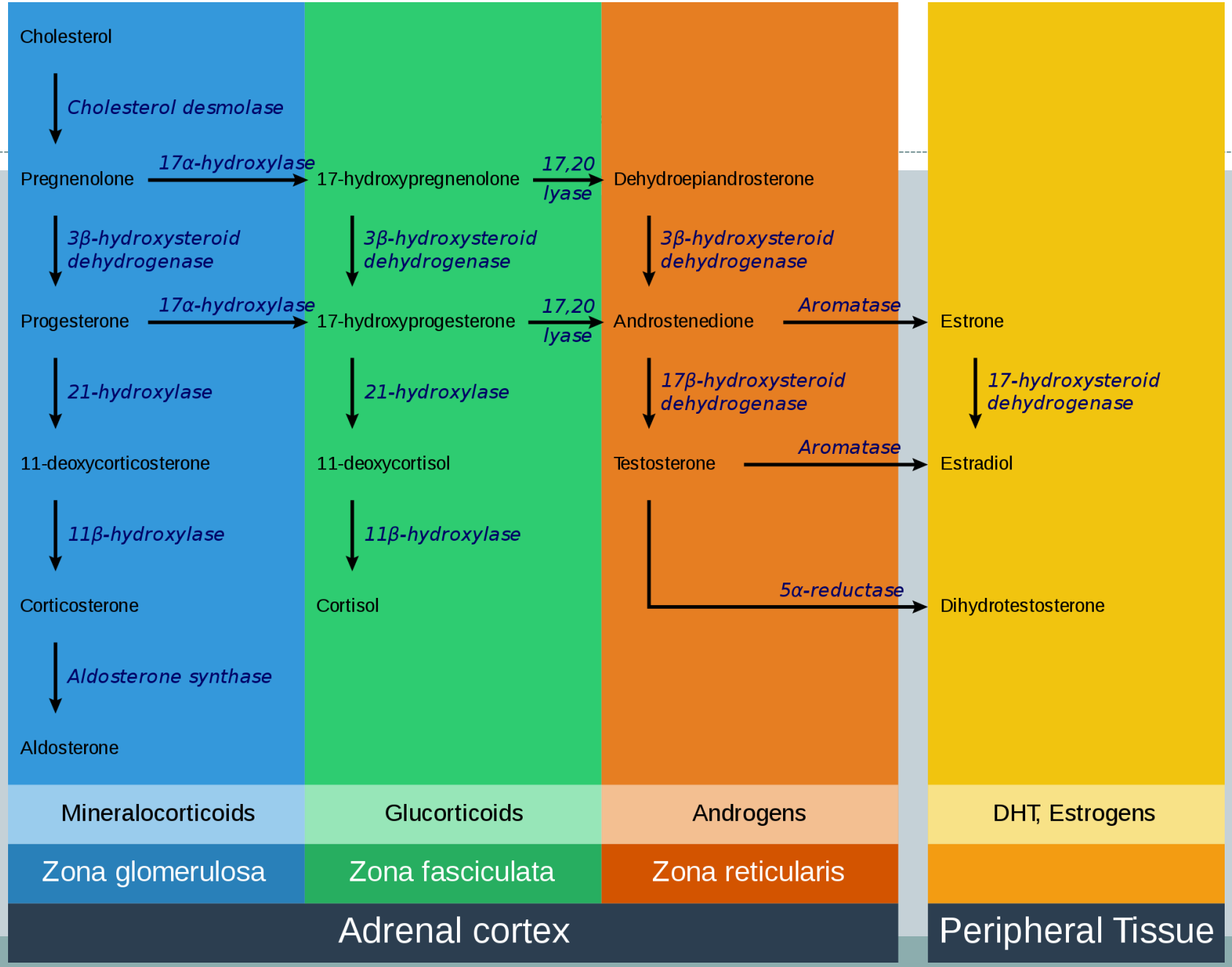
- Endogenous (or exogenous) glucocorticoids feedback to inhibit ACTH and CRH secretion.

- The renin-angiotensin system and potassium regulate aldosterone secretion

- Normal variation of serum cortisol and ACTH levels leads to values that are high early in the morning and lower at night.

- This normal diurnal variation may take months to years to fully develop in neonates.


Adrenal Gland Hormones
ENDOCRINE ASSOCIATES OF DALLAS & PLANO
Adrenal gland
Kidney
Ureter
Androgens
Estrogens & Testosterone
Glucocorticoids
Cortisol & Cortisone
Catecholamines
Epinephrine & Norepinephrine
Mineralocorticoids
Aldosterone & Corticosterone
Peptides
Somatostatin & Substance P
Medulla
Cortex
Zona glomerulosa
Zona fasciculata
Zona reticularis


Cholesterol
Cholesterol desmolase
Pregnenolone
17α-hydroxylase
17-hydroxypregnenolone
17,20 lyase
Dehydroepiandrosterone
3β-hydroxysteroid dehydrogenase
3β-hydroxysteroid dehydrogenase
3β-hydroxysteroid dehydrogenase
Progesterone
17α-hydroxylase
17-hydroxyprogesterone
17,20 lyase
Androstenedione
Aromatase
Estrone
21-hydroxylase
21-hydroxylase
17β-hydroxysteroid dehydrogenase
17-hydroxysteroid dehydrogenase
11-deoxycorticosterone
11-deoxycortisol
Testosterone
Aromatase
Estradiol
11β-hydroxylase
11β-hydroxylase
5α-reductase
Corticosterone
Cortisol
Dihydrotestosterone
Aldosterone synthase
Aldosterone
Mineralocorticoids
Glucorticoids
Androgens
DHT, Estrogens
Zona glomerulosa
Zona fasciculata
Zona reticularis
Adrenal cortex
Peripheral Tissue

Classification of adrenal insufficiency

- primary adrenal insufficiency

- Congenital or acquired lesions of the adrenal cortex
- Acquired primary adrenal insufficiency is termed Addison disease .

- Secondary adrenal insufficiency; the term tertiary adrenal insufficiency is sometimes used to denote cases arising from hypothalamic dysfunction
- Hyperpigmentation
- Hyperkalemia, Hyponatremia

Primary adrenal insufficiency

- Most frequently caused by genetic conditions that are often but not always manifested in infancy

- Acquired problems such as autoimmune conditions

Inherited Etiologies

- Inborn Defects of Steroidogenesis

The most common causes of adrenocortical insufficiency in infancy are the salt-losing forms of congenital adrenal hyperplasia

75% of infants with 21-hydroxylase deficiency

lipoid adrenal hyperplasia

3βhydroxysteroid dehydrogenase deficiency

Manifest salt-losing symptoms in the newborn period

Inherited Etiologies

- Adrenal Hypoplasia Congenita
- Adrenoleukodystrophy
- Familial Glucocorticoid Deficiency
- Corticosteroid-Binding Globulin Deficiency

Acquired adrenal insufficiency

- Autoimmune Addison disease
- sporadically
- Type I autoimmune polyendocrinopathy syndrome (APS-1) autosomal recessive manner
- APS-2 has complex inheritance .

Acquired Etiologies

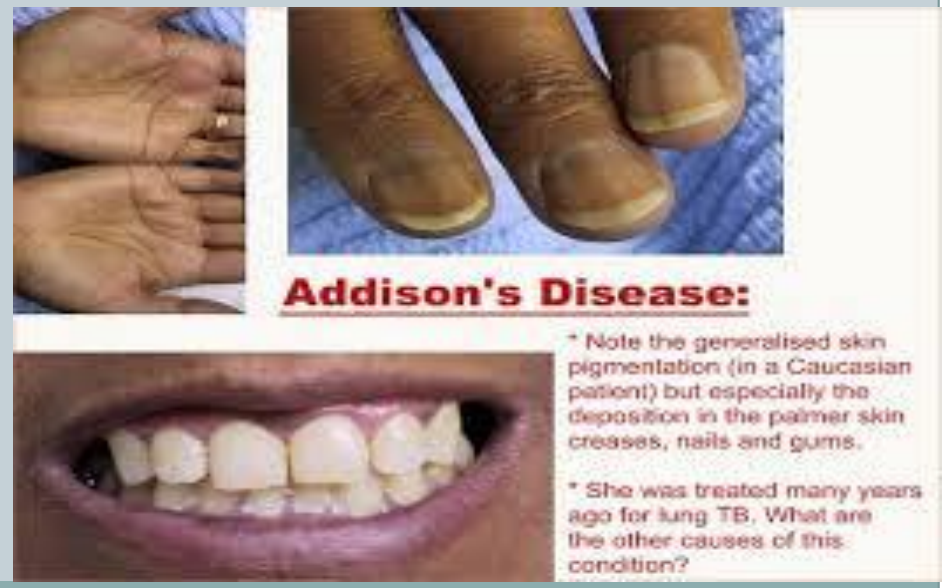
- Infection
- Hemorrhage Into Adrenal Glands
- Drugs

Secondary adrenal insufficiency

- Congenital (isolated, MPHD)
- Acquired (exogenous glucocorticoids) , trauma, tumor. Infiltrative dis, surgery

Clinical Manifestations

- Primary adrenal insufficiency leads to cortisol and often aldosterone deficiency.
- The signs and symptoms of adrenal insufficiency, age and etiology



	PATHOPHYSIOLOGIC MECHANISM	(%)*
SYMPTOMS		
Fatigue	Glucocorticoid deficiency	90
Anorexia, weight loss	Glucocorticoid deficiency	90
Nausea, vomiting	Glucocorticoid deficiency, mineralocorticoid deficiency	90
Salt craving (primary adrenal insufficiency only)	Mineralocorticoid deficiency	20
Myalgia or joint pain	Glucocorticoid deficiency	
SIGNS		
Low blood pressure, orthostatic hypotension	Mineralocorticoid deficiency, glucocorticoid deficiency	70–100
Skin or mucosal hyperpigmentation (primary adrenal insufficiency only)	Excess of proopiomelanocortin-derived peptides	70
LABORATORY FINDINGS		
Hyponatremia	Mineralocorticoid deficiency, glucocorticoid deficiency (leading to decreased free water excretion)	90
Hyperkalemia (primary adrenal insufficiency only)	Mineralocorticoid deficiency	50
Hypoglycemia	Glucocorticoid deficiency	30
Ketosis	Glucocorticoid deficiency	30
Low random cortisol level	Glucocorticoid deficiency	80
Eosinophilia, lymphocytosis	Glucocorticoid deficiency	
High ACTH level (primary adrenal insufficiency only)	Glucocorticoid deficiency	100
High plasma renin activity (primary adrenal insufficiency only)	Mineralocorticoid deficiency	100

Diagnosis

- Cortisol, ACTH, Renin ,Aldosterone

- ACTH Stimulation test
- Specific etiology (CAH, ……..)

Treatment of adrenal insufficiency

- Adrenal crisis
- IV fluid, D/S , 1.5 maintenance
- Hydrocortisone (10, 25, 50, 100) mg stat then divided Q6h
- Tapering gradually (10-15 mg/m2)
- fludrocortisone

F/U of treatment

- Weight
- Height
- Lab w/u (ACTH, 17OHP,….)
- Renin activity
- BP
- Stress management


Thank You for
Your Attention