Adrenal Disorders for the USMLE, Step One:

Abnormalities of the Fasciculata: Hypercortisolism

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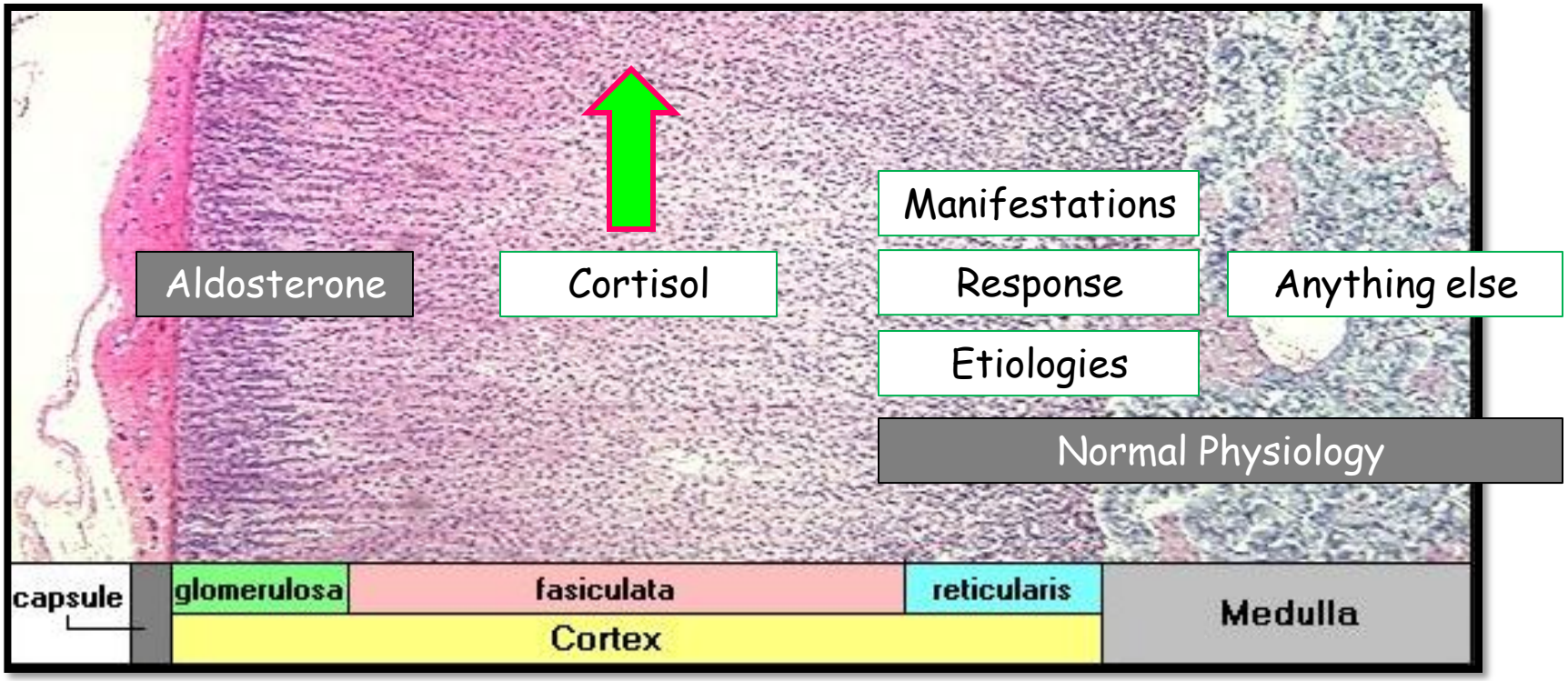
Patients Course, 2017
Associate Professor of Clinical Medicine
UMass Medical School

The Official Winter Storm of the Class of 2019


Aldosterone
Cortisol
Manifestations
Response
Etiologies
Anything else
Normal Physiology
capsule
glomerulosa
fasiculata
reticularis
Cortex
Medulla

Manifestions: Hypercortisolism

- Cardiovascular
  - Permissive effects with NE; upregulates α-1 receptors
- Renal
  - Mineralocorticoid-like properties
    - HTN, ↓ K, ↑ HCO3
- Endo
  - Hyperglycemia
- MSK
  - Appearance: Facies/hump/striae
  - Osteoporosis: ↓ osteoblast/↑ osteoclast
  - Avascular necrosis
  - Myopathy
- Heme
  - Leukocytosis
- <u>Cause-specific</u>
  - ↑ ACTH: hirsutism, pigmentation

Upregulates α1-receptors
Permissive fx w/ NE

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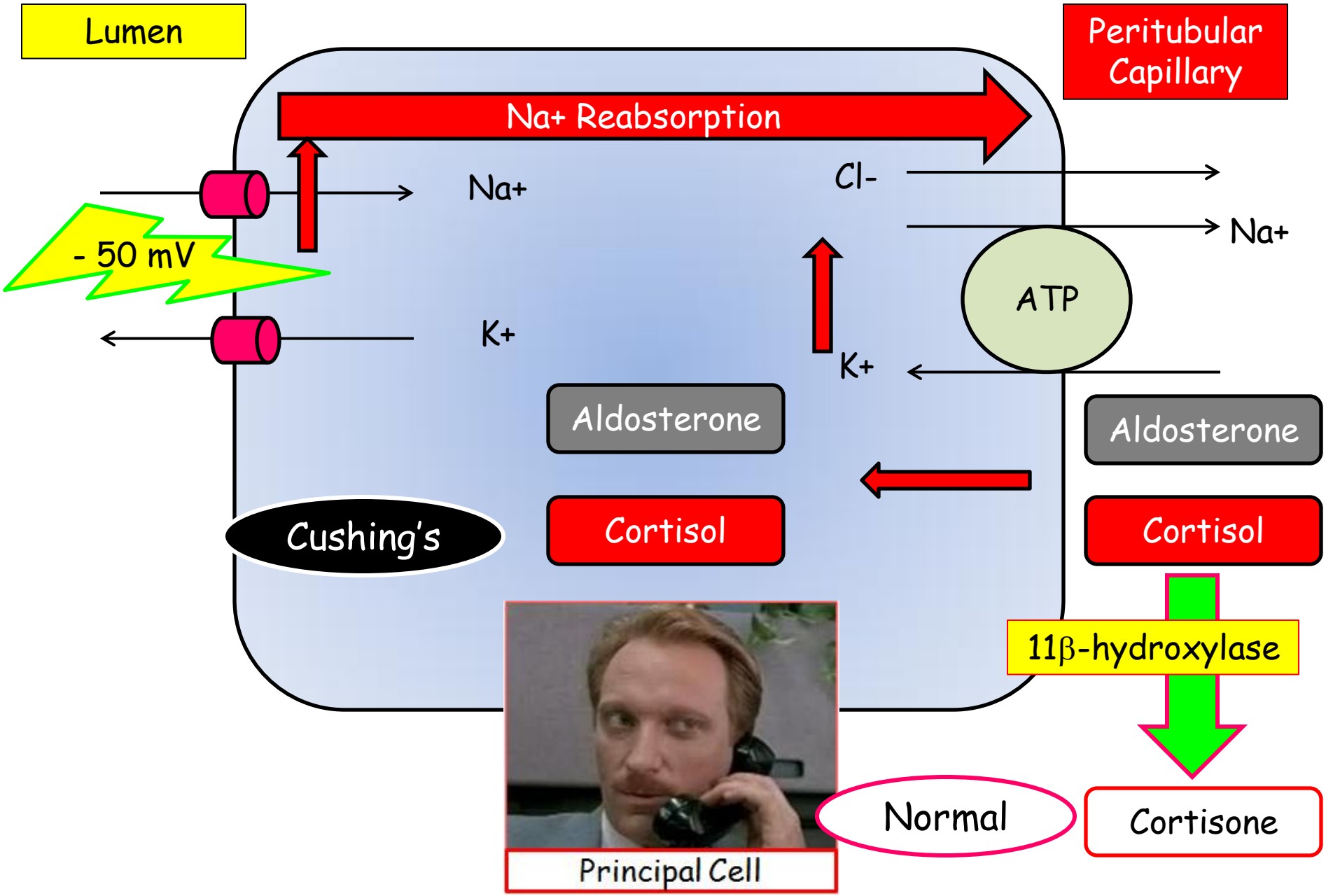
Permissive fx w/ NE

Collecting Tubules



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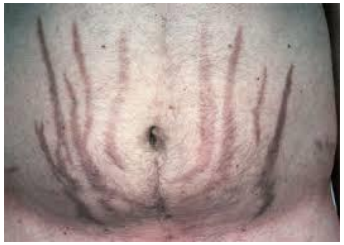
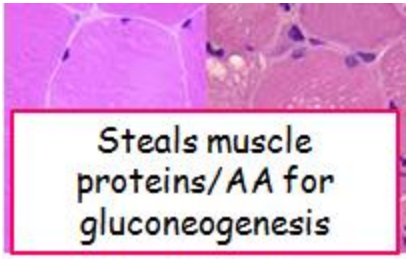
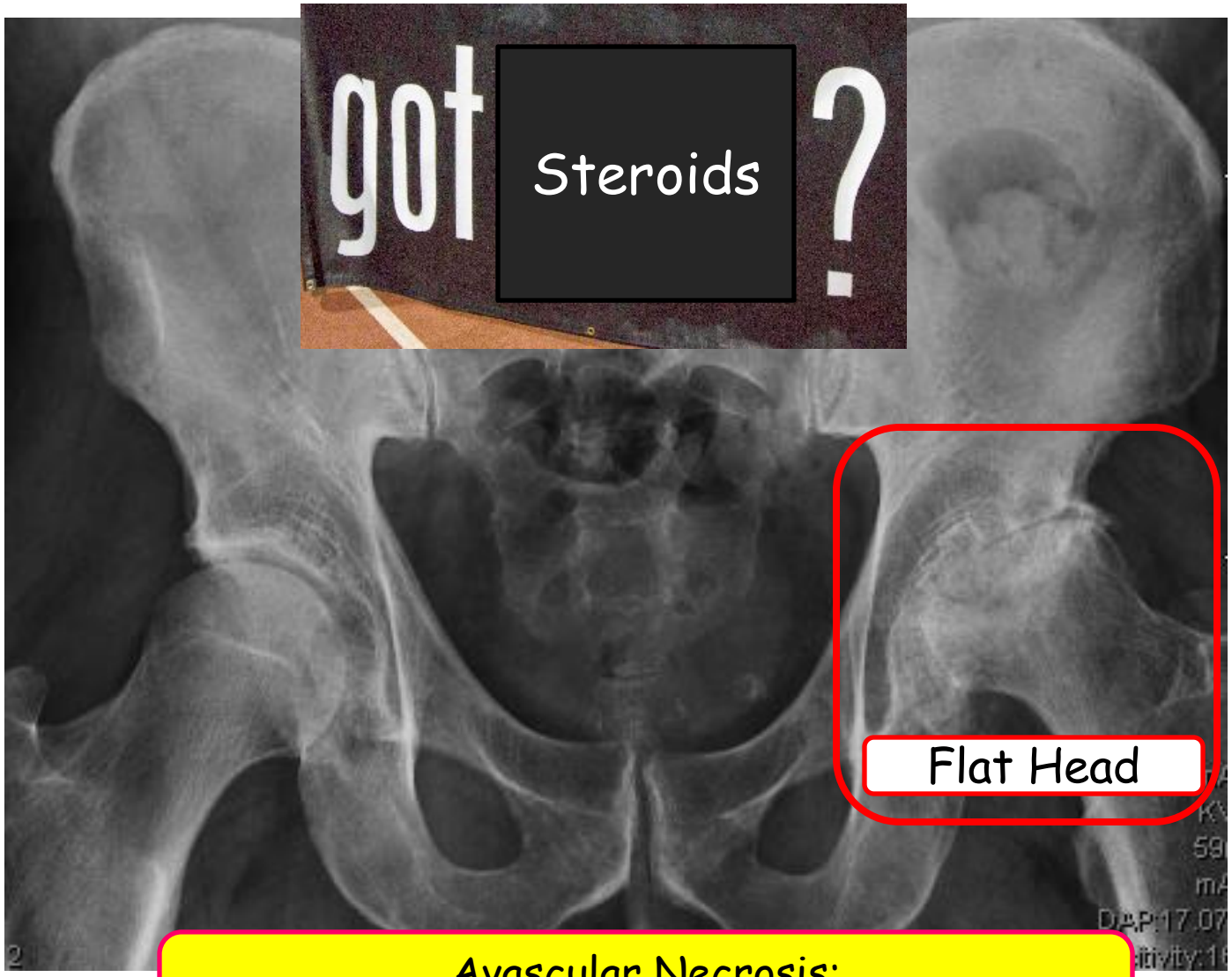




Steals muscle proteins/AA for gluconeogenesis



Avascular Necrosis:
Collapse (flattening) of the Femoral Head

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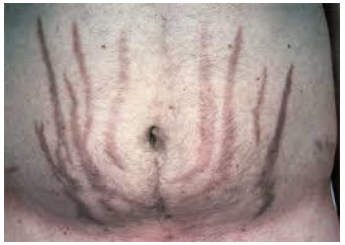

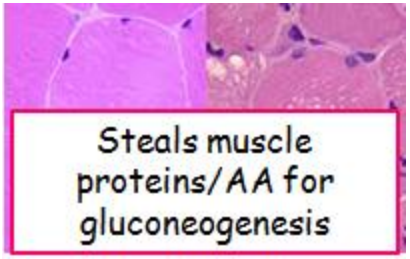

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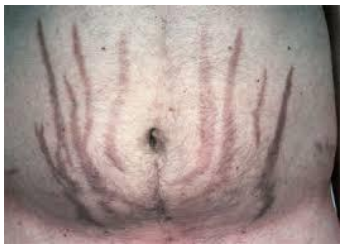
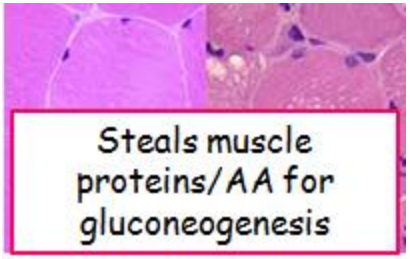
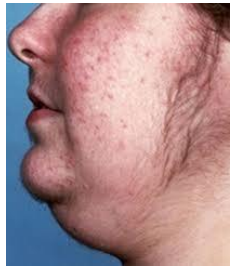




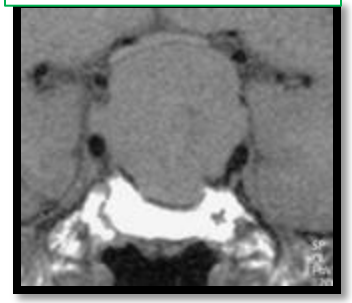


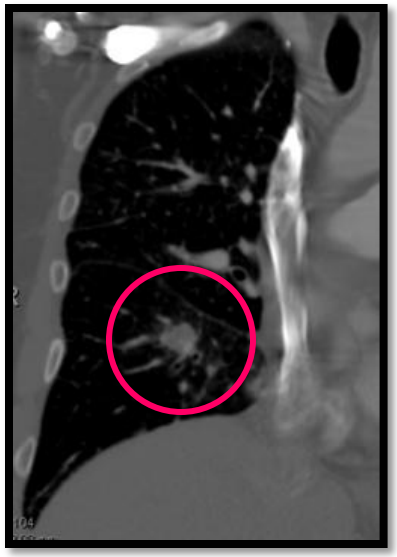
ACTH stimulates reticularis with ↑ androgen synthesis.

ACTH has homology with MSH.

Response to Hypercortisolism based on Etiologies

Cushing's Disease





- Hypothalamus
  - CRH suppressed (all causes)
- Pituitary Adenoma, Ectopic
  - ACTH is elevated
- Adrenal Adenoma, Exogenous
  - ACTH is suppressed

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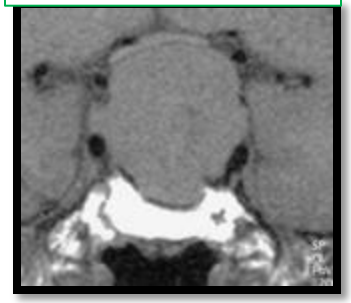

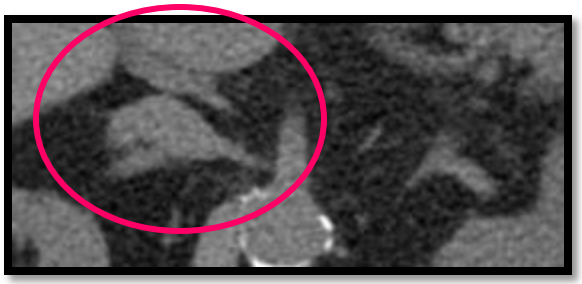

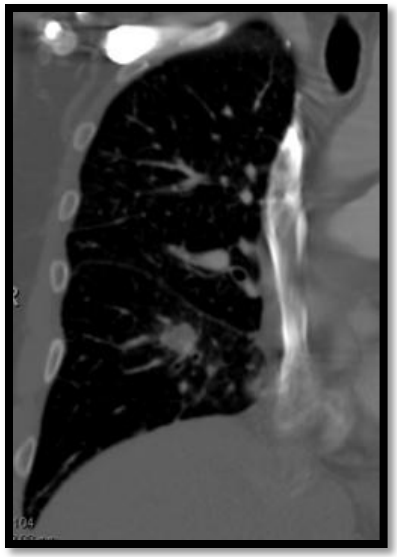

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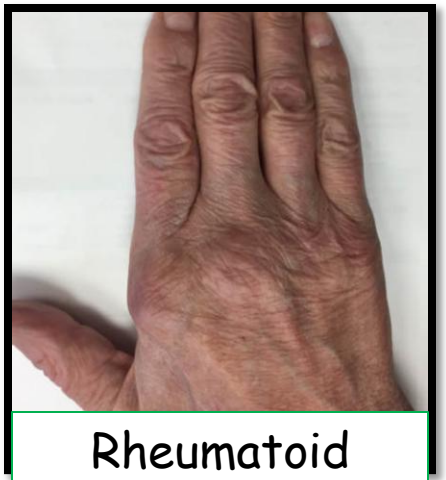


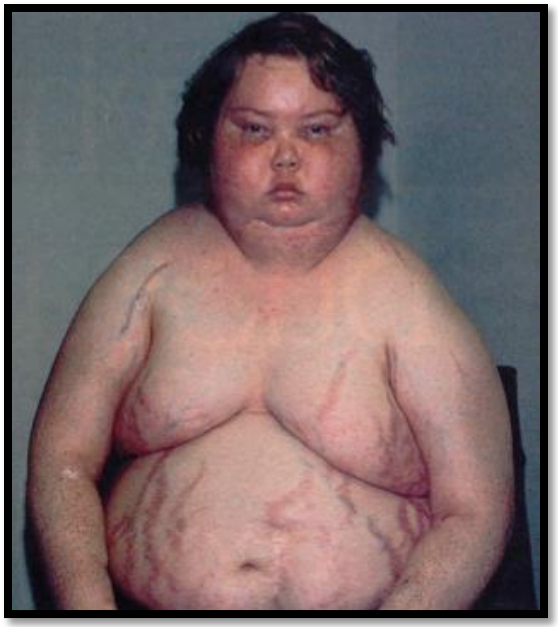
Rheumatoid Arthritis

Diagnostics

- Part One
  - Confirm hypercortisolism (based upon clinical suspicion)
    - 24 hr urinary free cortisol
    - Overnight dexamethasone suppression test
      - Don't be ascared! 1 mg at midnight; cortisol level at 0800
      - Cortisol should be <5 μg/dL

HTN

OP



↑ Glu

Myopathy

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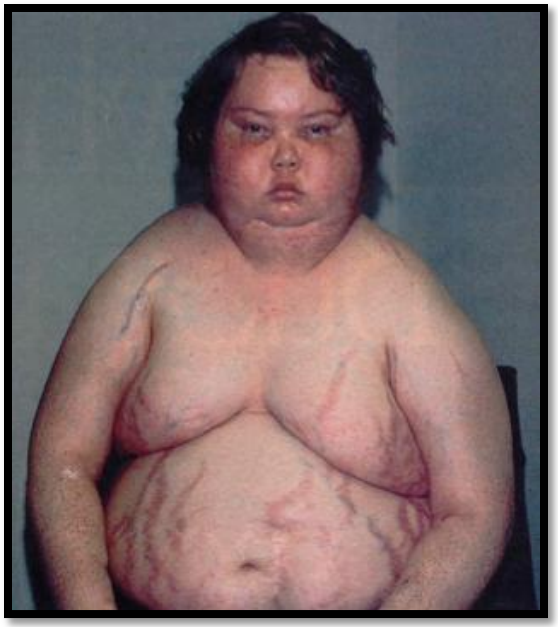

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Myopathy

These are initial screening studies…

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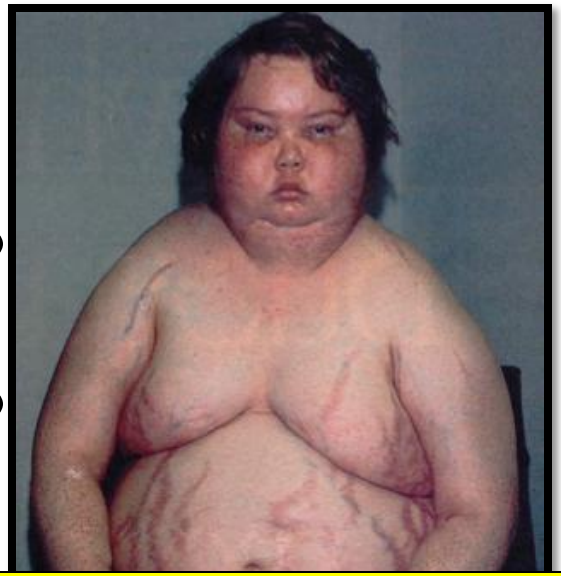

Note: exogenous glucocorticoids are NOT measured. Cortisol level will be low due to suppression of HPA axis.

Diagnostics

- Part One
  - Confirm hypercortisolism (based upon clinical suspicion)
    - 24 hr urinary free cortisol
    - Overnight dexamethasone suppression test
- Part Two
  - ACTH level – suppressed (negative feedback)
    - If suppressed, adrenal adenoma…you nailed it!
    - Grab an imaging study so you can admire your work.

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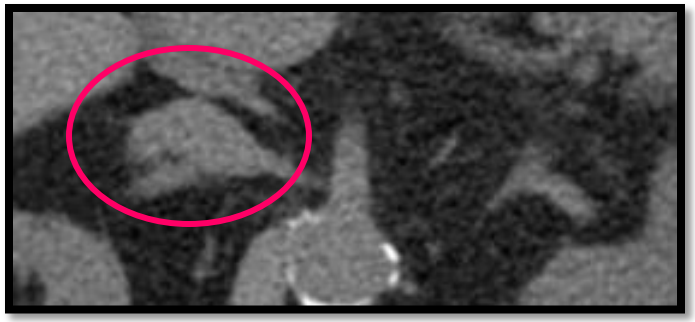
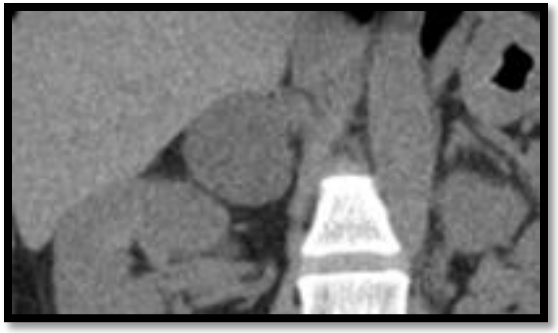
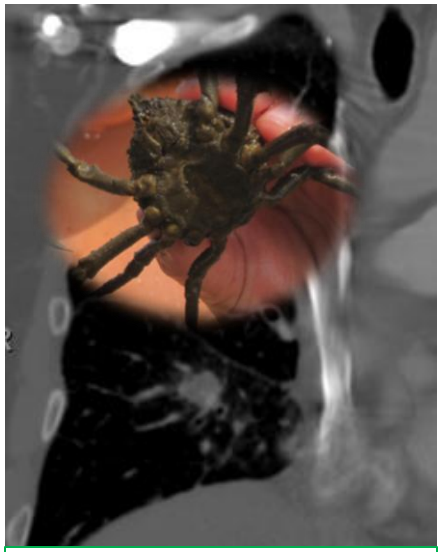




Adrenocortical Carcinoma

Diagnostics

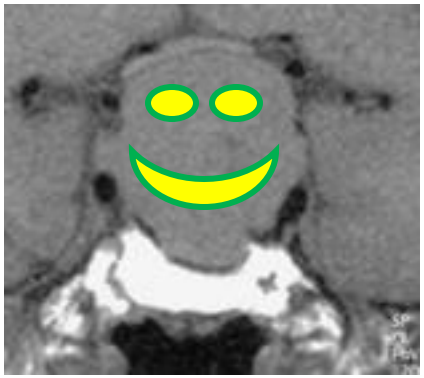
- Part Two
  - ACTH : suppressed → adrenal adenoma
  - ACTH: elevated ('ACTH-dependent')



Small Cell Carcinoma

But what if ACTH level is elevated?

How can you distinguish between a tumor pouring out ACTH (due to some major mutations) and a misguided pituitary adenoma that has simply lost its way?



Pituitary Adenoma

Diagnostics

- Part Two
  - ACTH : suppressed → adrenal adenoma
  - ACTH: elevated ('ACTH-dependent')

I don't suppress

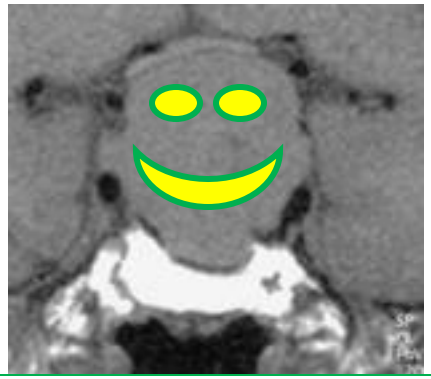
High Dose Dexamethasone Suppression

2 mg q6h x 48h

Assess cortisol

Chest imaging

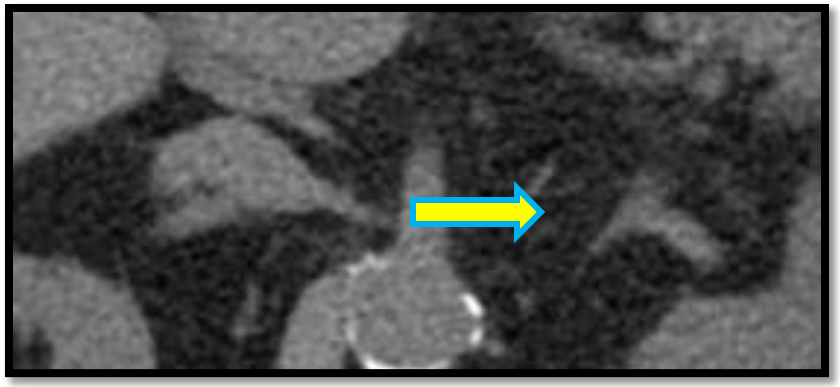
Pituitary imaging



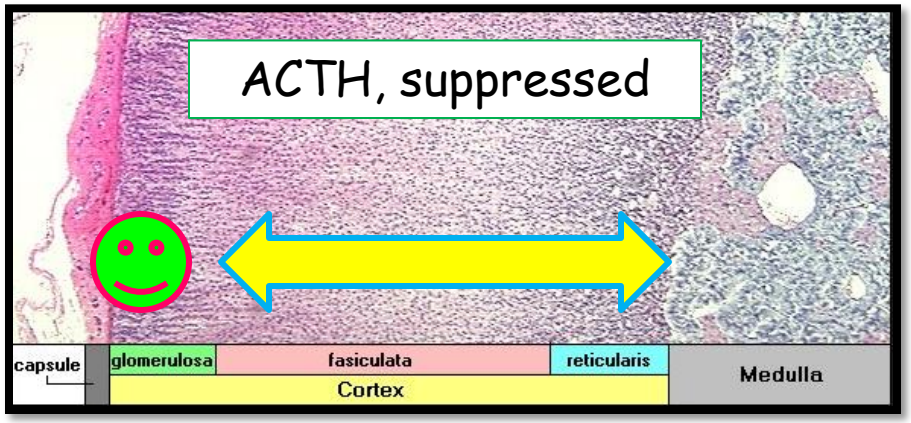
I (partially) suppress

Loose Ends

If this guy is making lots of cortisol, what is going on across the street?



Glomerulosa?



Fasciculata?
Reticularis?

Loose Ends

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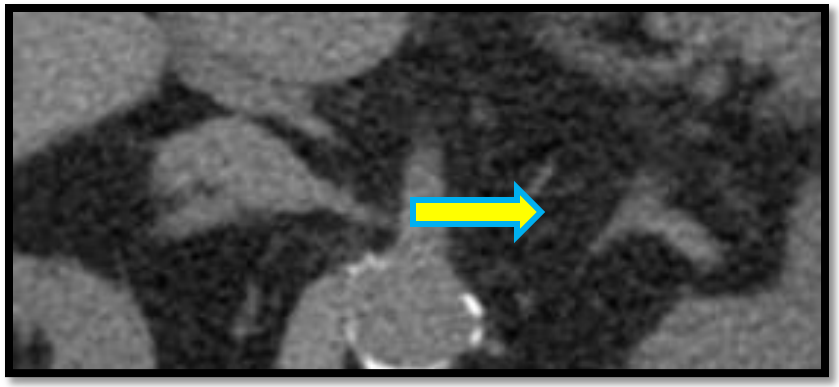
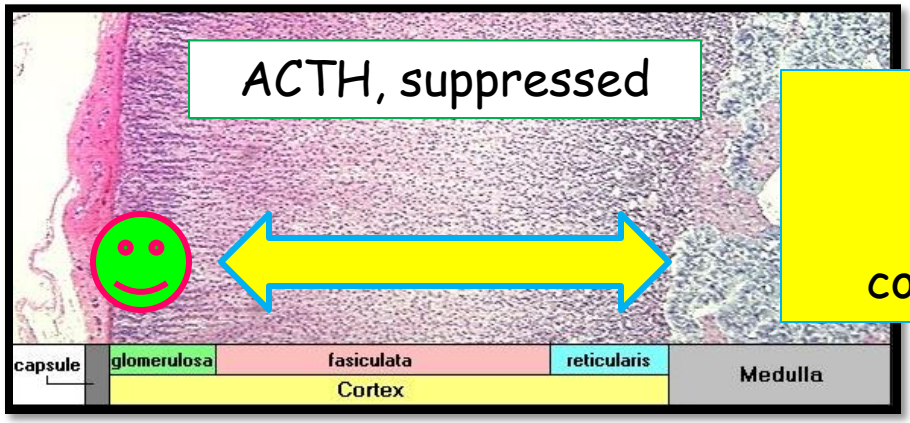


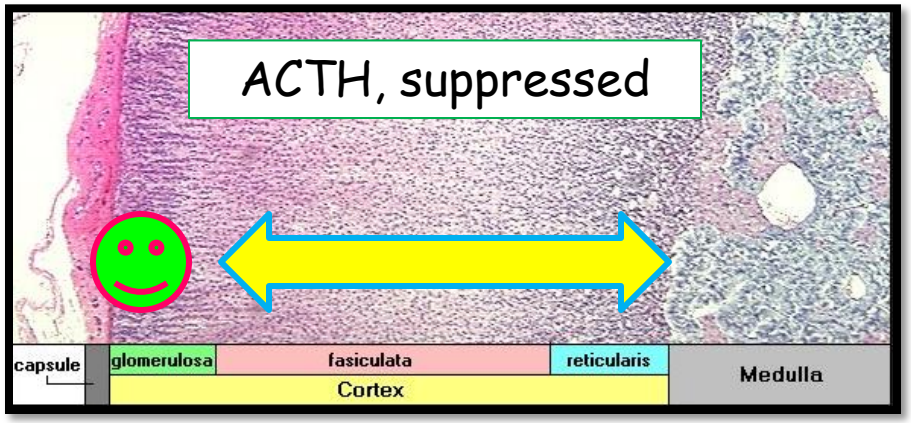
Glomerulosa: No change



Fasciculata, Reticularis: Atrophy of contralateral gland

Loose Ends

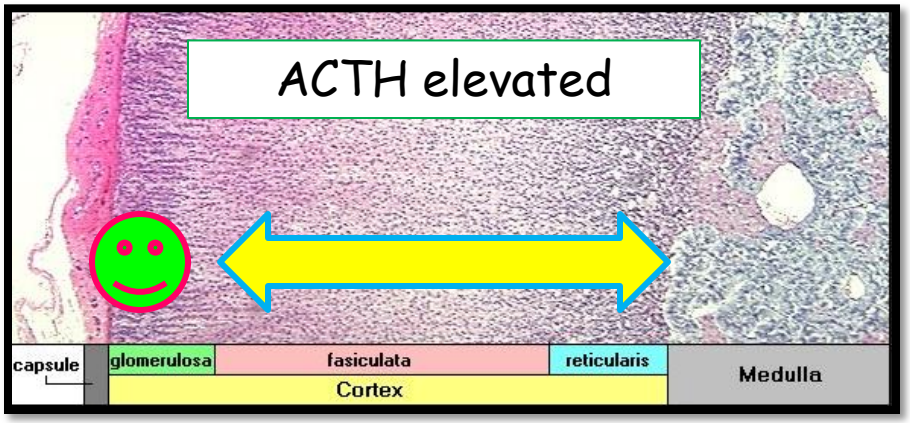
Glomerulosa:
No change



Fasciculata &
Reticularis:
Atrophy

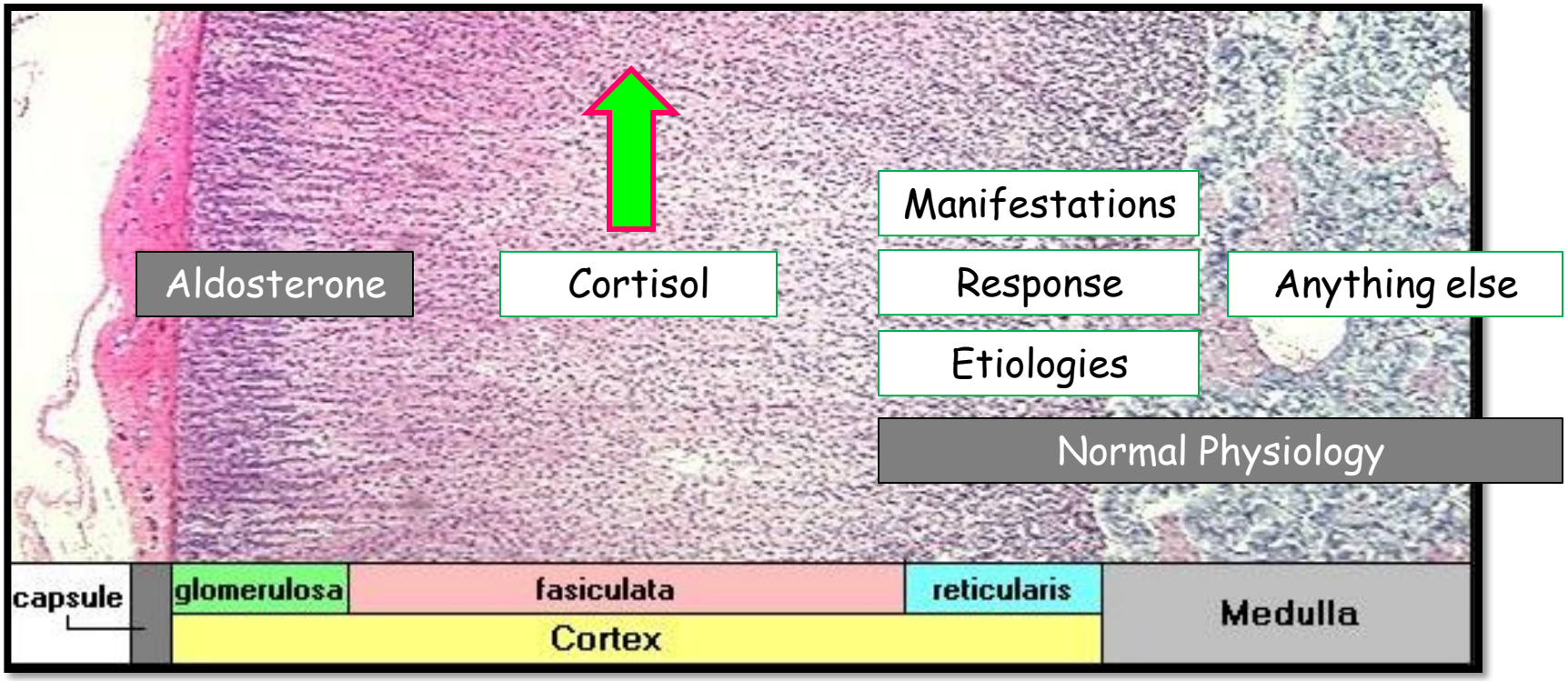
Loose Ends

If this guy is making lots of ACTH, what is going on downstream?



Glomerulosa: No change

Fasciculata Reticularis: Hyperplasia



Questions follow the next presentation…

Winter Storm Stella