BI 121 Lecture 11

Fun lab today! Lifetime data!
Thanks for being prepared!

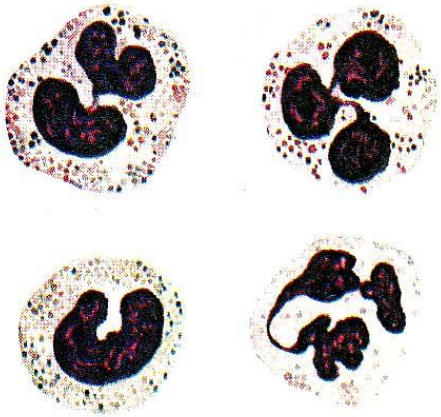
I. ***Blood Cell Connections*** **Q?**

II. ***Lab 5 Review: Safety & Techniques*** **Q?**

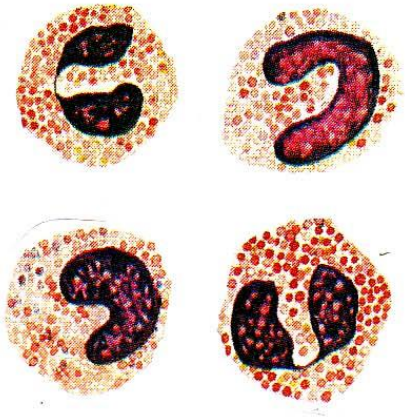
III. ***Blood Glucose & Insulin*** **LS pp 530-2, DC pp 110-2**

IV. ***Introduction to Endocrinology*** **LS ch 17, DC Module 13, SI Fox+**

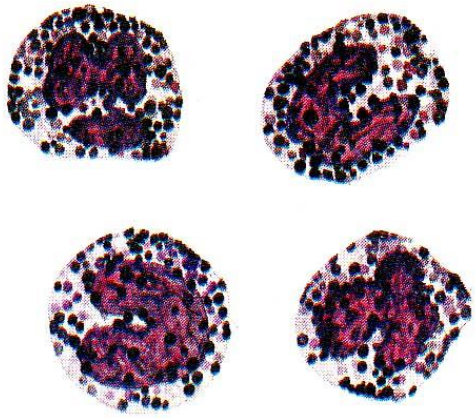
- **A. Endocrine vignette: Cushing's syndrome LS fig17-20 p 521-2**
- **B. Endocrine system DC p 103 fig 13-1, LS fig 17-1, tab 17-1**
- **C. What's an endocrine? + classes ~ LS pp 495 – 6**
- **D. Hypothalamus (Master) – Pituitary (subcontroller)**
  DC pp 104-6 + LS pp 499-506
- **E. Posterior pituitary + hormones DC p 108, LS fig 17-4 p 502**
- **F. Anterior pituitary + hormones DC pp 105-7, LS pp 502-6**
- **G. GH: Body builder's dream? Fountain of youth? LS pp 506-11**
- **H. Peripheral endocrine organs DC pp 109-13, LS pp 513-36**
  1. Pancreas 2. Thyroid 3. Adrenals



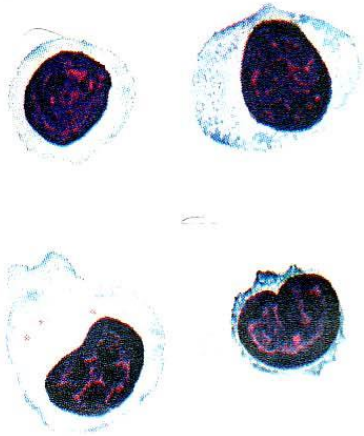
NEUTROPHILS



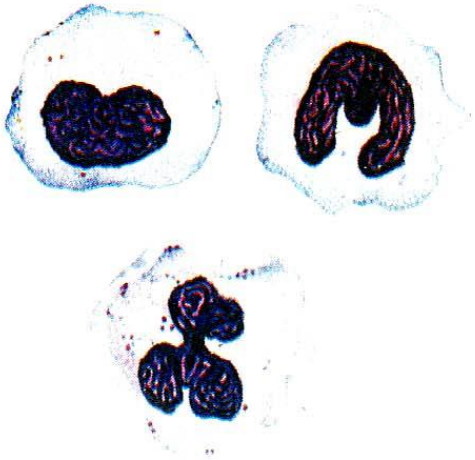
EOSINOPHILS



BASOPHILS

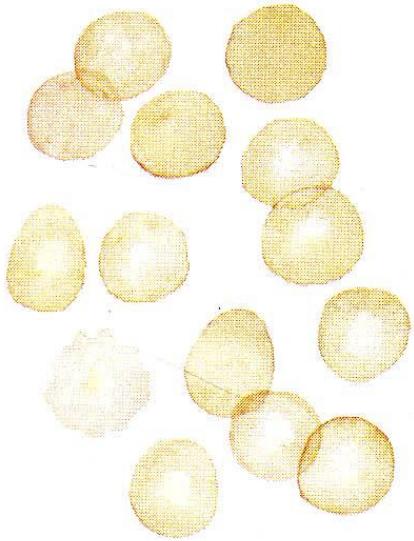


LYMPHOCYTES



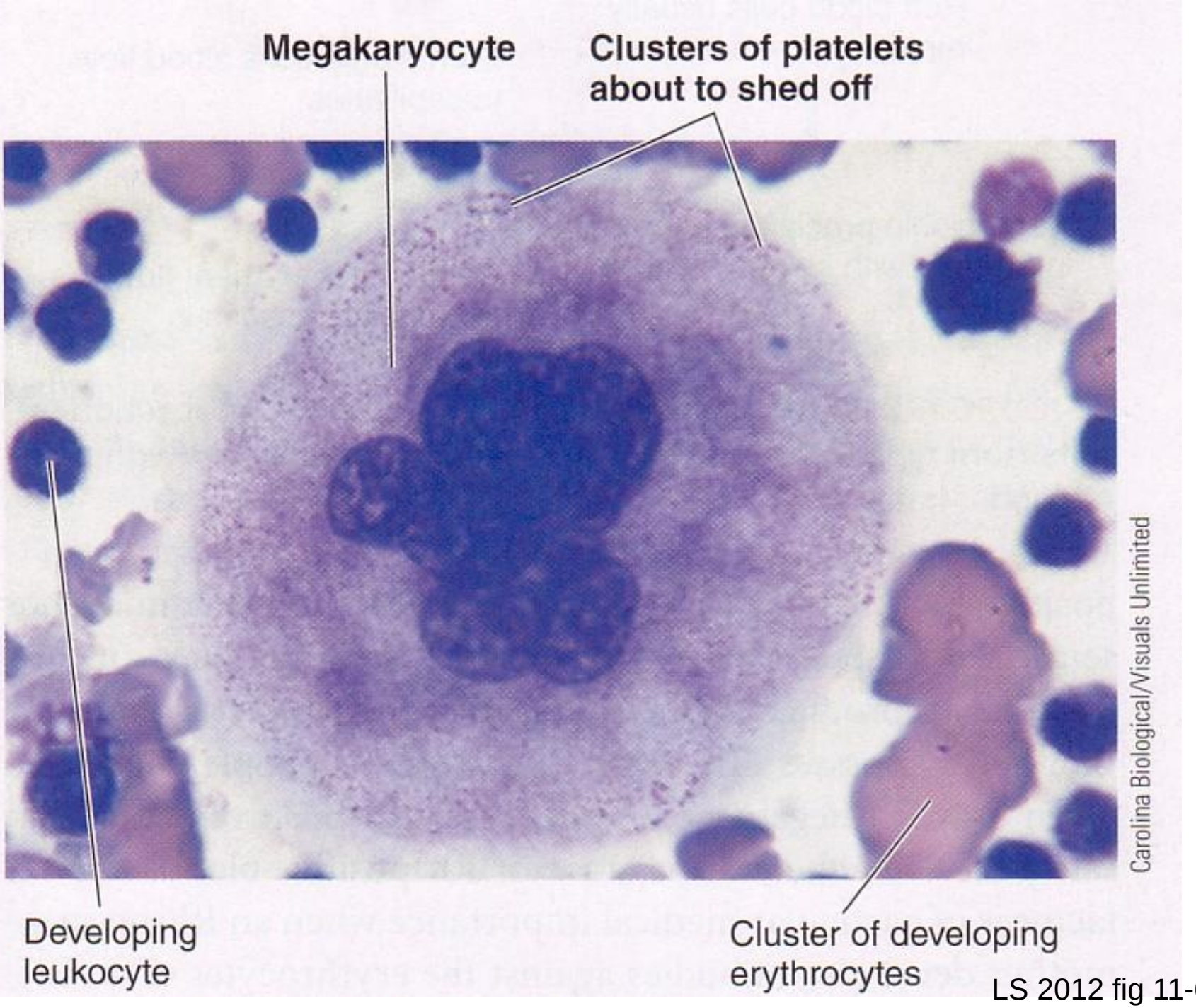
MONOCYTES

PLATELETS



ERYTHROCYTES

SI Fox 2009 fig 10-2



LS 2012 fig 11-6

No food, drink or gum in lab today! Thanks sincerely!

…Healthy, tasty & fresh, but not in lab!!

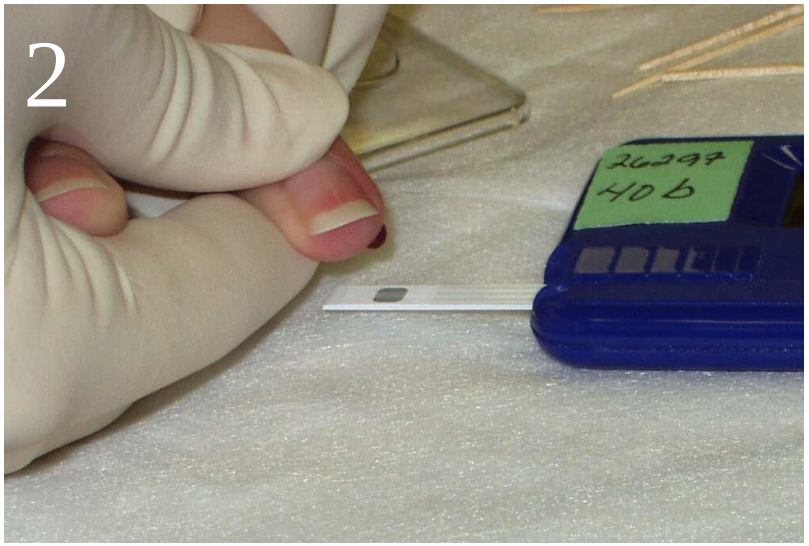
PREPARATION

WASH & DRY

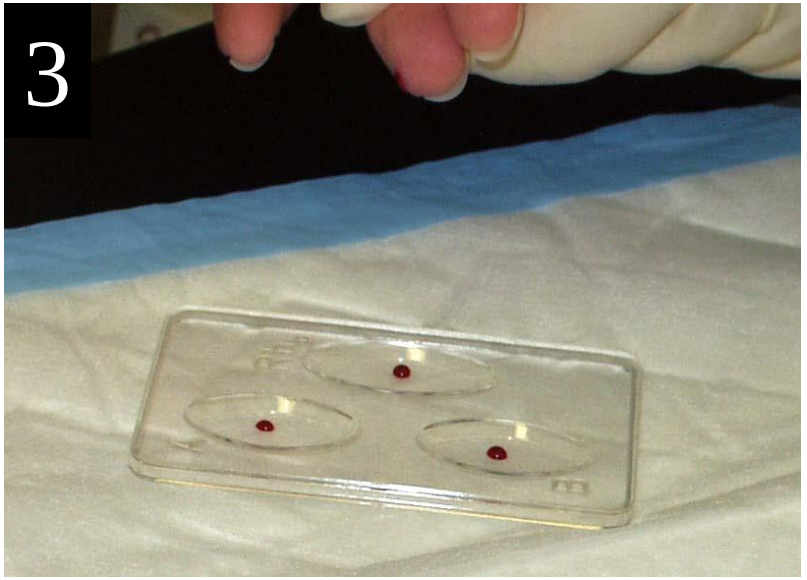
ALCOHOL

SAMPLE+TESTS

OBTAIN μSAMPLE

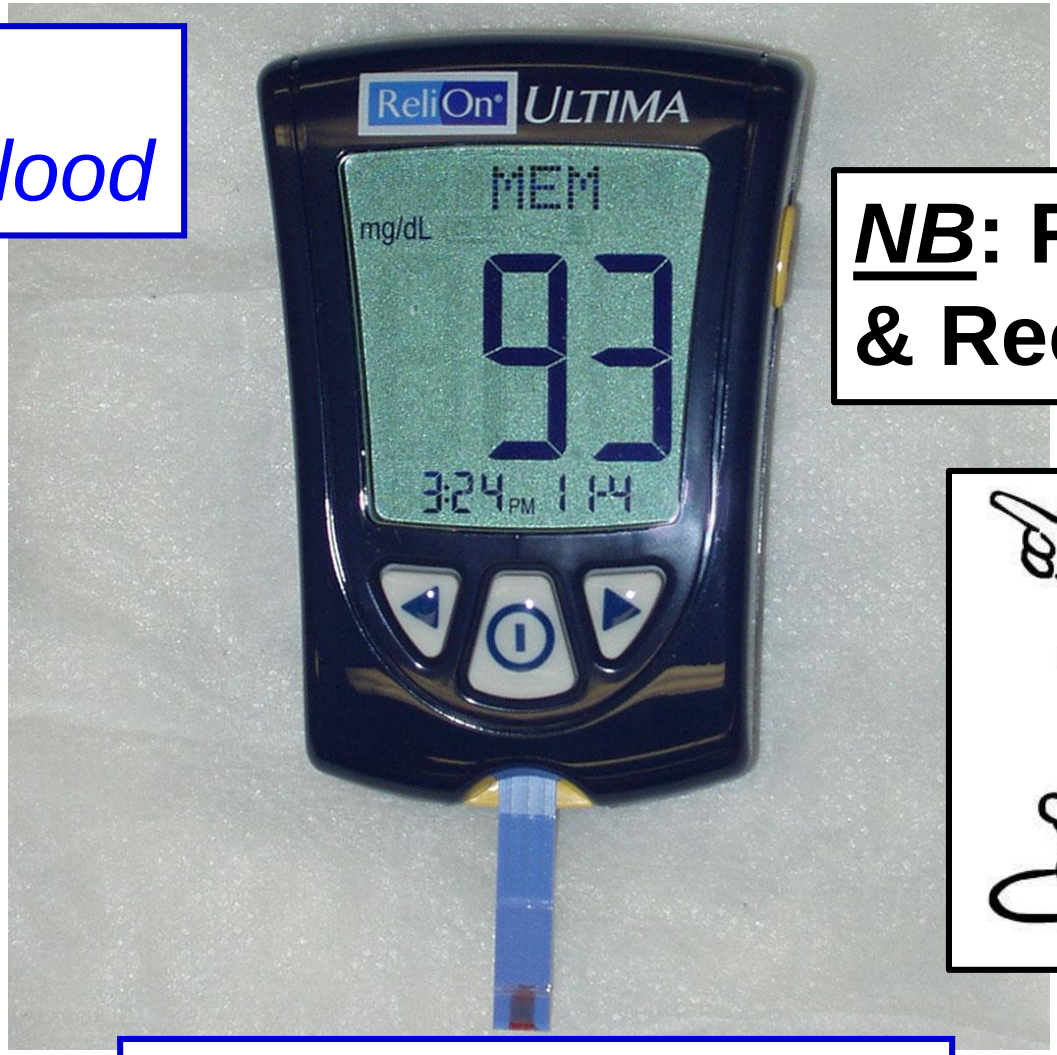


BLOOD GLUCOSE

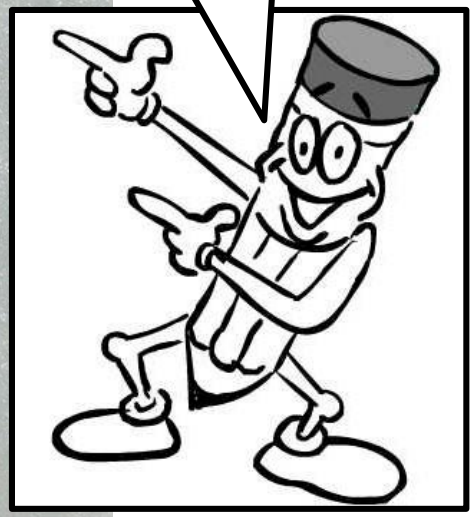


BLOOD TYPING

Glucose:
Sugar in Blood

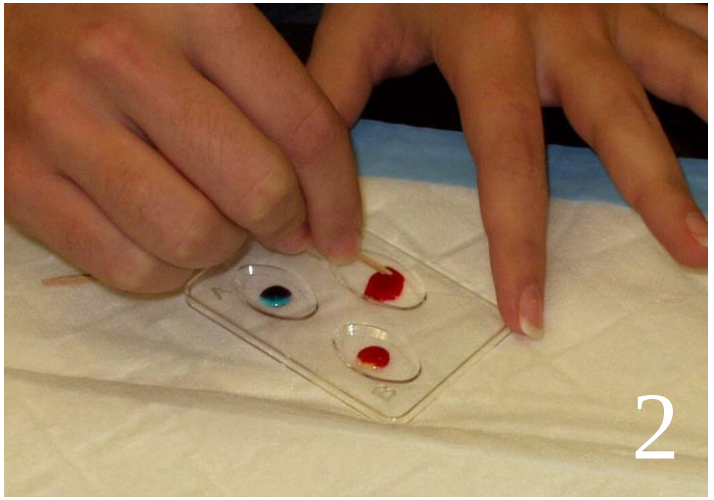


***NB*: Read & Record!**

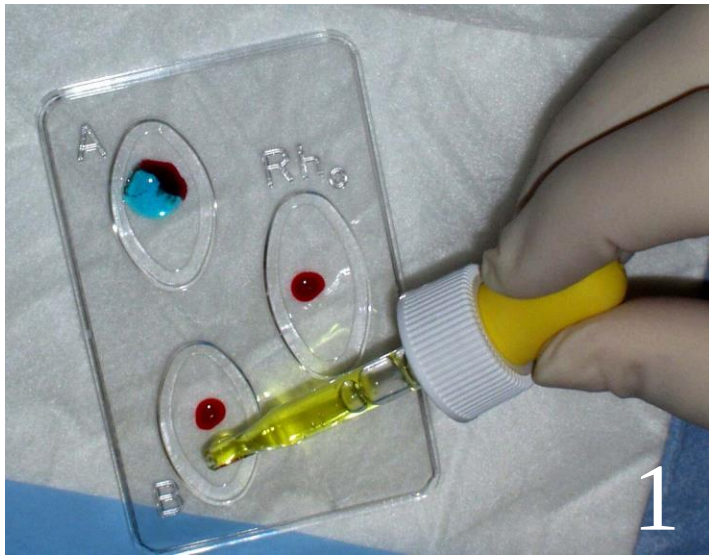


Normal: 70-99
Pre-Diabetes: 100-125
Diabetes: ≥ 126 mg/dL

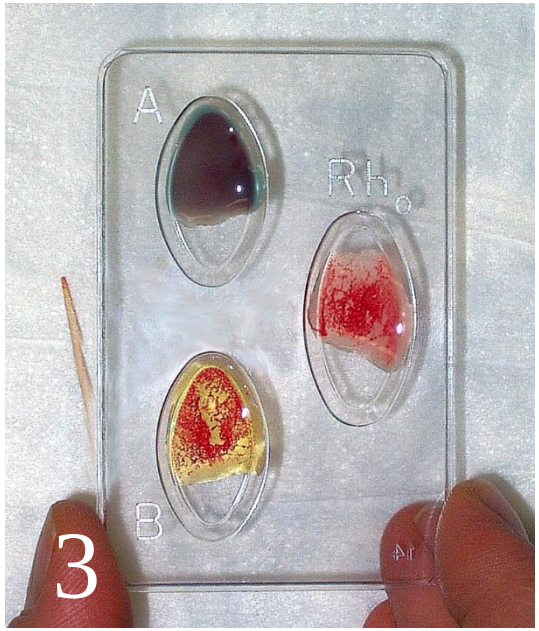
BLOOD TYPING



MIX W/TOOTHPICKS



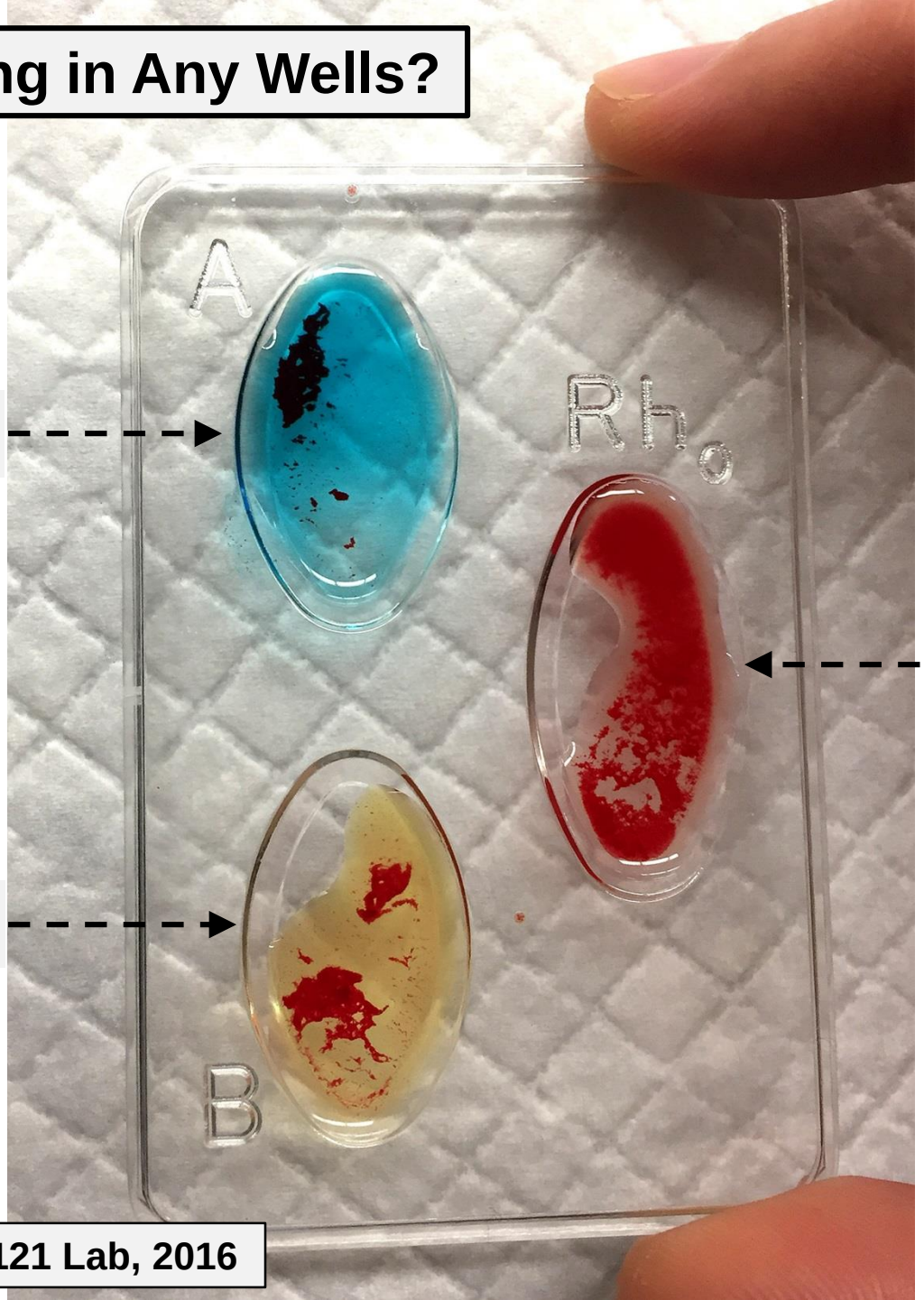
ADD ANTISERA



READ & RECORD!!

1^0 Q? Clumping in Any Wells?

Type AB+



Here?

Here?

Here?

Source: S Wong, BI 121 Lab, 2016

CLEAN-UP!

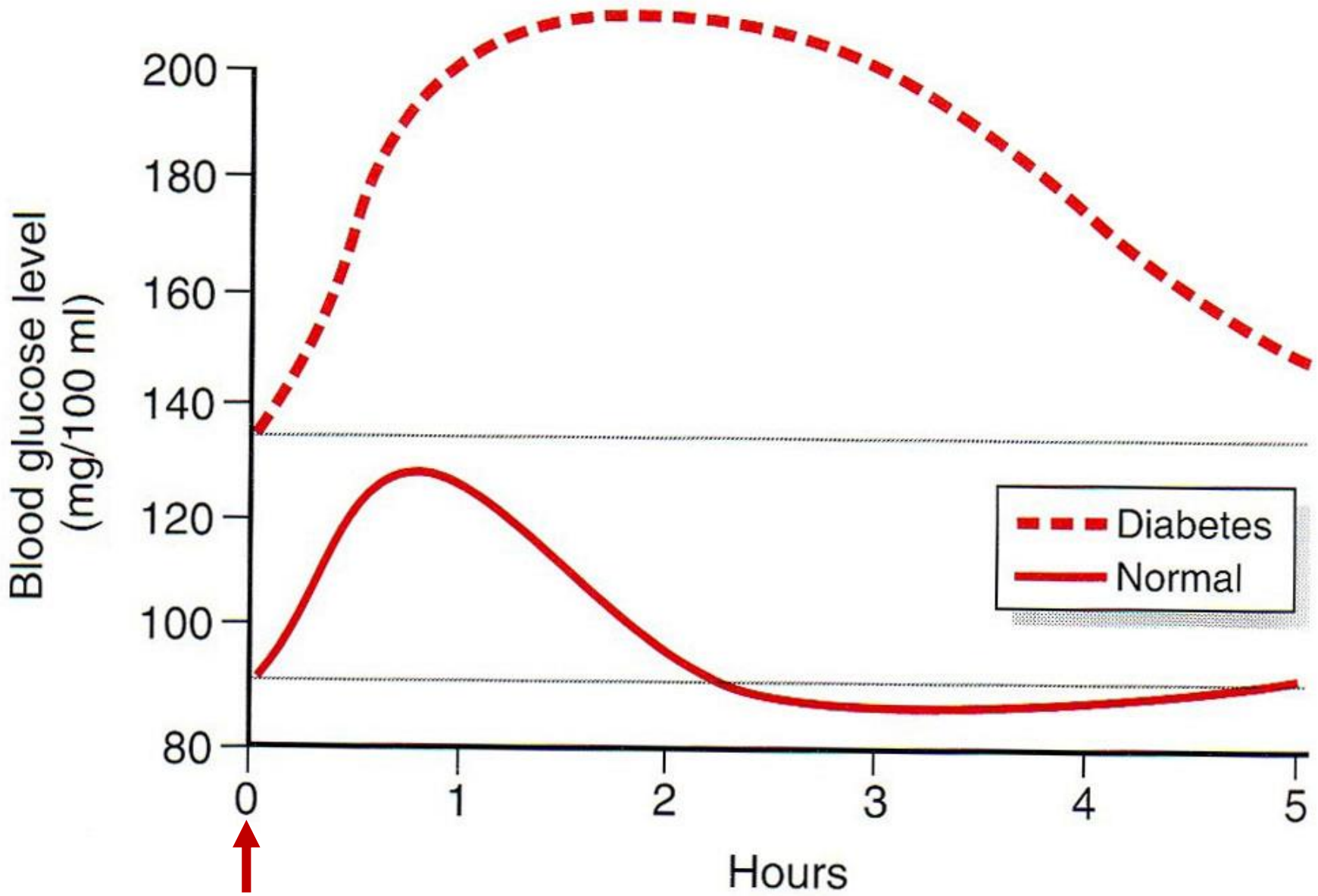
FOLD DIAPER

BLOOD PRODUCTS

REWASH!!

Blood Chem Lab Q?

Diabetic & Normal Response to Glucose Load



Ingest Glucola or eat meal

Guyton & Hall 2000

Proinsulin with C-Connecting Peptide

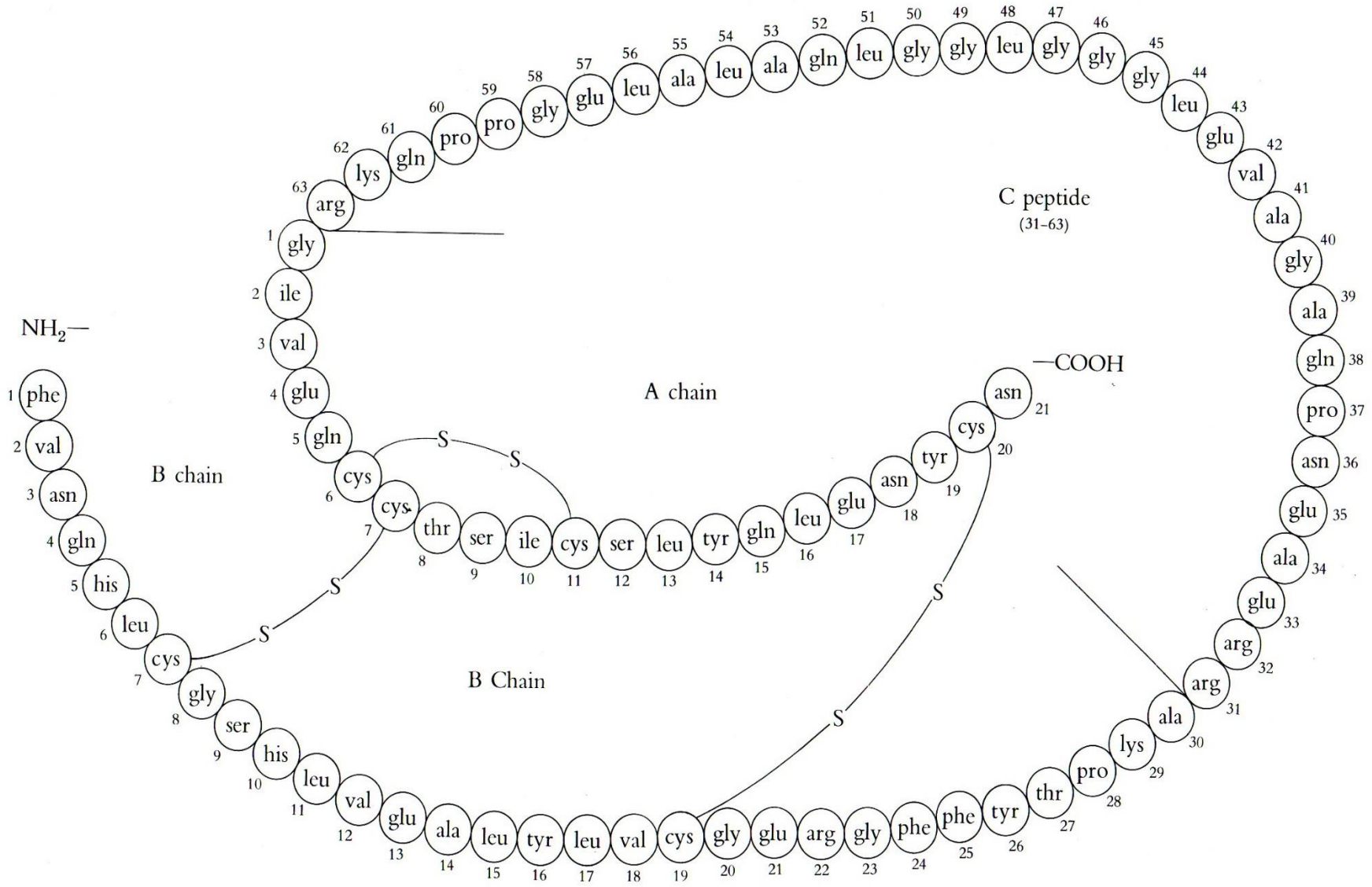
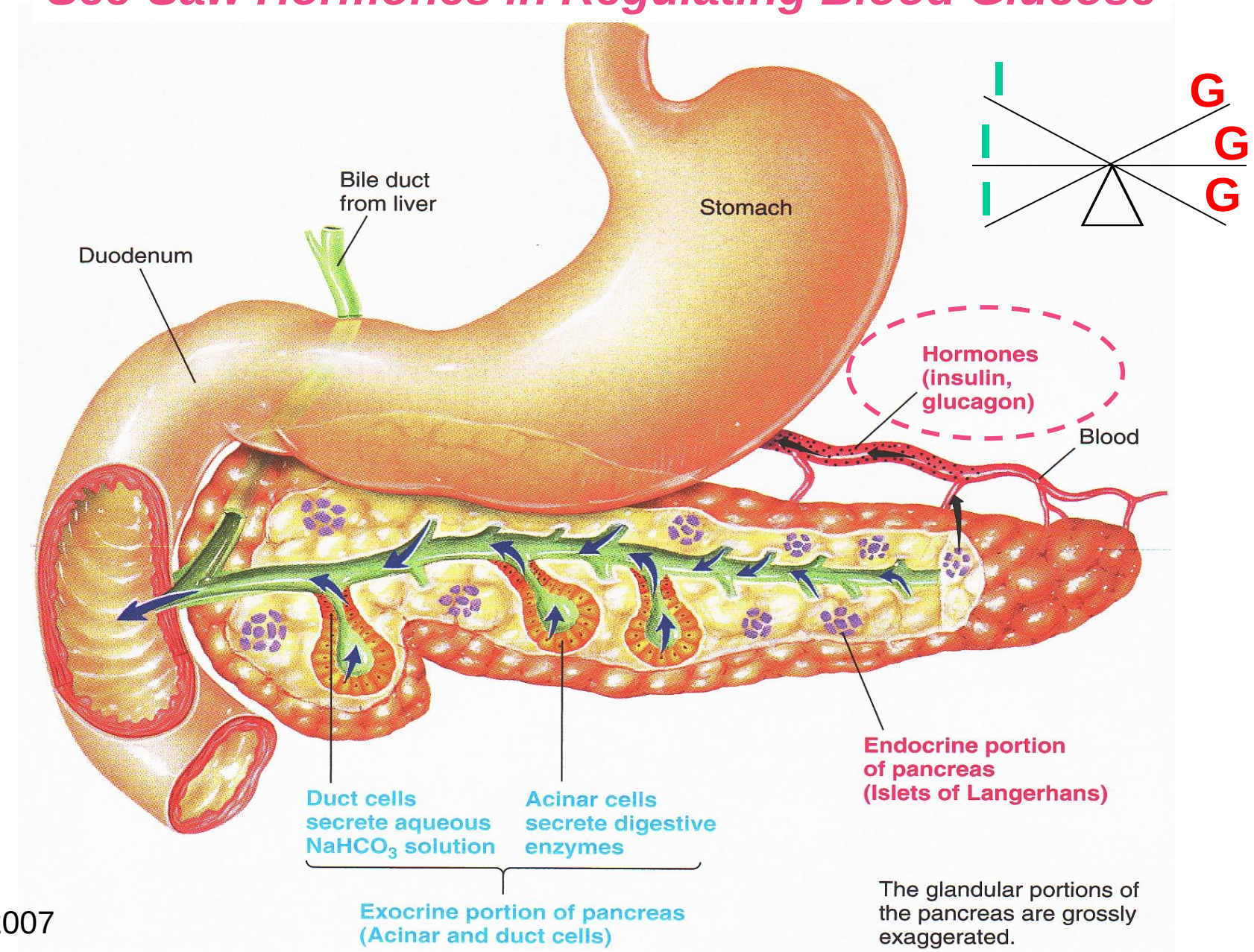


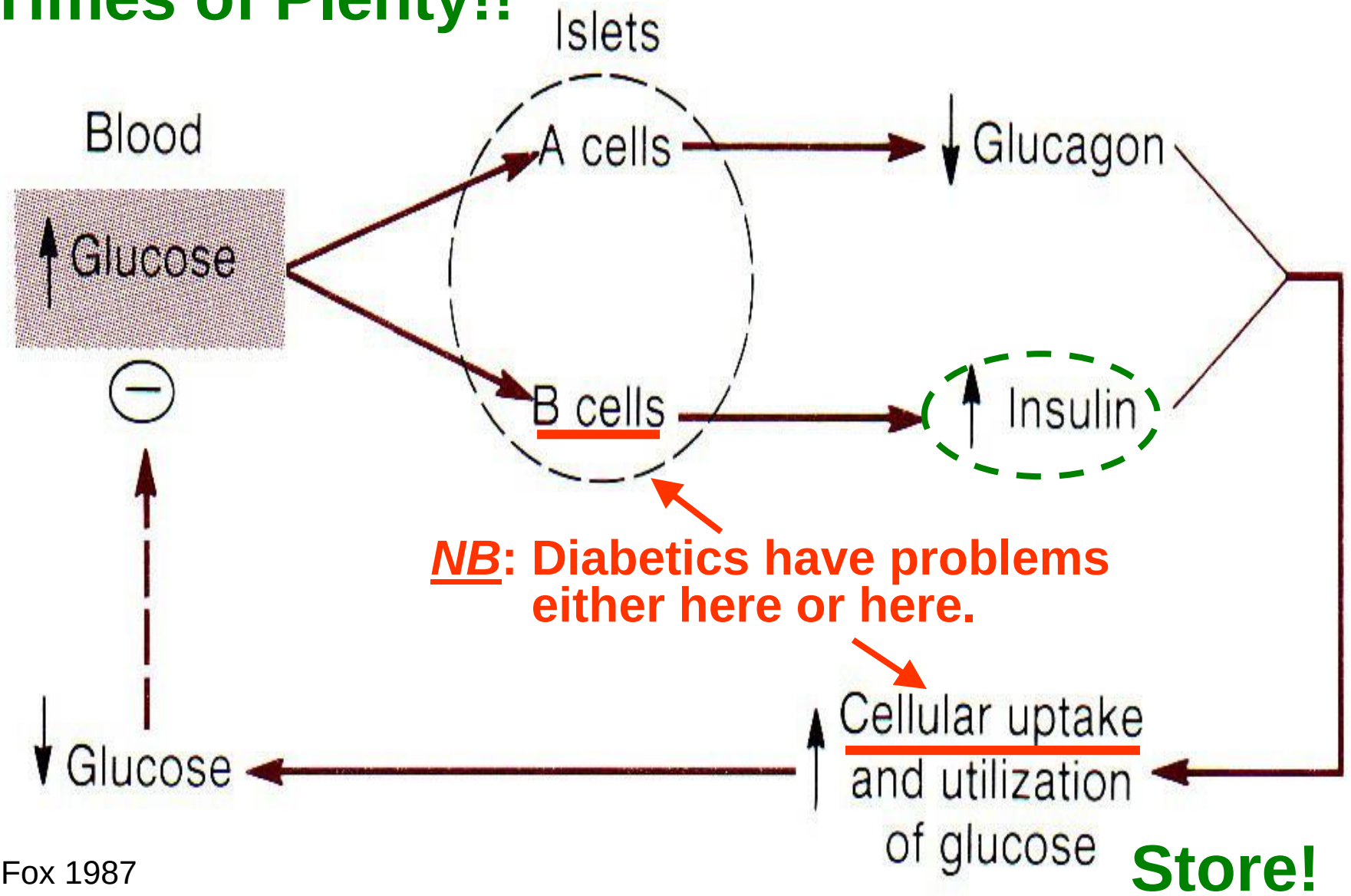
FIG. 10-4. Amino acid sequence of a mammalian proinsulin molecule. Note how the insulin molecule can be formed by cleaving this polypeptide chain at two locations to liberate the C peptide.

DO Norris 1980

Endocrine Pancreas: Insulin (I) & Glucagon (G) See-Saw Hormones in Regulating Blood Glucose



Times of Plenty!!



Fox 1987

https://ed.ted.com/lessons/what-does-the-pancreas-do-emma-bryce

https://www.youtube.com/watch?v=8dgoeYPoE-0

TABLE 4-7

Warning Signs of Diabetes

These signs appear reliably in type 1 diabetes and, often, in the later stages of type 2 diabetes.

- Excessive urination and thirst
- Glucose in the urine
- Weight loss with nausea, easy tiring, weakness, or irritability
- Cravings for food, especially for sweets
- Frequent infections of the skin, gums, vagina, or urinary tract
- Vision disturbances; blurred vision
- Pain in the legs, feet, or fingers
- Slow healing of cuts and bruises
- Itching
- Drowsiness
- Abnormally high glucose in the blood

S&W 2011 tab 4-7 p 131

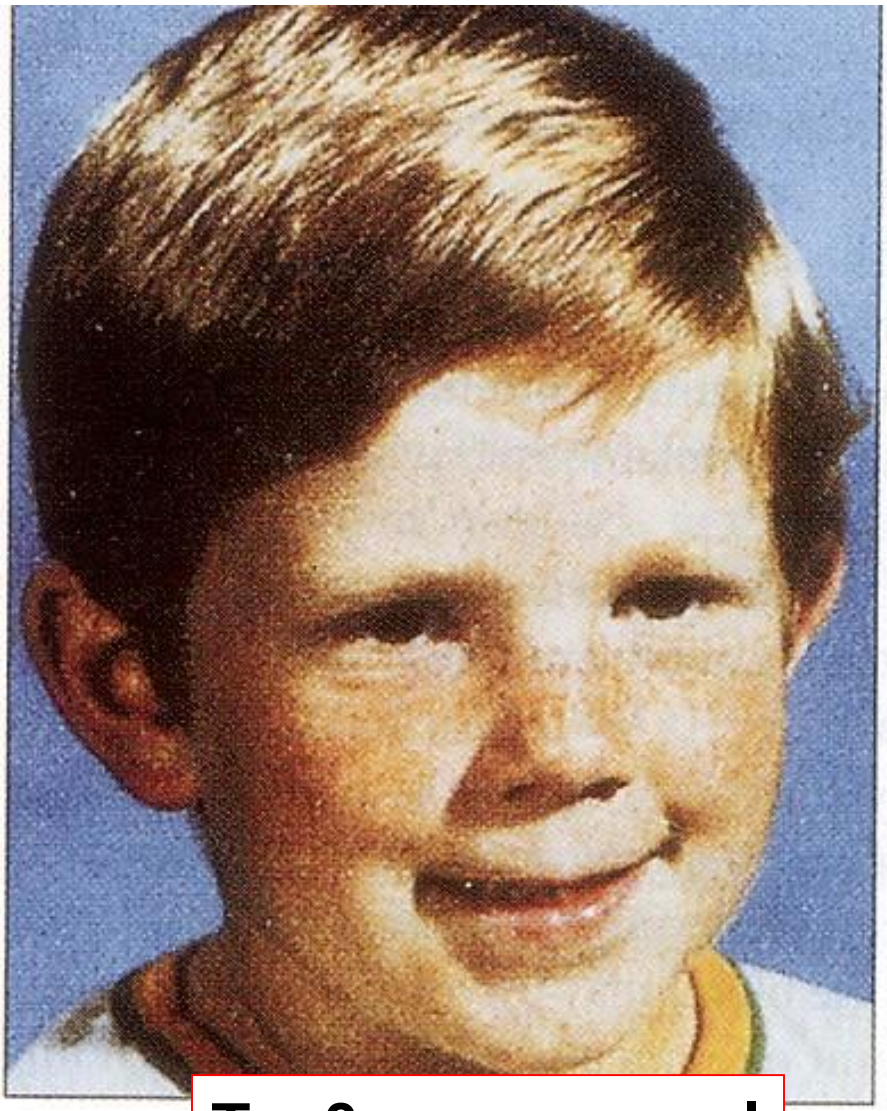
Diabetics must constantly juggle diet, exercise & medication to control blood glucose!

Like others, diabetics benefit from whole grains, vegetables, fruits, legumes & non-/low-fat milk products!

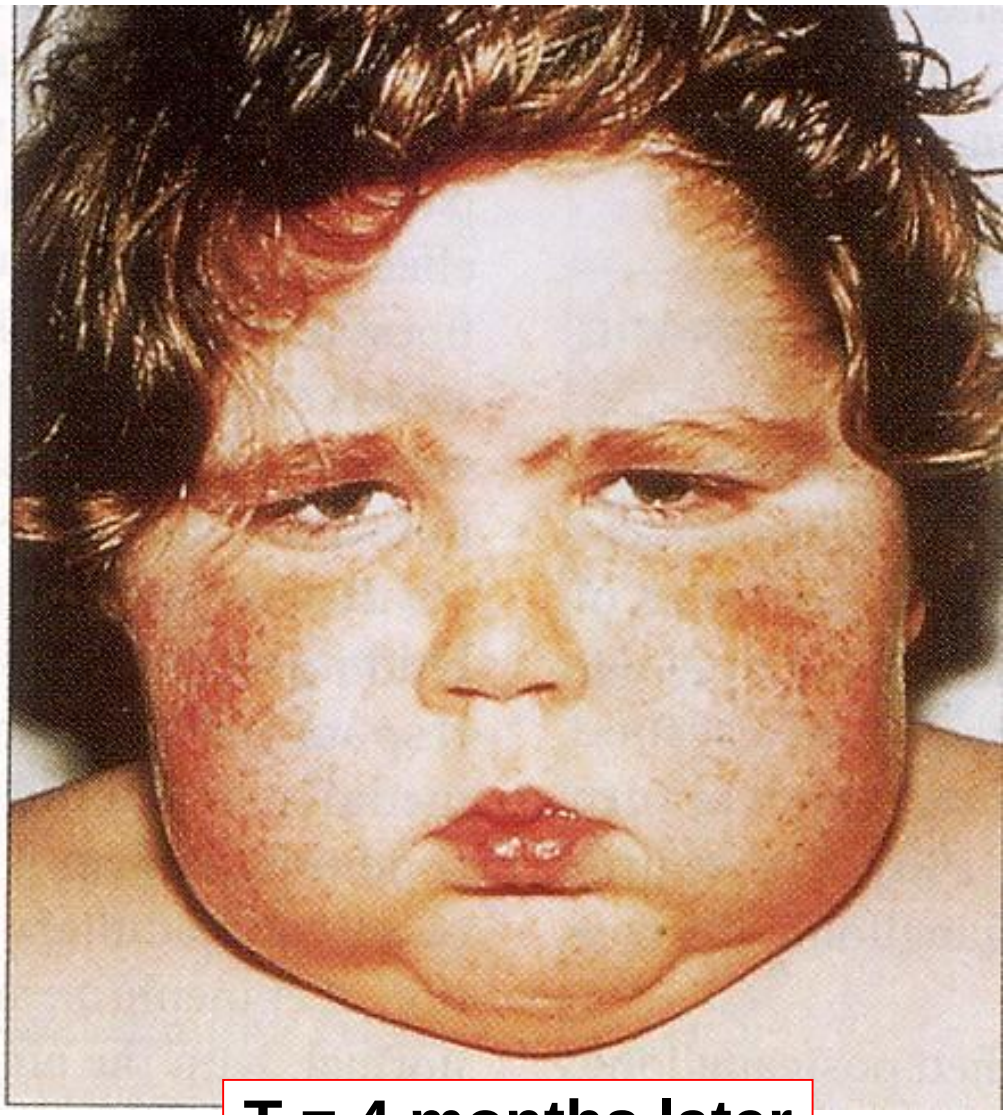
S&W p 133

Discussion/Questions/Break!

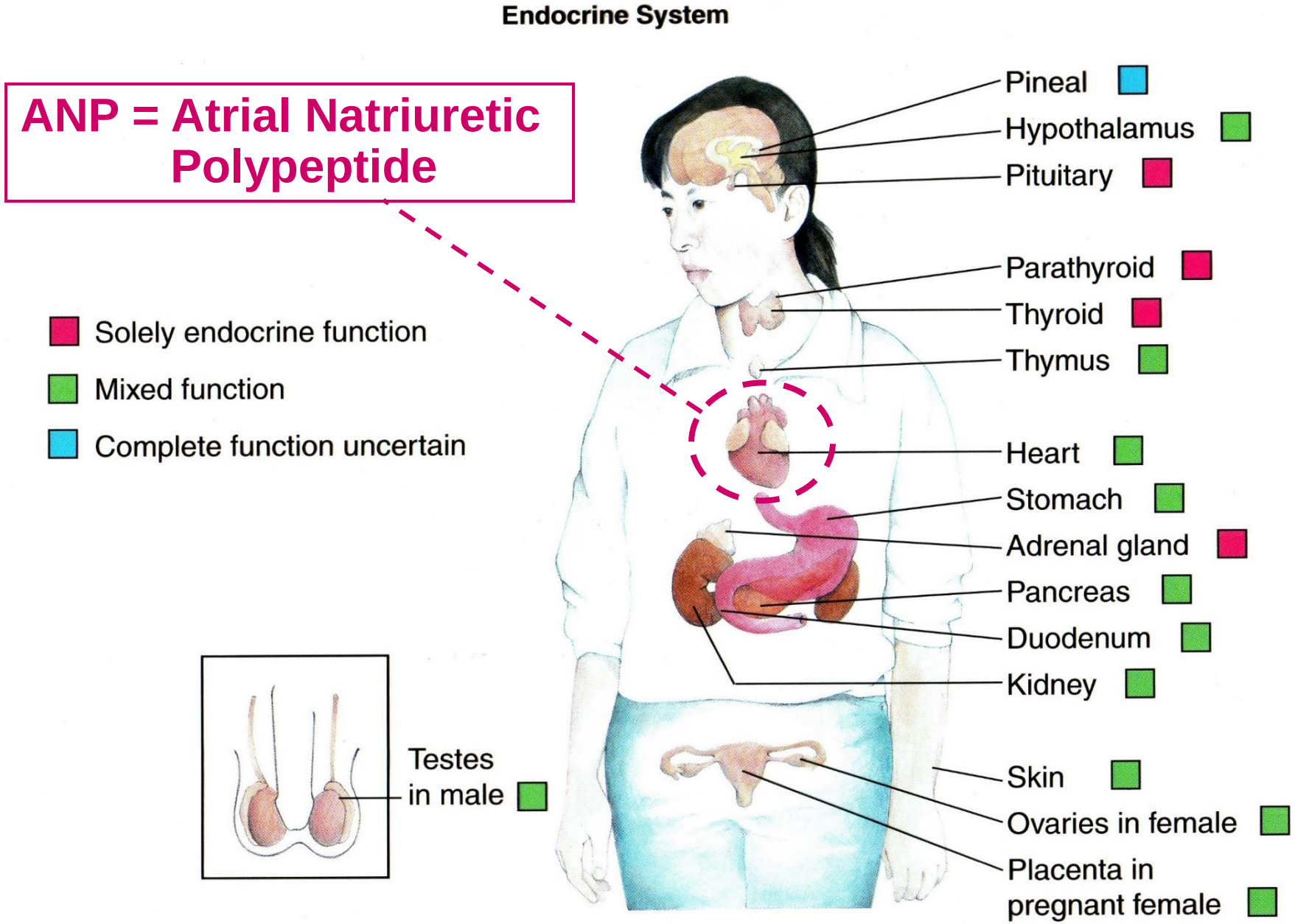
Cushing's Syndrome = Hypersecretion of Cortisol: Hypothalamic (CRH), Pituitary (ACTH), or Adrenal (Cortisol)



T = 0, near normal



T = 4 months later

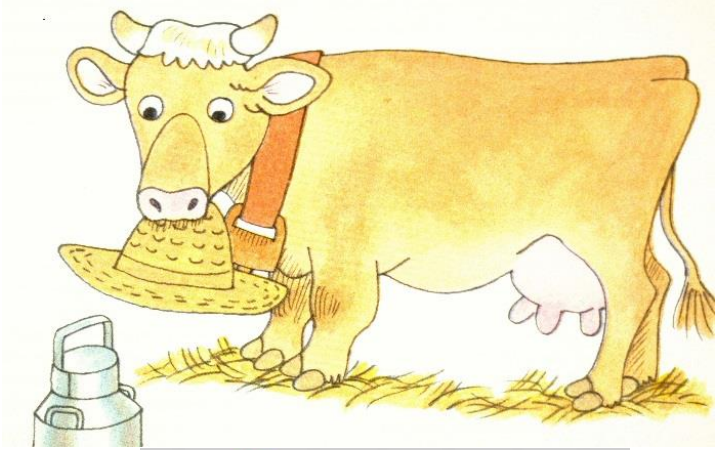


https://www.youtube.com/watch?v=lRJE8c3ghRE

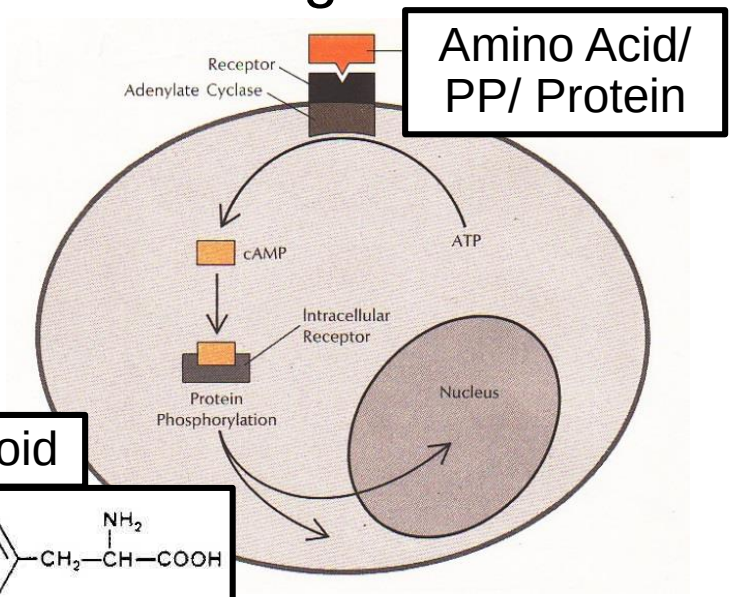
https://www.hopkinsallchildrens.org/Patients-Families/Health-Library/HealthDocNew/Movie-Endocrine-System

Hormone/Endocrine Classifications?

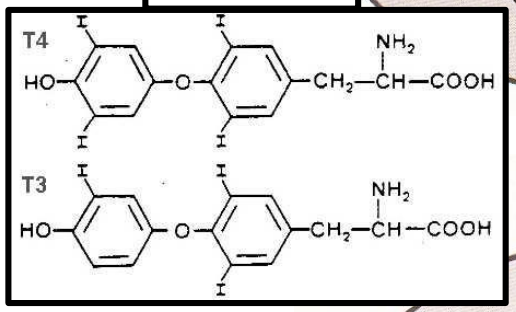
Exogenous

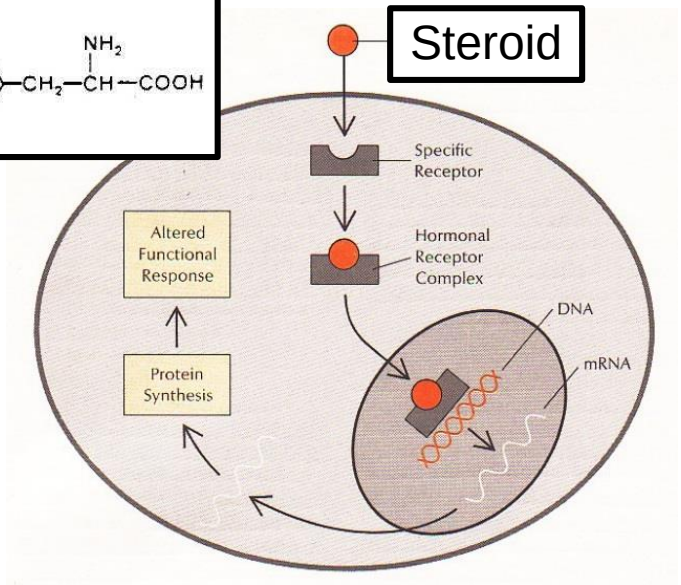


Endogenous

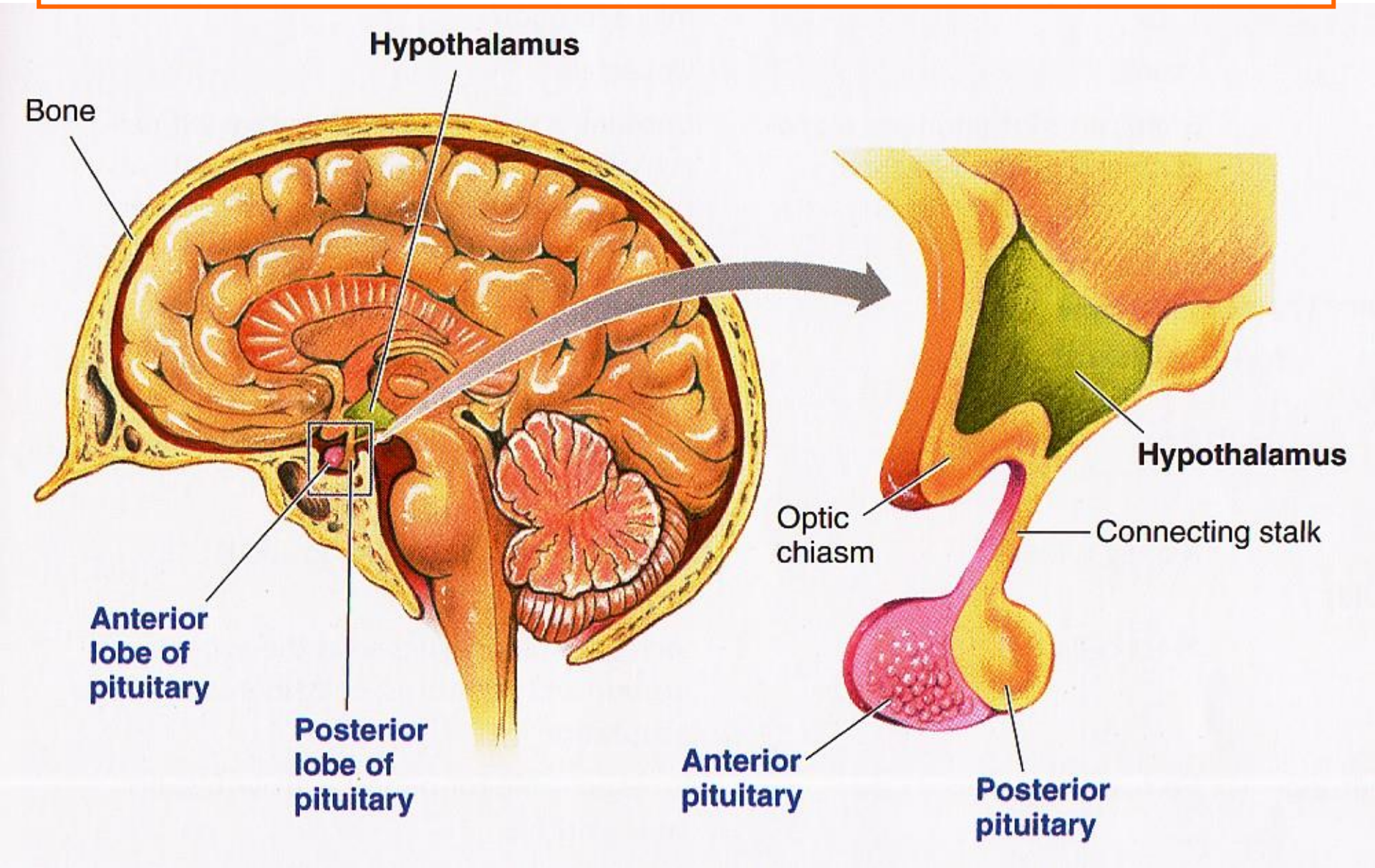


Thyroid



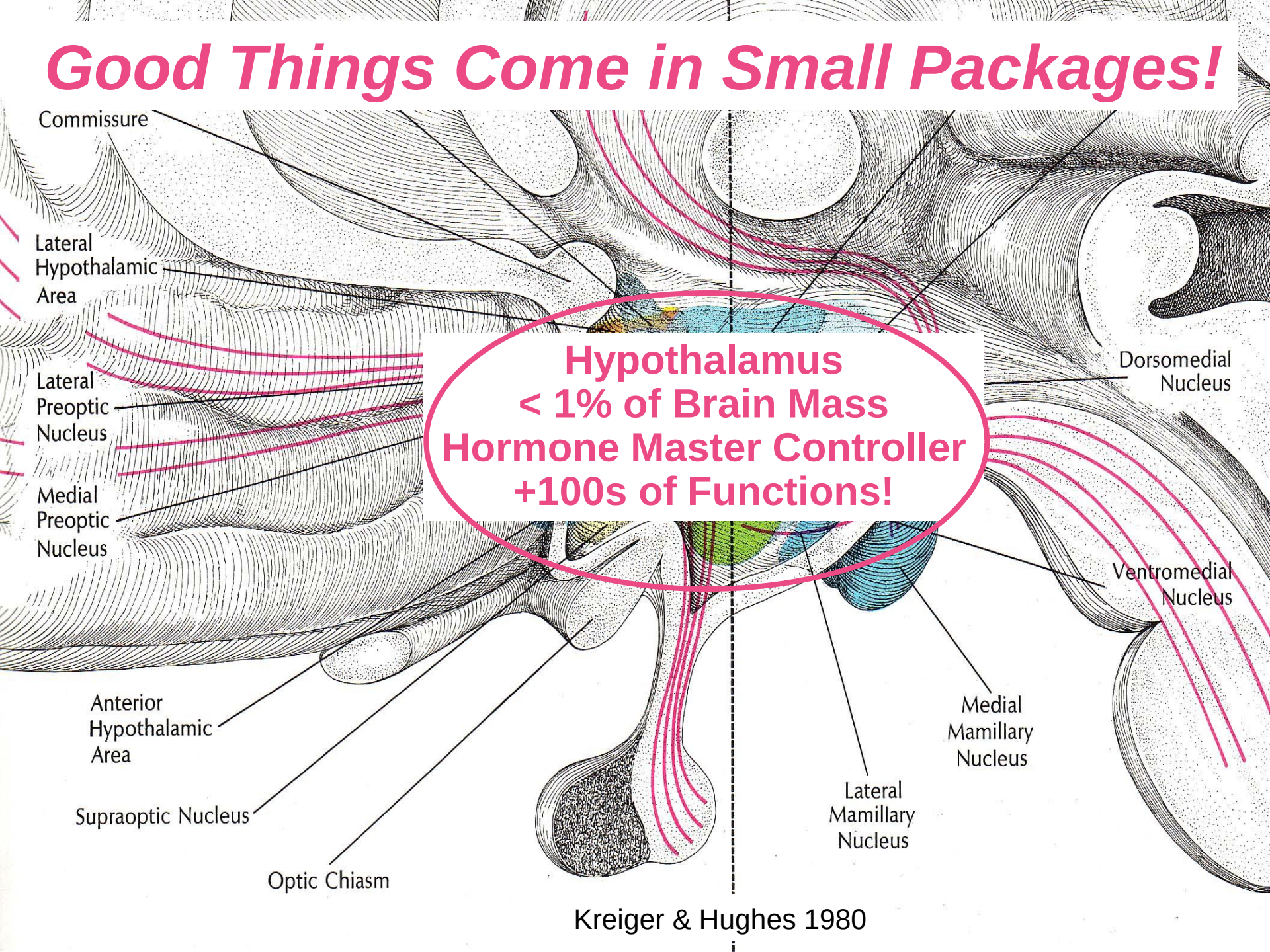


Hypothalamus & Pituitary: Intimate Relationship



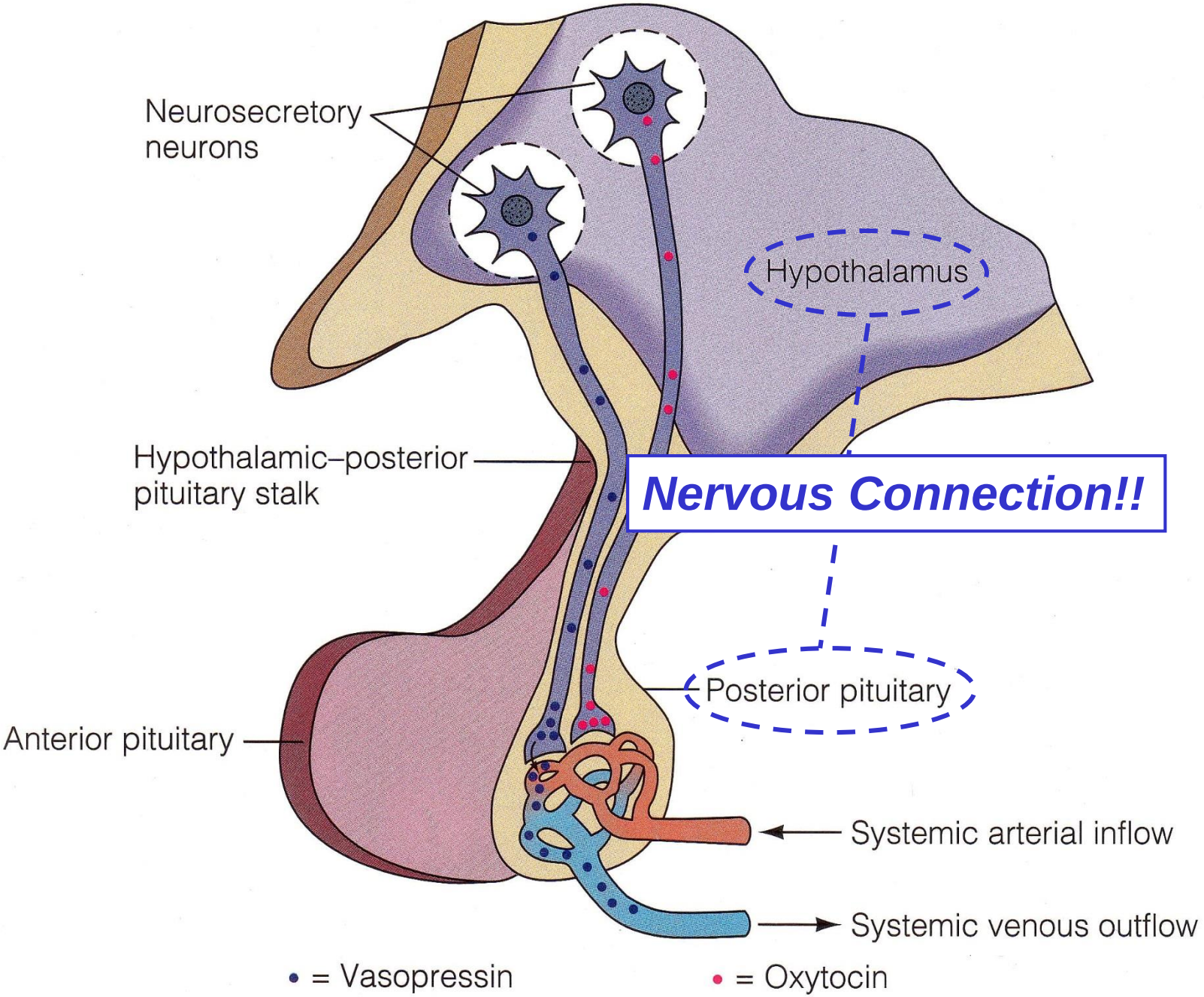
LS 2012 fig 17-3

Good Things Come in Small Packages!



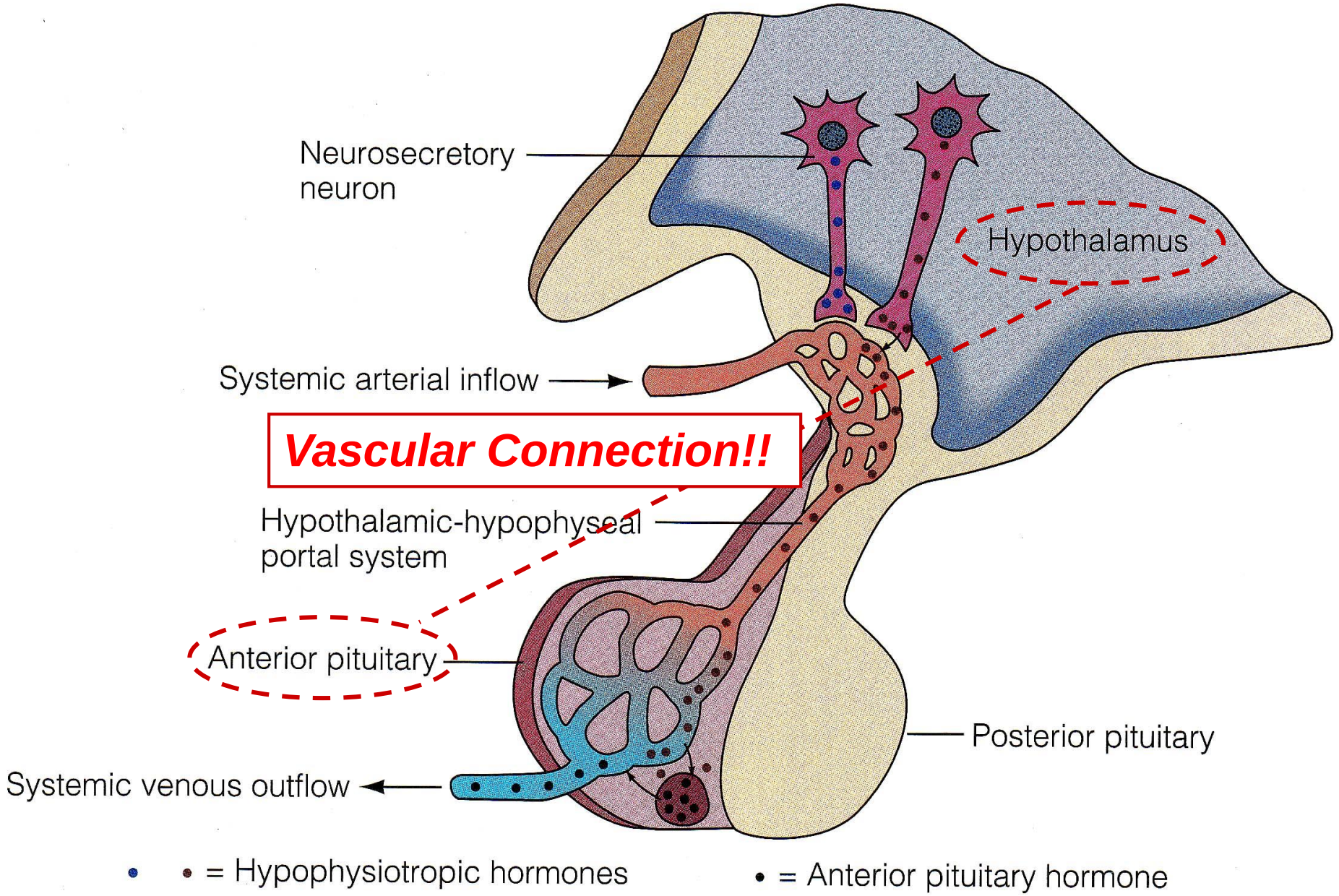
Hypothalamus
< 1% of Brain Mass
Hormone Master Controller
+100s of Functions!

Kreiger & Hughes 1980

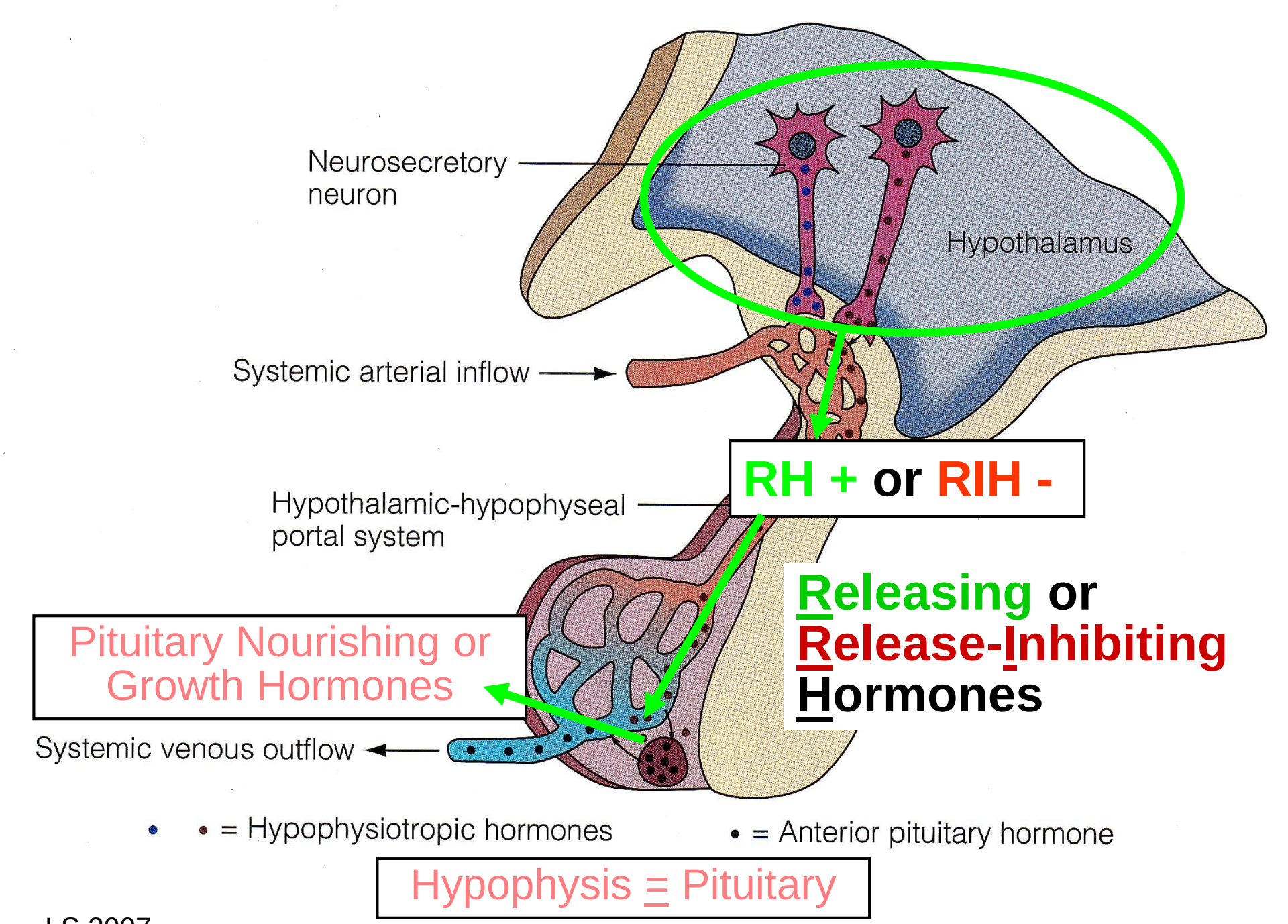

Neurosecretory neurons
Hypothalamus
Hypothalamic–posterior pituitary stalk
Nervous Connection!!
Posterior pituitary
Anterior pituitary
Systemic arterial inflow
Systemic venous outflow
• = Vasopressin
• = Oxytocin

LS 2007

Hypothalamus-Anterior Pituitary Vascular Connection!

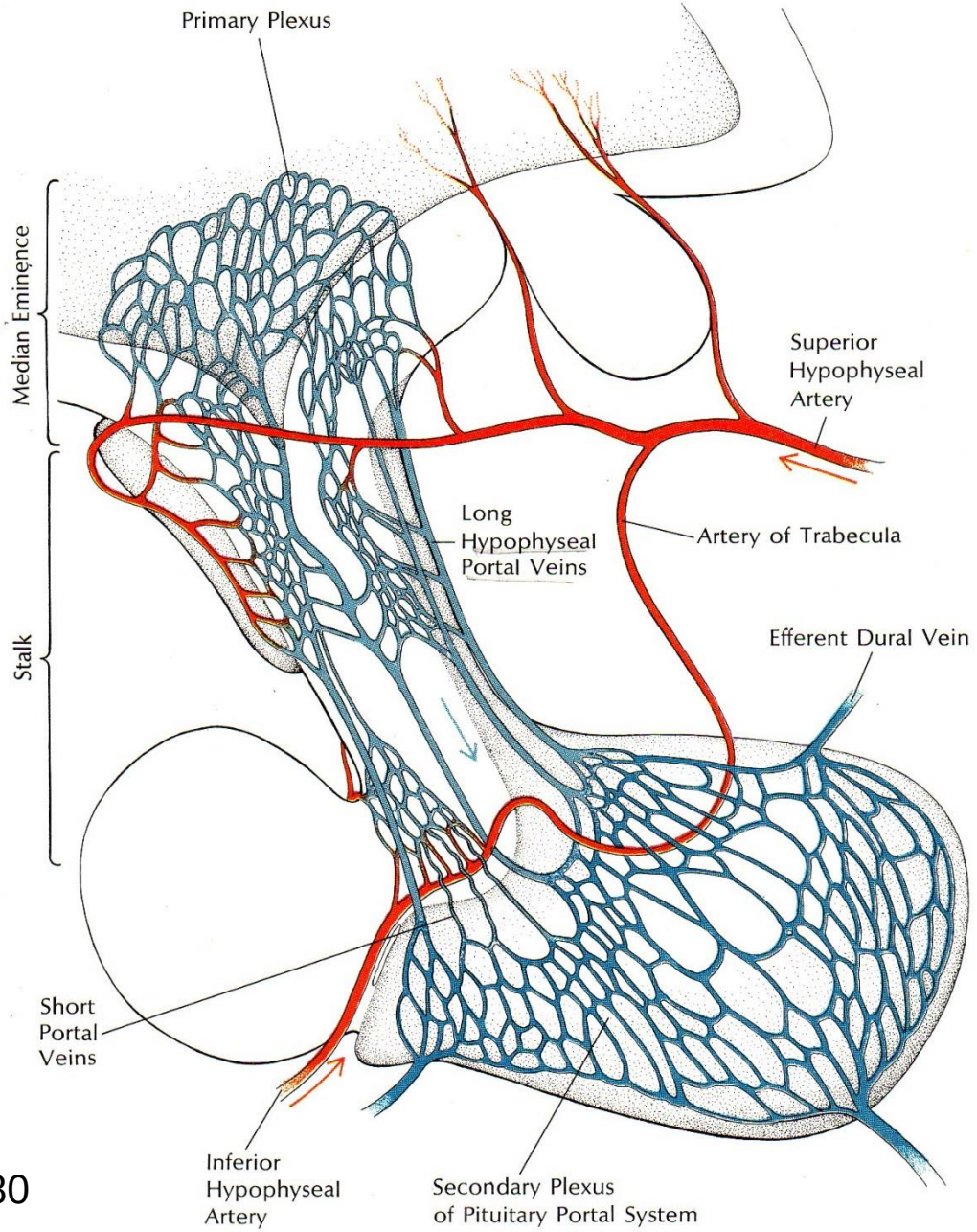


LS 2007

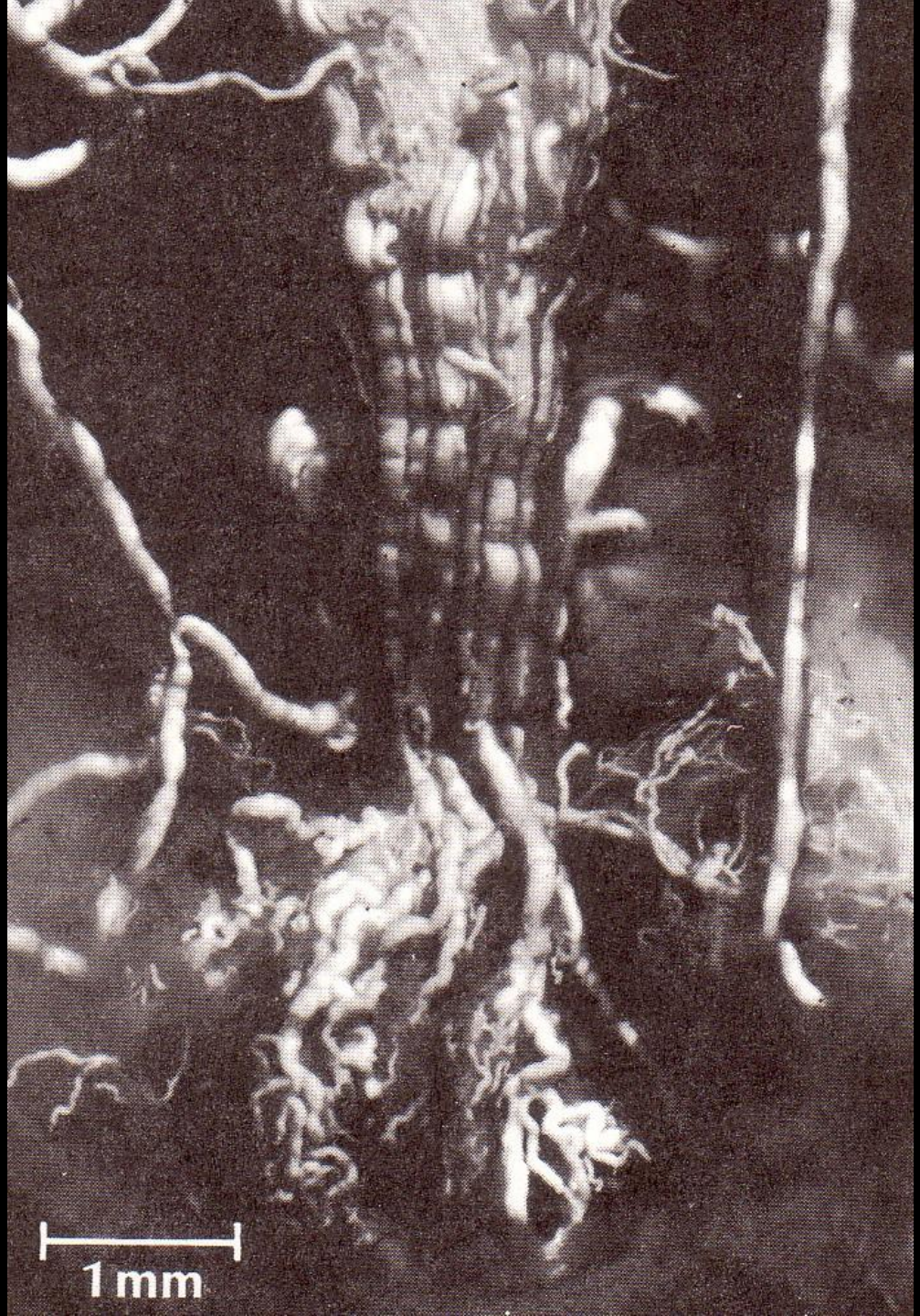

Neurosecretory neuron
Hypothalamus
Systemic arterial inflow
RH + or RIH -
Hypothalamic-hypophyseal portal system
Releasing or Release-Inhibiting Hormones
Pituitary Nourishing or Growth Hormones
Systemic venous outflow
• • = Hypophysiotropic hormones
• = Anterior pituitary hormone
Hypophysis = Pituitary

LS 2007

Capillary-Venule-Capillary Intimate Circulation

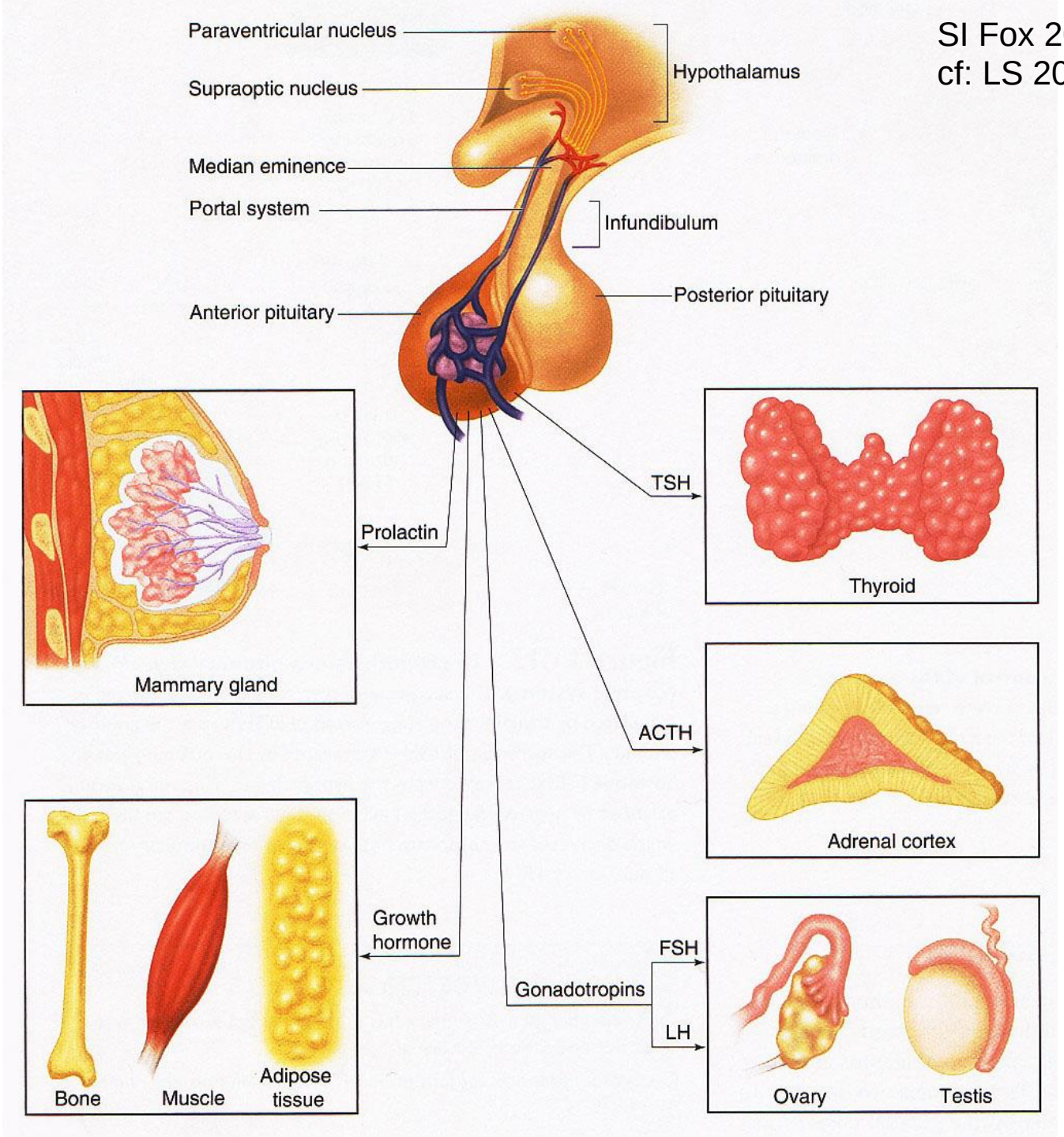


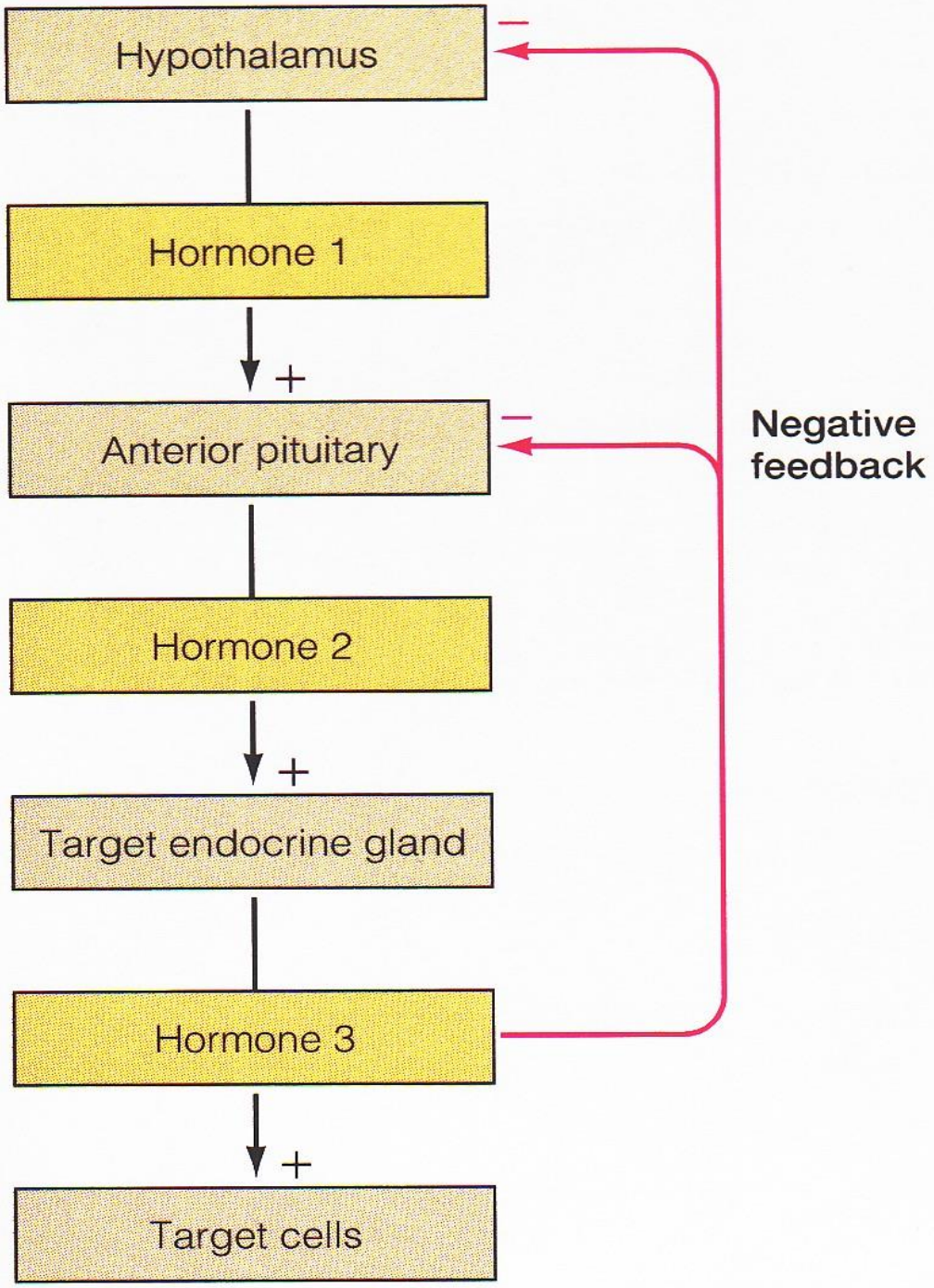
Krieger & Hughes 1980



Krieger & Hughes 1980

SI Fox 2008
cf: LS 2012 fig 17-5

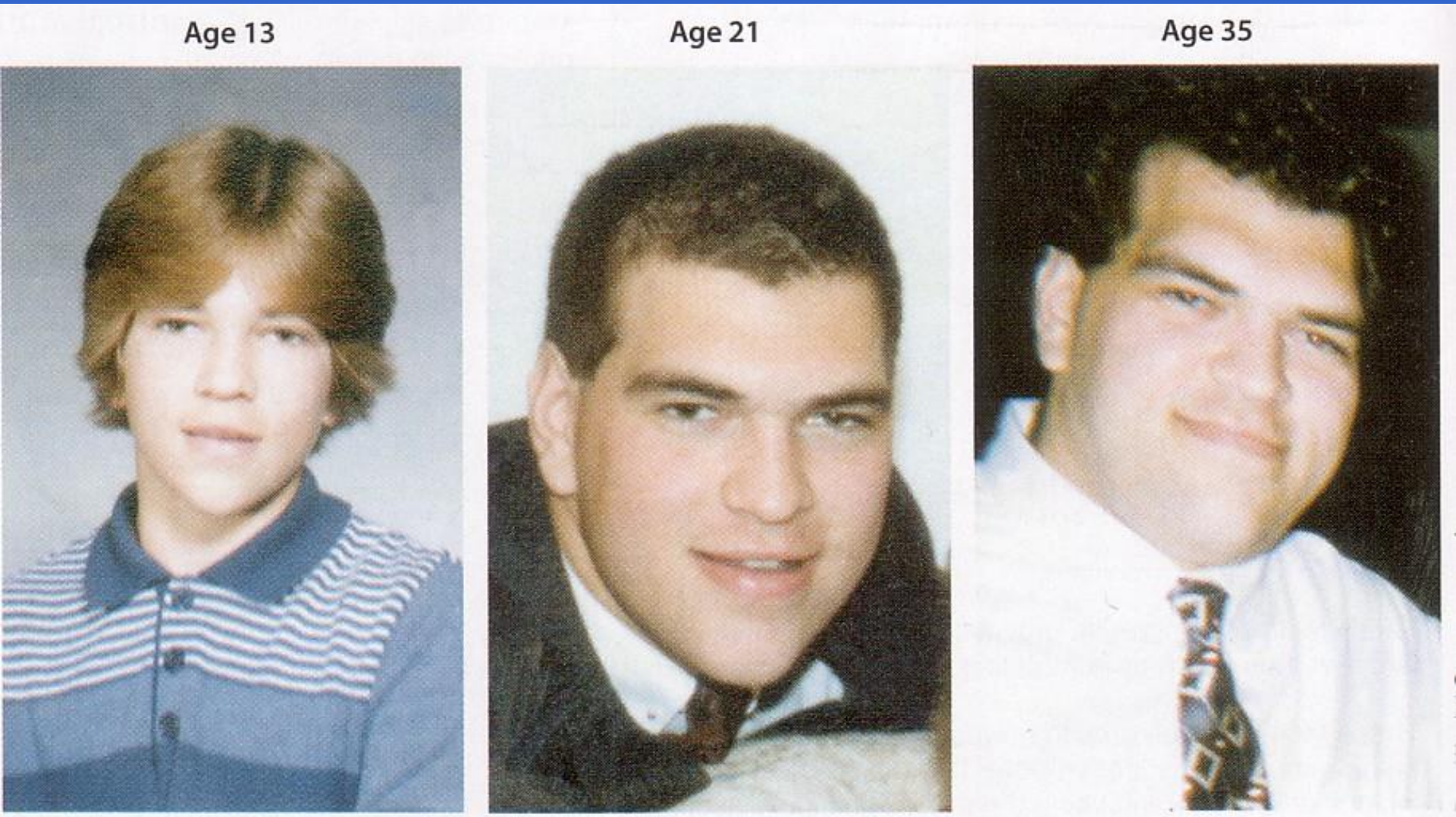



Hypothalamus
Hormone 1
+
Anterior pituitary
Hormone 2
+
Target endocrine gland
Hormone 3
+
Target cells
−
−
Negative feedback

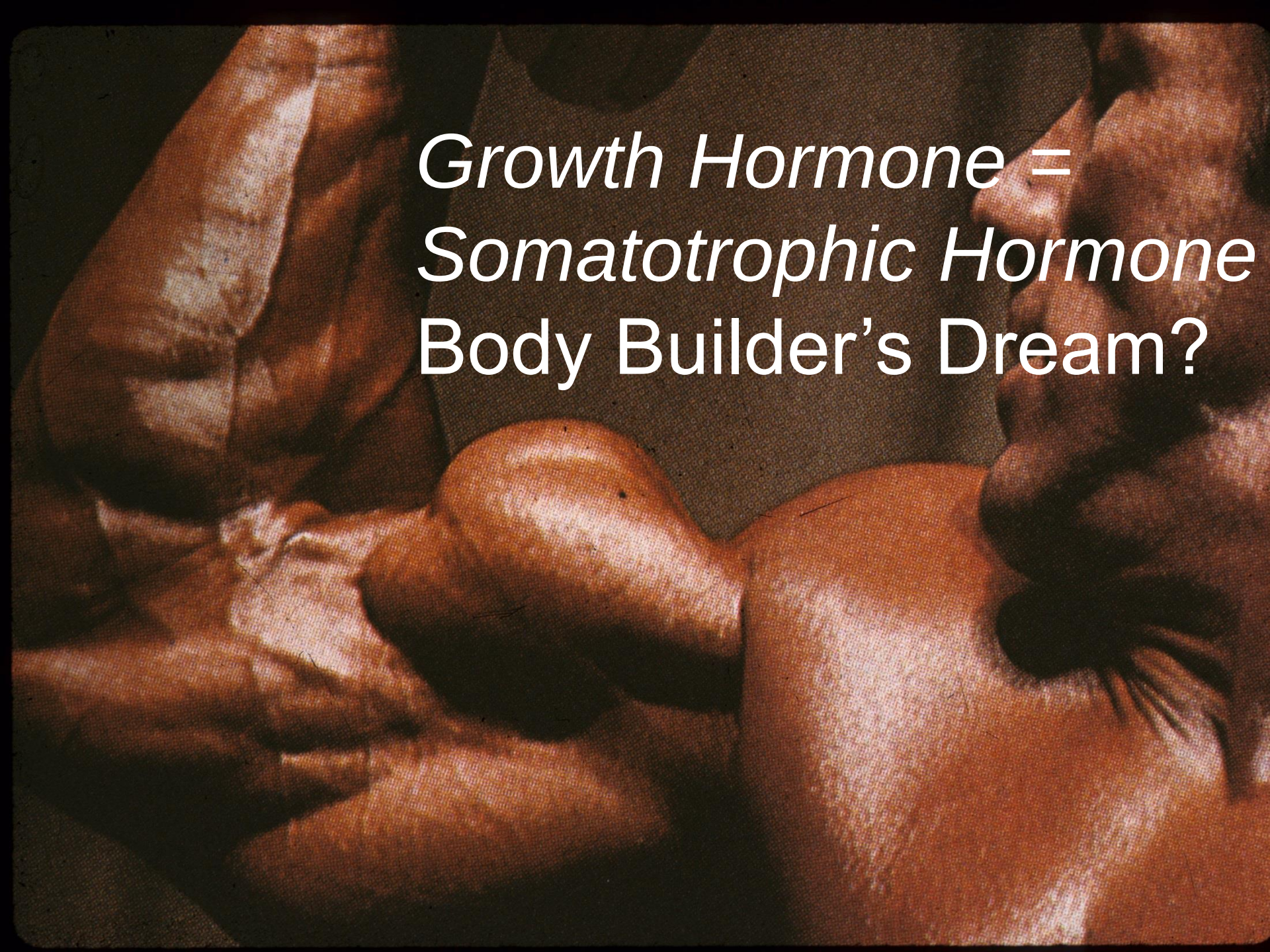
LS 1991

LS 2006, cf: LS 2012
fig 17-10

Progression & Development of Acromegaly



LS 2012 fig 17-11


Growth Hormone =
Somatotrophic Hormone
Body Builder's Dream?

GH/STH Effects: Insulin Resistance/Type II Diabetes?

↑ Amino Acid uptake & Protein synthesis

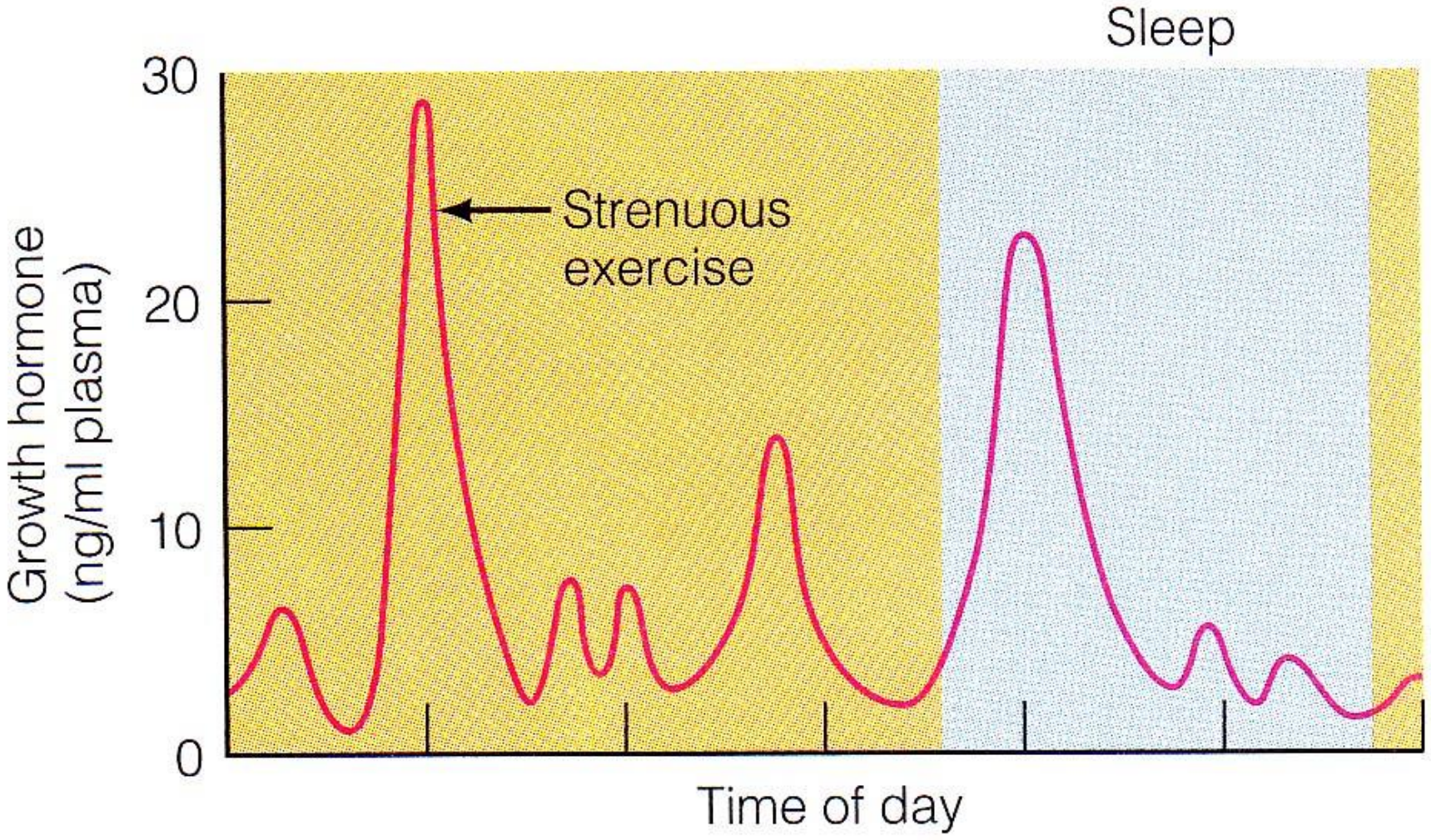
↑ Lipolysis & Fatty Acid mobilization

↓ Glucose uptake
(skeletal muscle & adipocytes)

↑ Glucose production
(liver glycogenolysis)

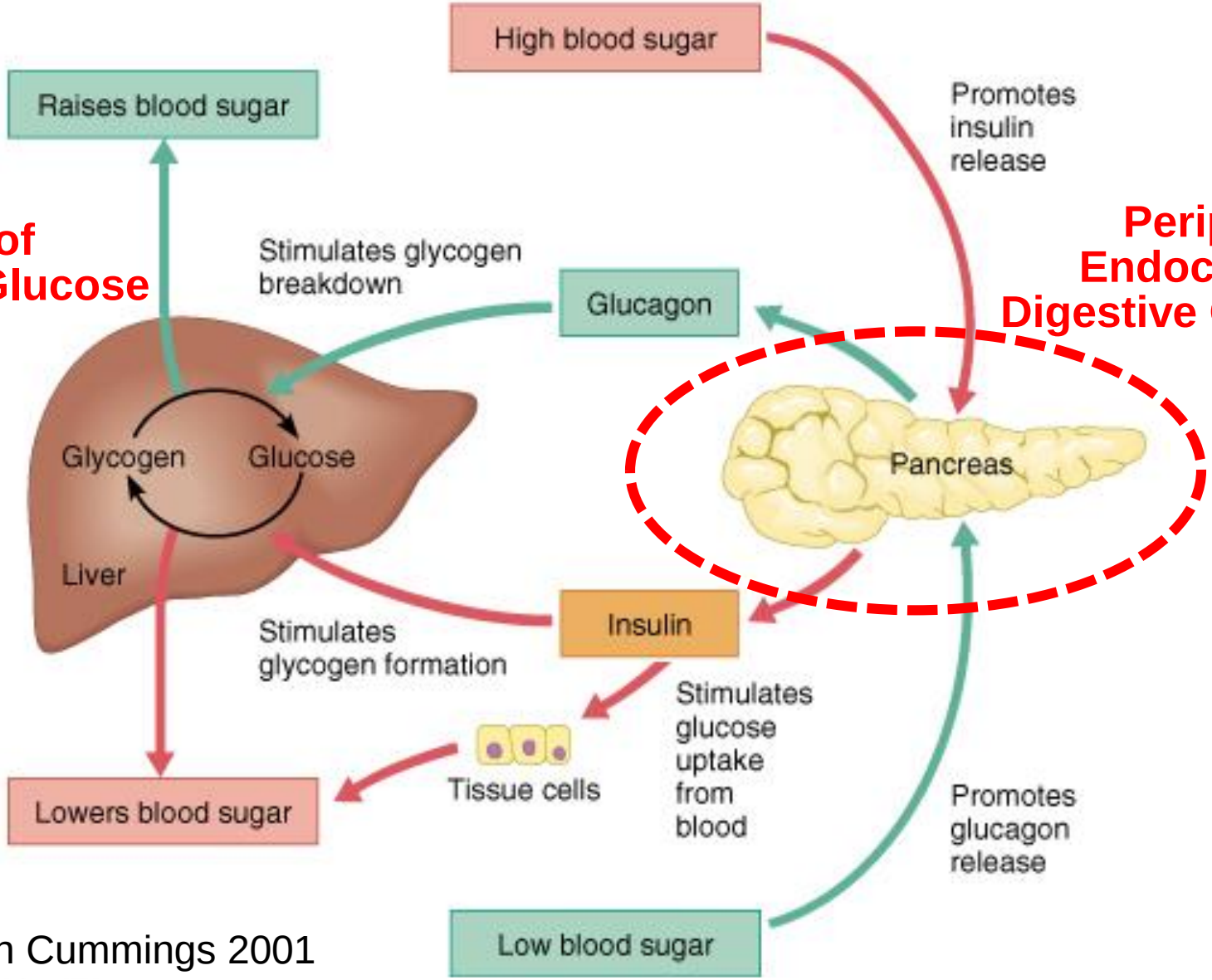
↑ Insulin secretion

Increase GH naturally with exercise & sleep!!



ng/ml = nanograms per mililiter

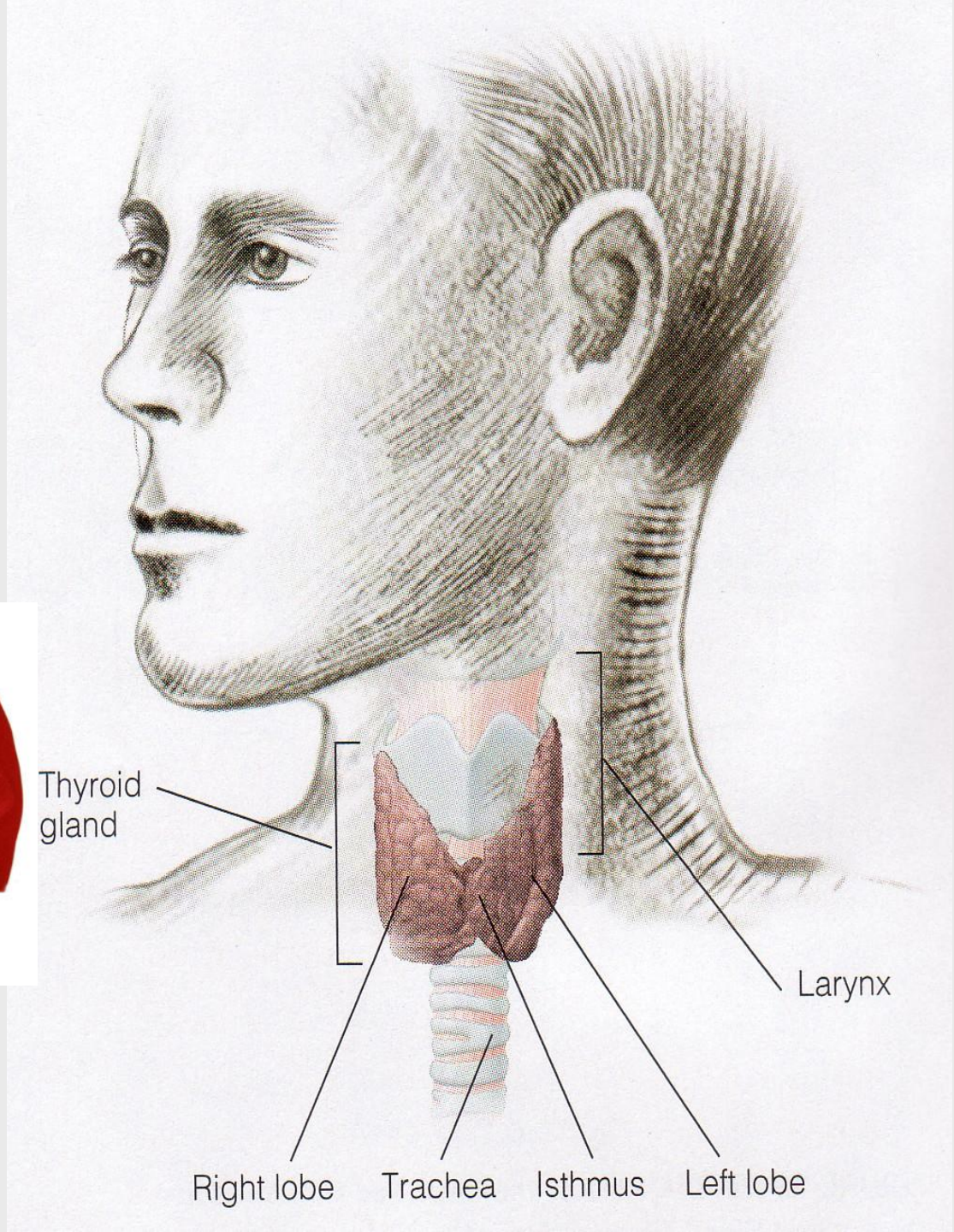
Insulin Stores Sugar, Glucagon Mobilizes Sugar!



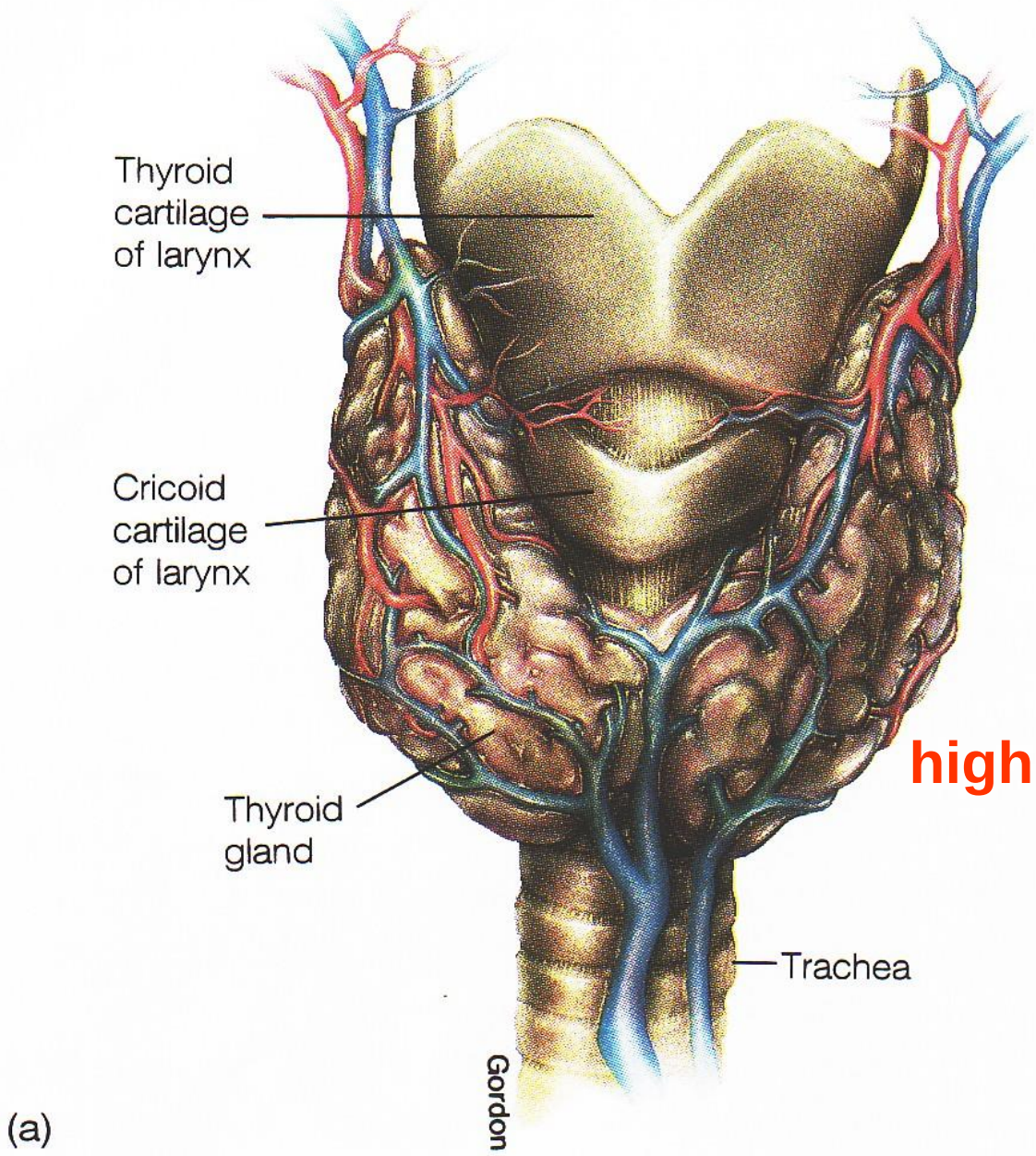
Benjamin Cummings 2001

https://www.youtube.com/watch?v=y9Bdi4dnSlg

https://www.fuseschool.org



DC 2003



Thyroid → **metabolism**
highly vascularized

https://ed.ted.com/lessons/how-does-the-thyroid-manage-your-metabolism-emma-bryce

DC 2003


DC 2003

LS 2012 fig 17-16

LS 2012 fig 17-17

Guyton & Hall 2000

Adrenals/Suprarenals

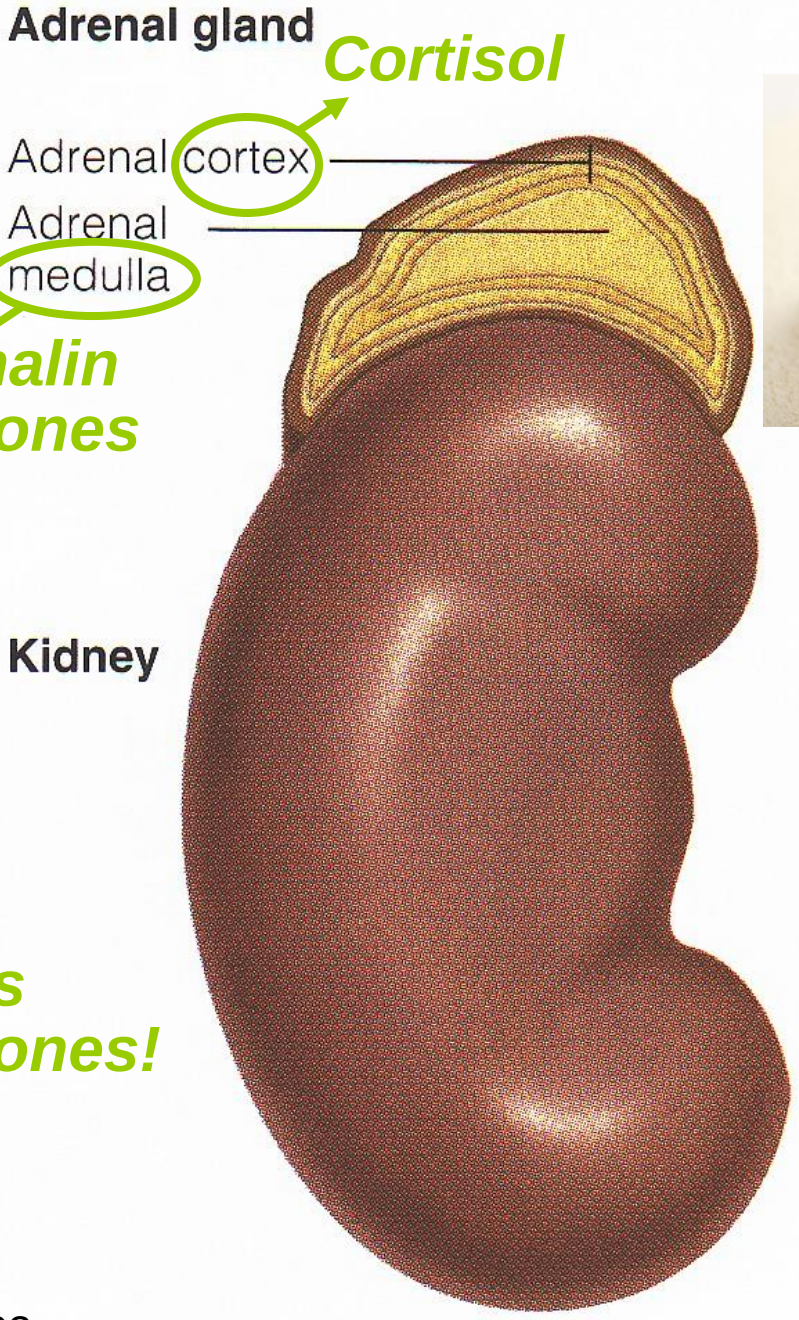
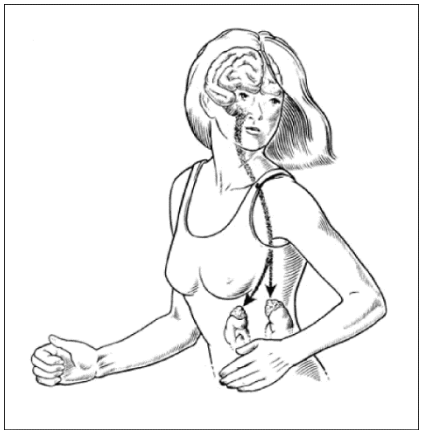


FIGURE 13-12
Adrenal Gland The adrenal glands sit atop the kidney and consist of an outer zone of cells, the adrenal cortex, which produces a variety of steroid hormones, and an inner zone, the adrenal medulla. The adrenal medulla produces adrenalin and noradrenalin.

BI 121!!

Epinephrine 80%

Norepinephrine 20%



Guyton & Hall 2000

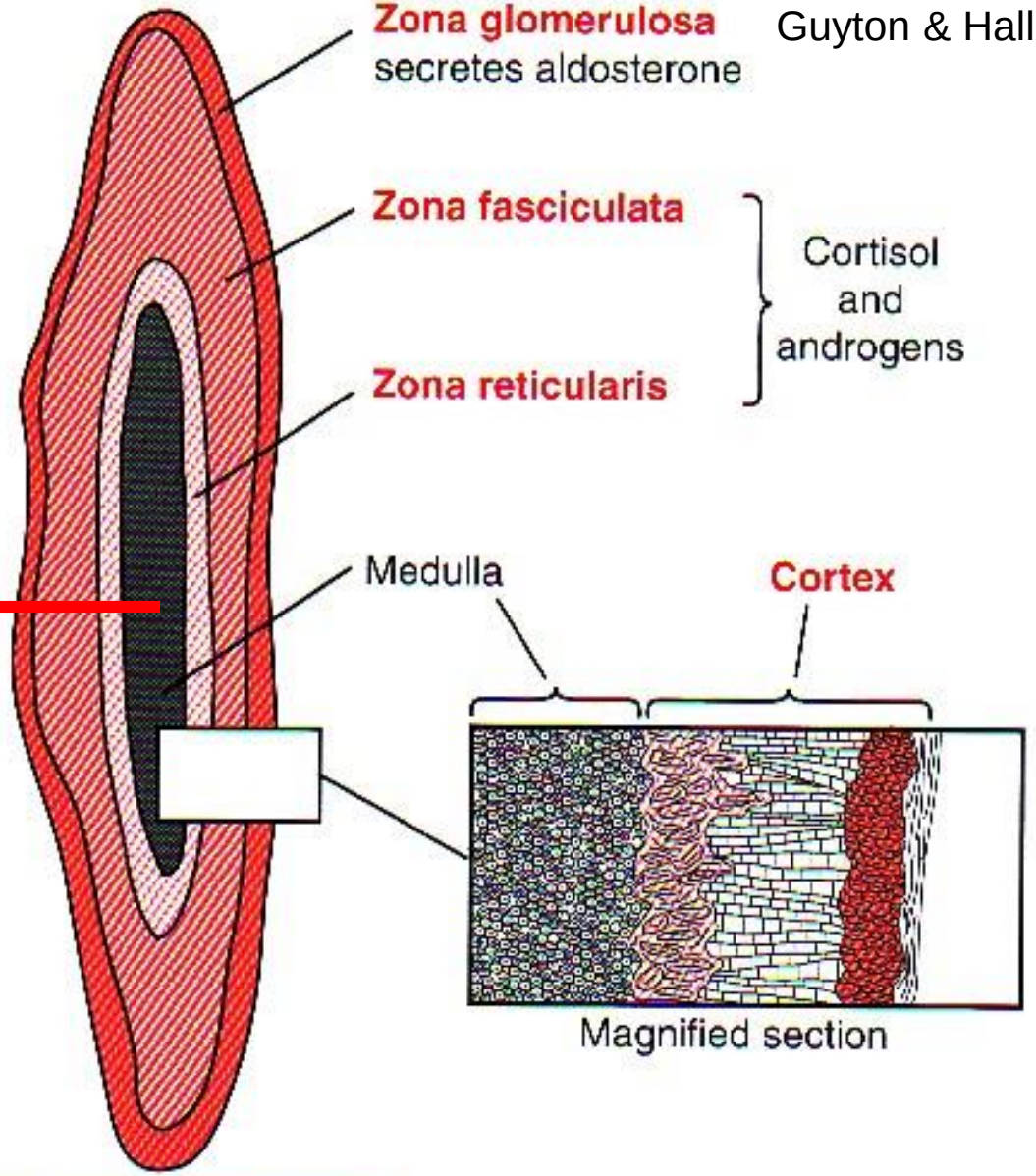
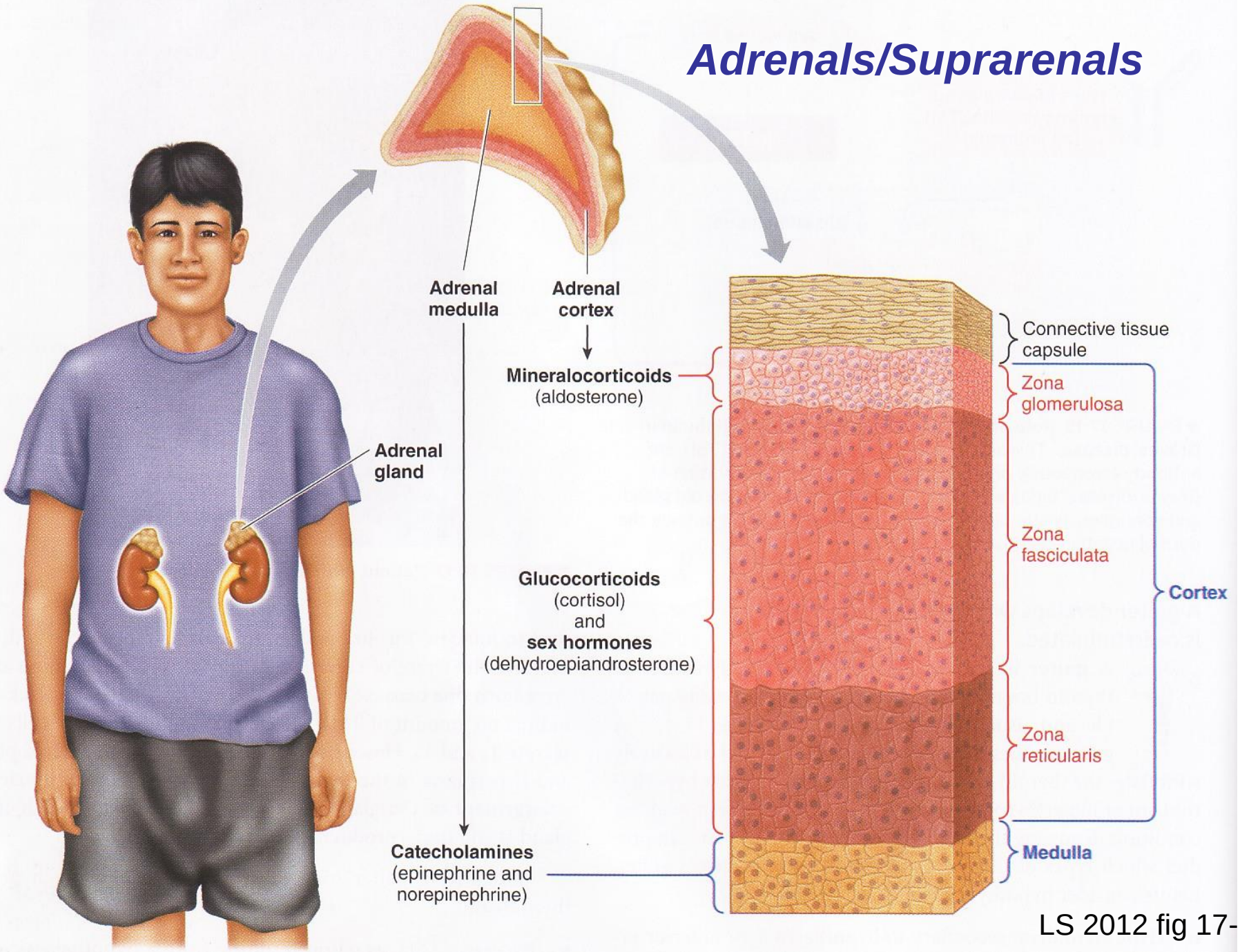


FIGURE 77–1

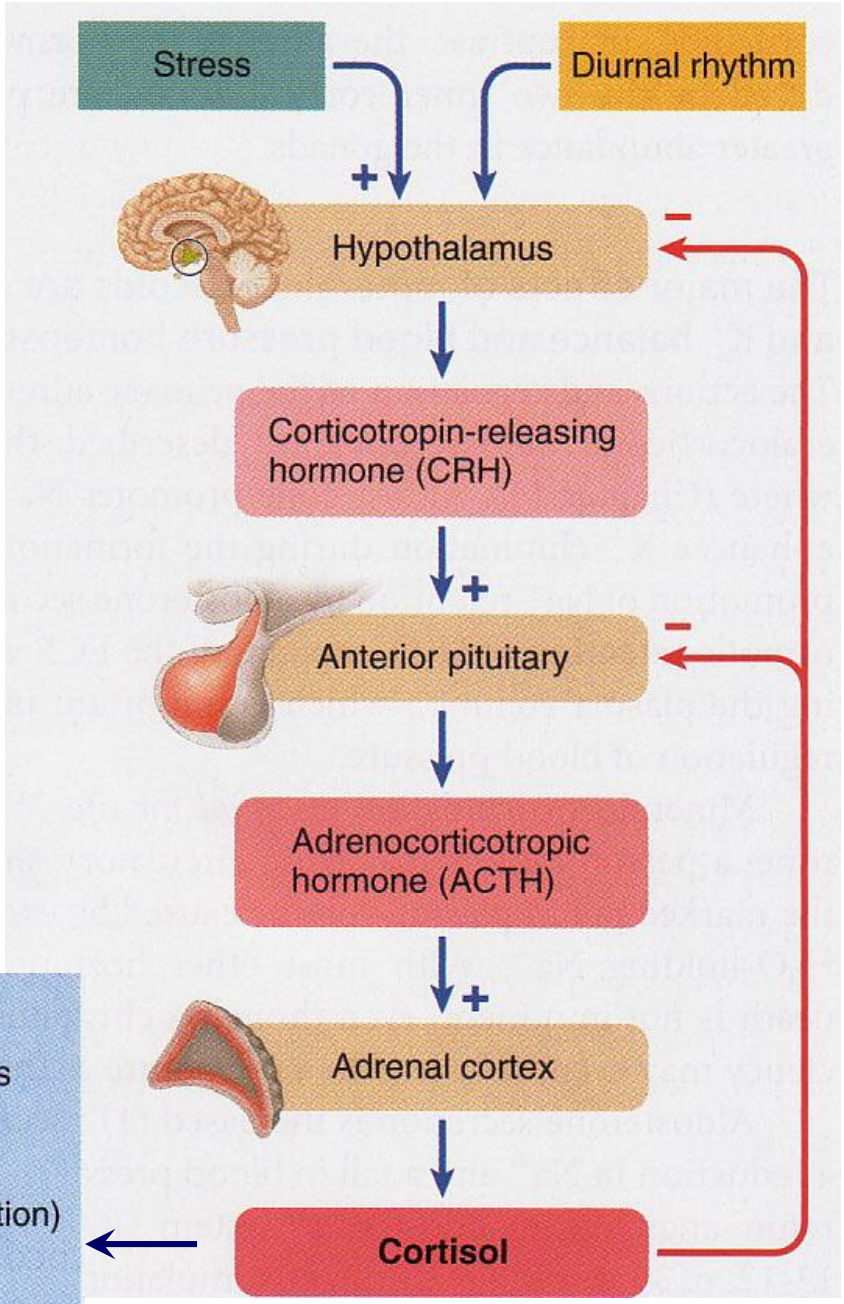
Secretion of adrenocortical hormones by the different zones of the adrenal cortex.

Adrenals/Suprarenals



LS 2012 fig 17-18

Stress Promotes Cortisol Secretion



Metabolic fuels and building blocks available to help resist stress

- ↑ Blood glucose (by stimulating gluconeogenesis and inhibiting glucose uptake)
- ↑ Blood amino acids (by stimulating protein degradation)
- ↑ Blood fatty acids (by stimulating lipolysis)

LS 2012 fig 17-19

Questions + Discussion