

BI 121 Lecture 10




...This Thursday more fun & data about me! Heck yeah!!

- I. Announcements** To make Lab 5 educational, fun & safe for all, **please read pp 5-1 thru 5-6 in LM twice before Thursday!** Remaining exams & notebooks returned > lecture. Key posted in glass box in Huestis near 120 HUE. Estimate grade? Q?
- II. Blood Chemistry Connections** LS ch 11 p 303, ch 17 pp 525-36
Erythroblastosis fetalis, diabetes, insulin, glucagon
- III. Endocrinology Overview** LS ch 17, DC Module 13, SI Fox+
 - A. Vignette: Cushing's syndrome LS fig 17-20 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 (insulin – glucagon see-saw!) 2. Thyroid 3. Adrenals

  ...I ♥ U of O!

Students who succeed are usually those who:

- (1) **Attend** class regularly 
- (2) **Ask** questions
- (3) **Come** to office hours & problem-solving sessions
- (4) **Study** outside class both alone & in study groups
- (5) **Seek** to understand methods & overarching principles/concepts rather than specific answers
- (6) **Teach** or tutor others &
- (7) **Discuss** concepts informally with fellow students.

Science Teaching Reconsidered, National Academy Press, 1997.

Q? What do I need on the final, if I want to get...?

A? You can actually calculate given assumptions...

e.g., 62 for Exam I & desire $\geq B-$ (assume ≥ 80)

**Assume 100% for lecture (20% of grade)
+ lab attendance & participation (20% of grade!)**

$$X = [\text{Hope for? } 80 - ((0.3 \times \text{Exam I } 62) + (0.2 \times \text{Lecture } 100) + (0.2 \times \text{Lab } 100))]/0.3$$

$$X = [80 - [(18.6) + (20) + (20)]]/0.3$$

$$X = [21.4]/0.3 = 71.3$$

Need this on Exam II for B- for course!

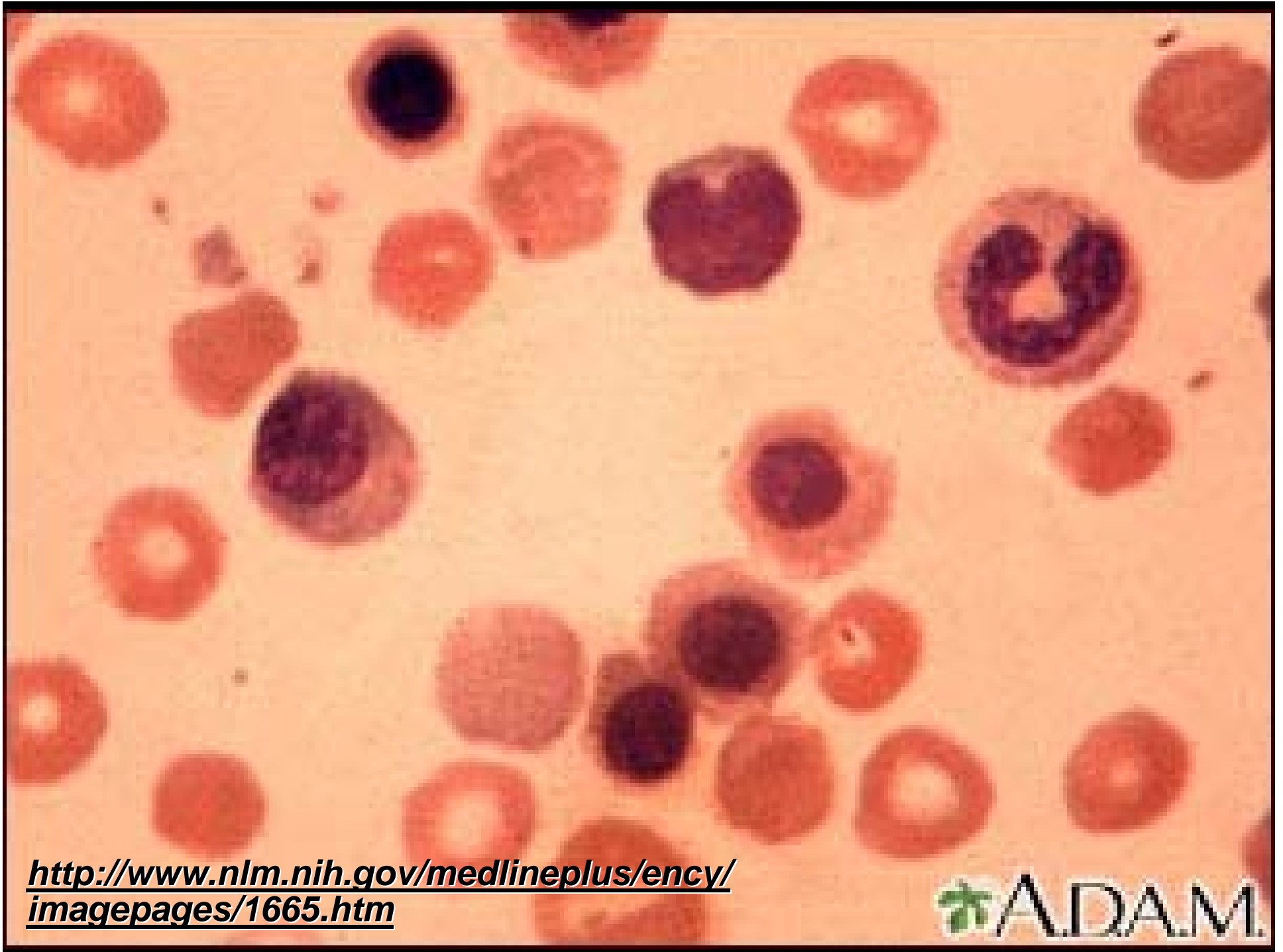


...Fortunately, the lab buffers the grade!

Erythroblastosis Fetalis?

***e.g., Rh- mom
Rh+ baby***

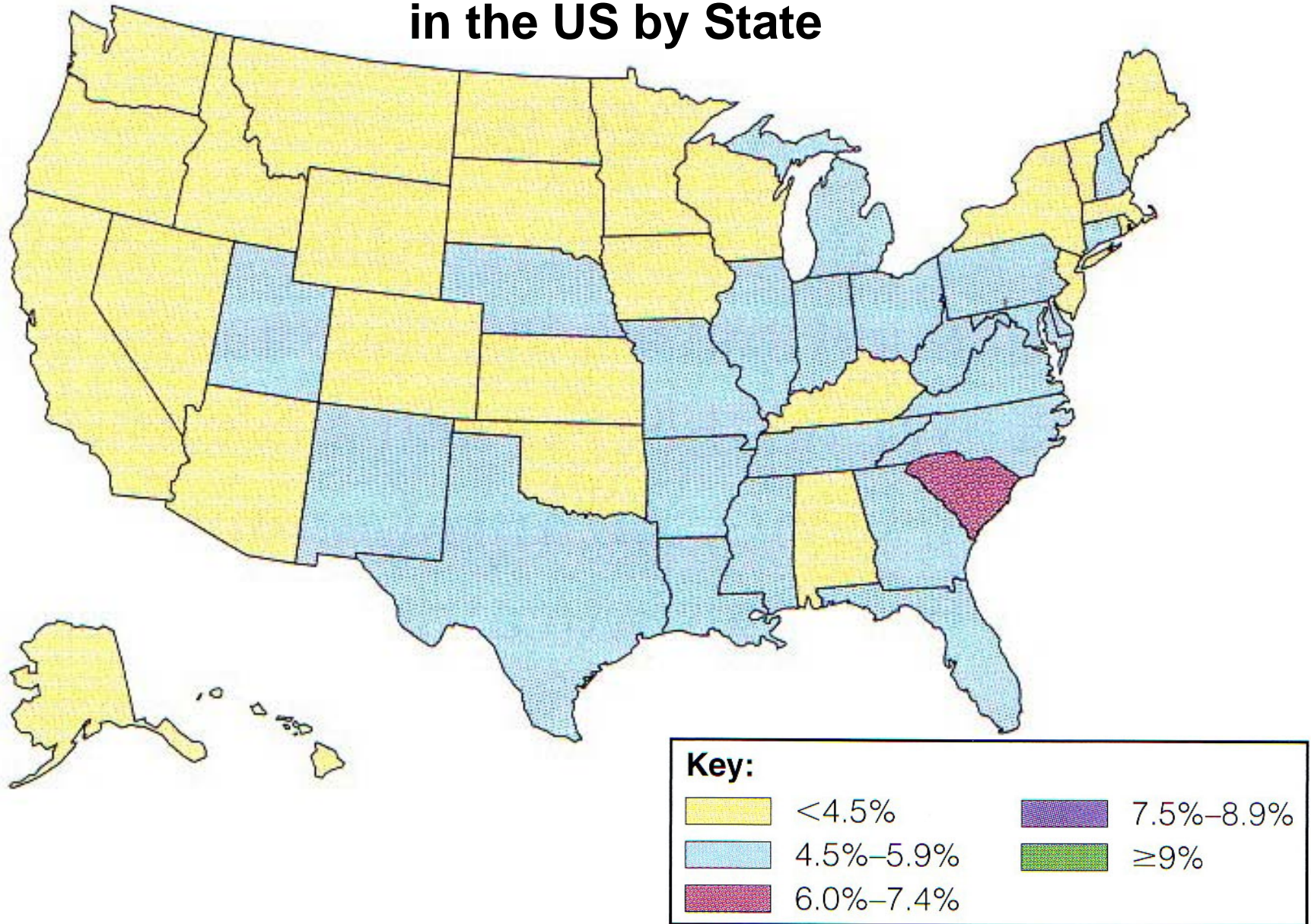
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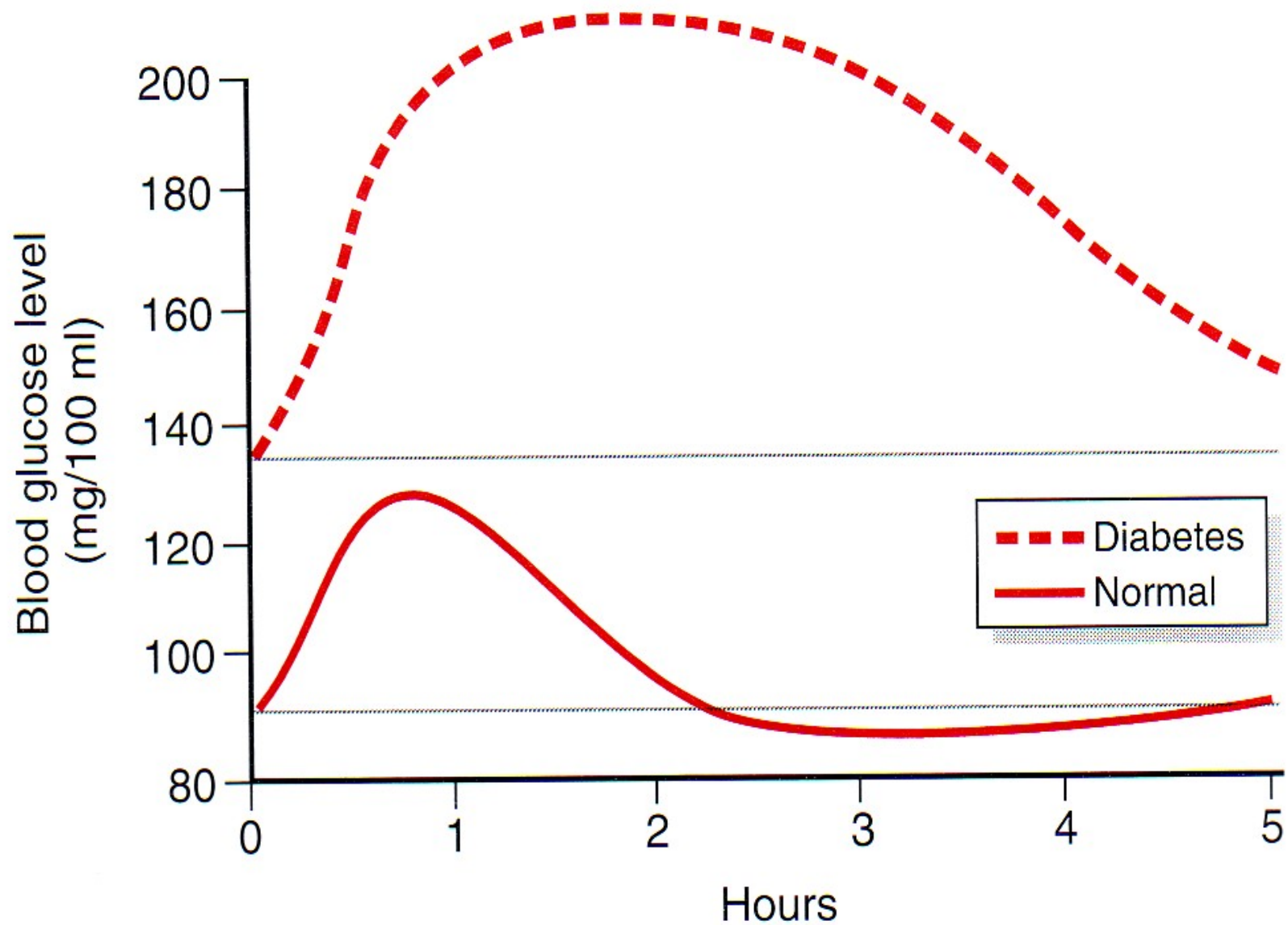
 ADAM

1994 Diabetes Prevalence in the US by State



Source: Centers for Disease Control, Division of Diabetes Translation,
<http://www.cdc.gov/diabetes/statistics>, S&W 2014 fig 4-15 p139A.

Diabetic & Normal Response to Glucose Load



Glucose:
Sugar in Blood



Normal: 70-99

Pre-Diabetes: 100-125

Diabetes: ≥ 126 mg/dL

Proinsulin with C-Connecting Peptide

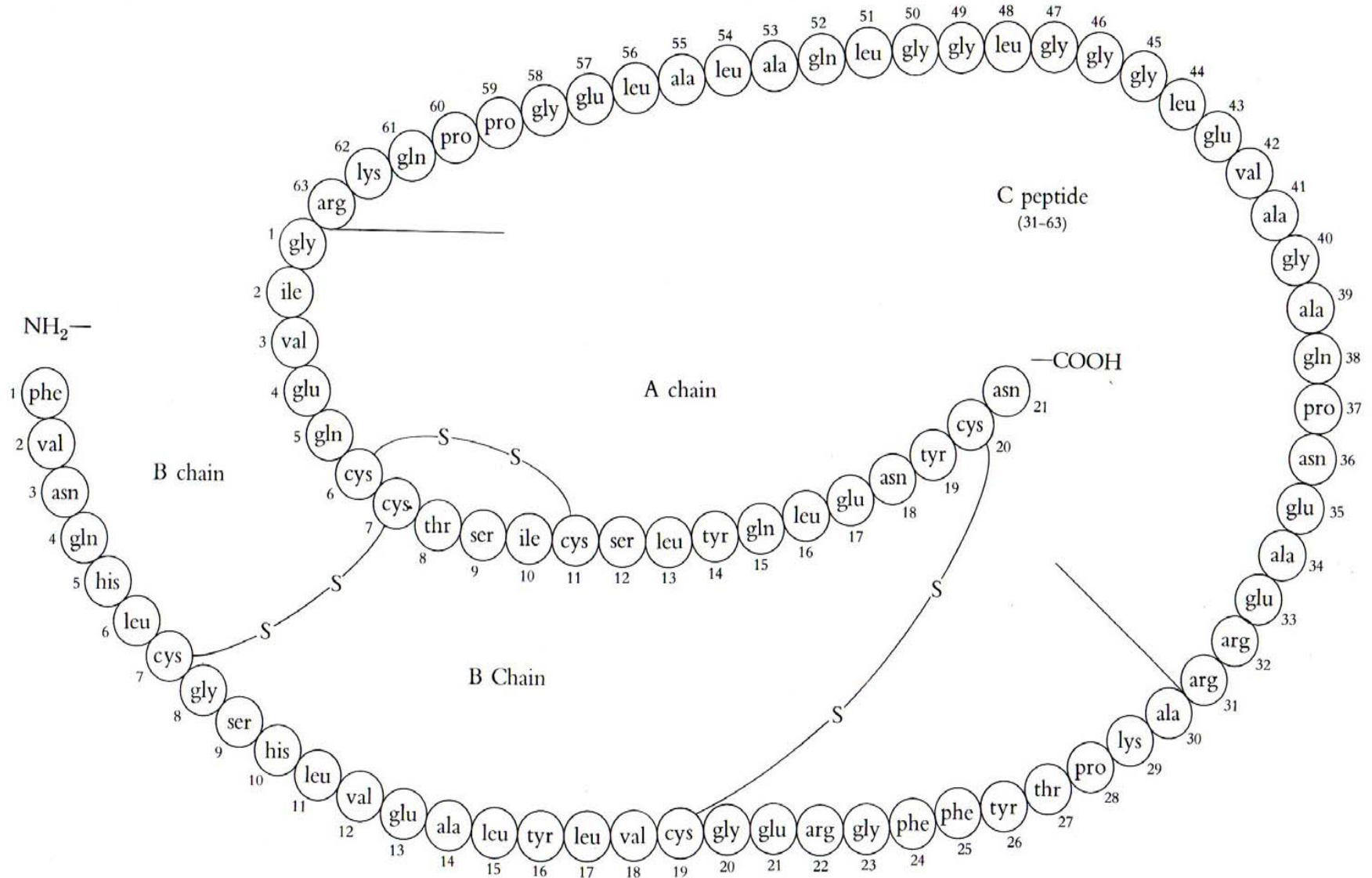
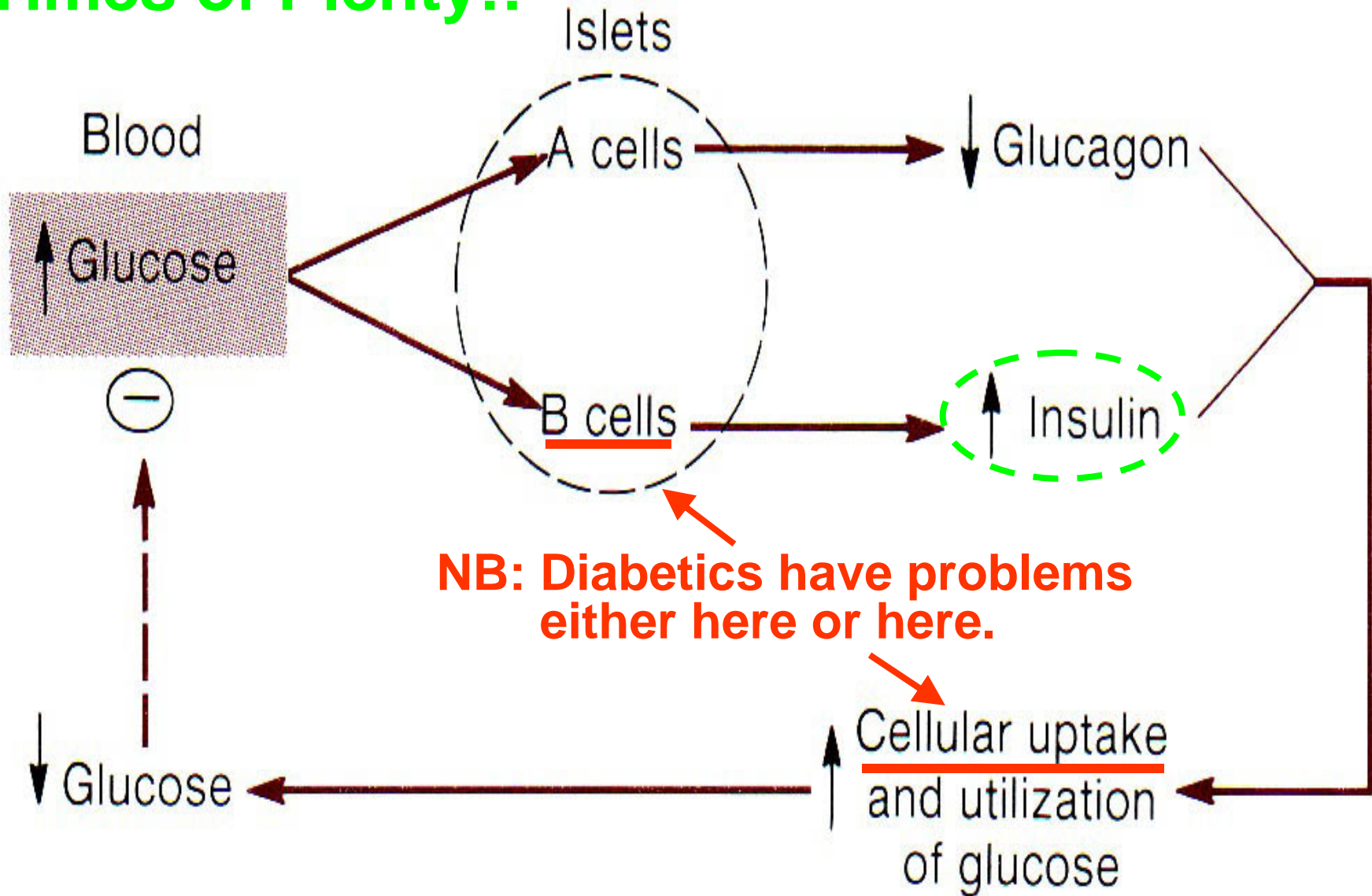
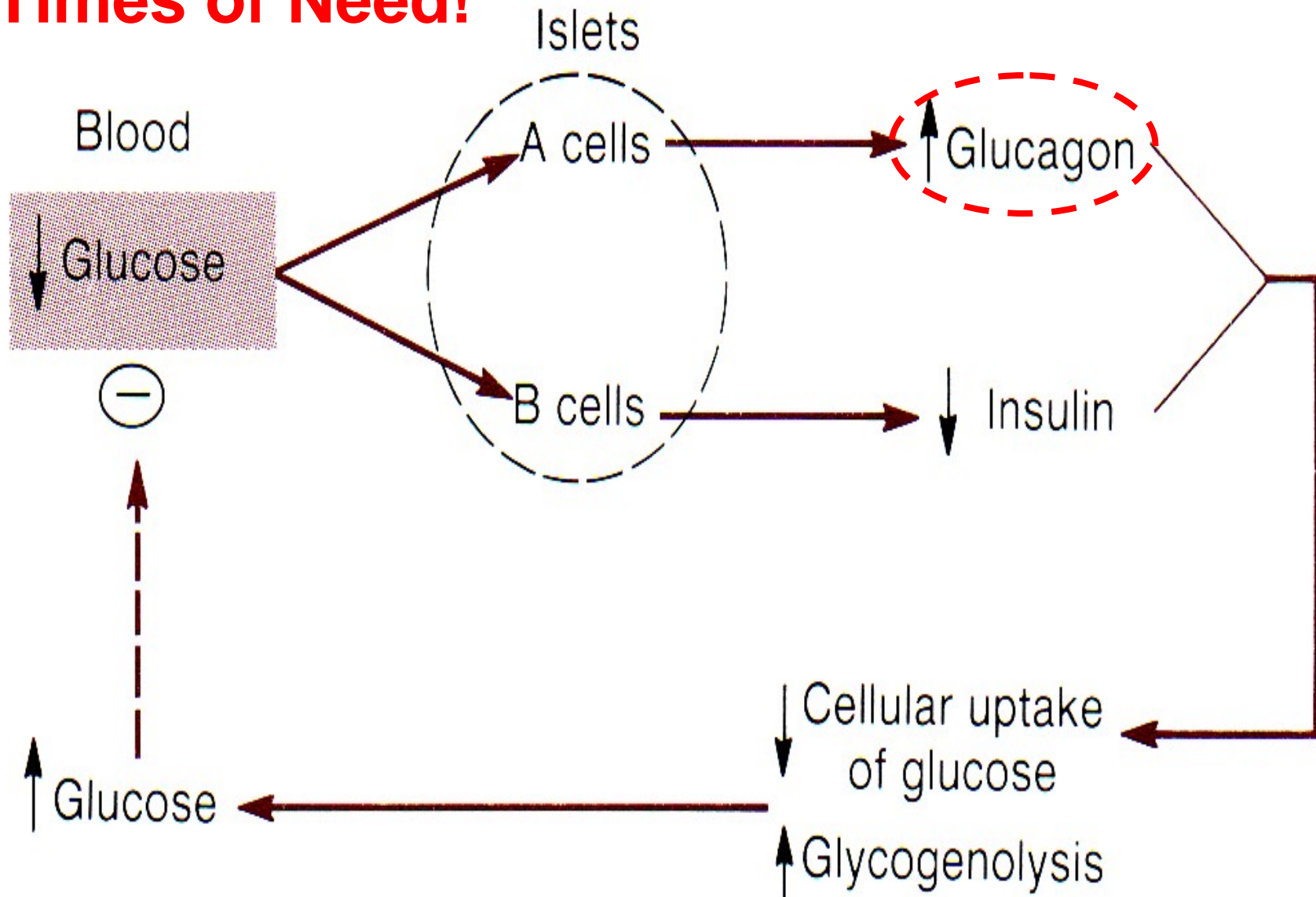


FIG. 10-4. Amino acid sequence of a mammalian proinsulin molecule. Note how the insulin molecule can be formed by cleaving this polypeptide chain at two locations to liberate the C peptide.

Times of Plenty!!



Times of Need!



Mobilize!!

Table 4–8

Type 1 and Type 2 Diabetes Compared

	Type 1	Type 2
Percentage of cases	5–10%	90–95%
Age of onset	<30 years	>40 years ^a
Associated characteristics	Autoimmune diseases, viral infections, inherited factors	Obesity, aging, inherited factors
Primary problems	Destruction of pancreatic beta cells; insulin deficiency	Insulin resistance, insulin deficiency (relative to needs)
Insulin secretion	Little or none	Varies; may be normal, increased, or decreased
Requires insulin	Always	Sometimes
Older names	Juvenile-onset diabetes Insulin-dependent diabetes mellitus (IDDM)	Adult-onset diabetes Noninsulin-dependent diabetes mellitus (NIDDM)

Table 4–9

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

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!



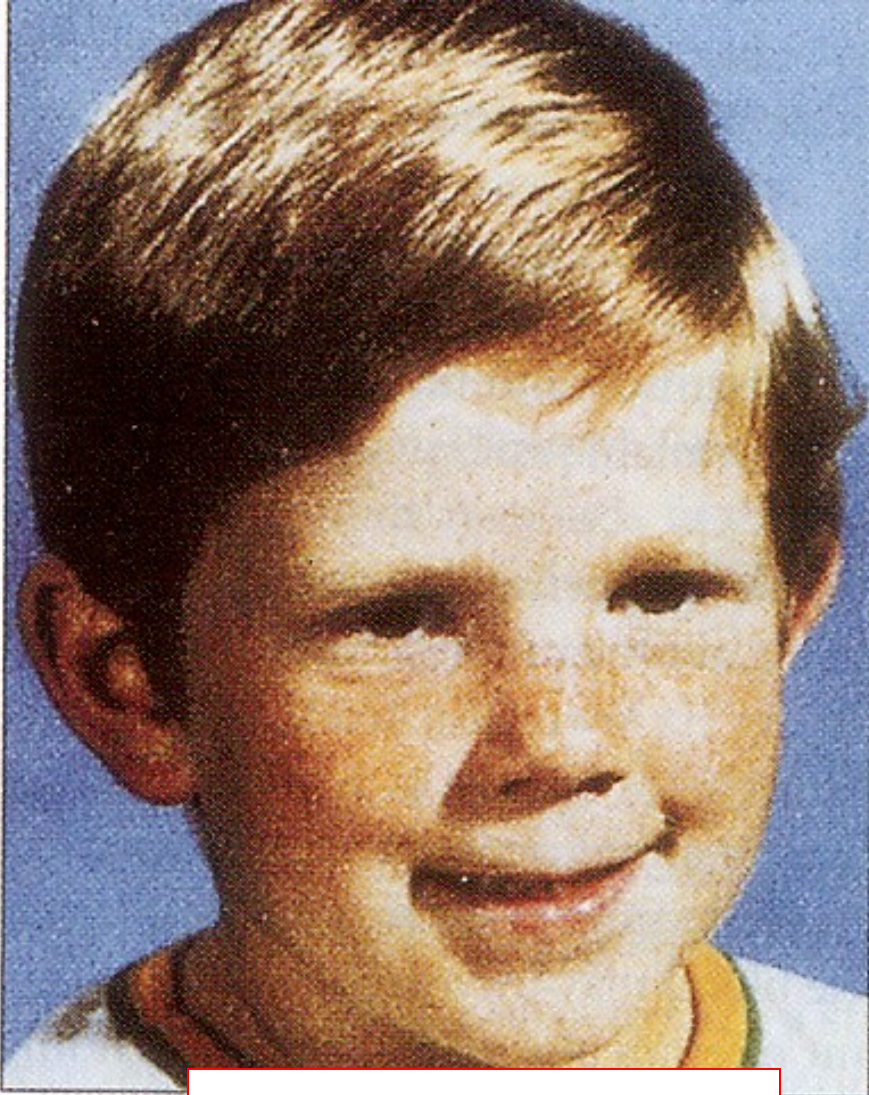
***Exercise is a must based on
its insulin-like effect!***



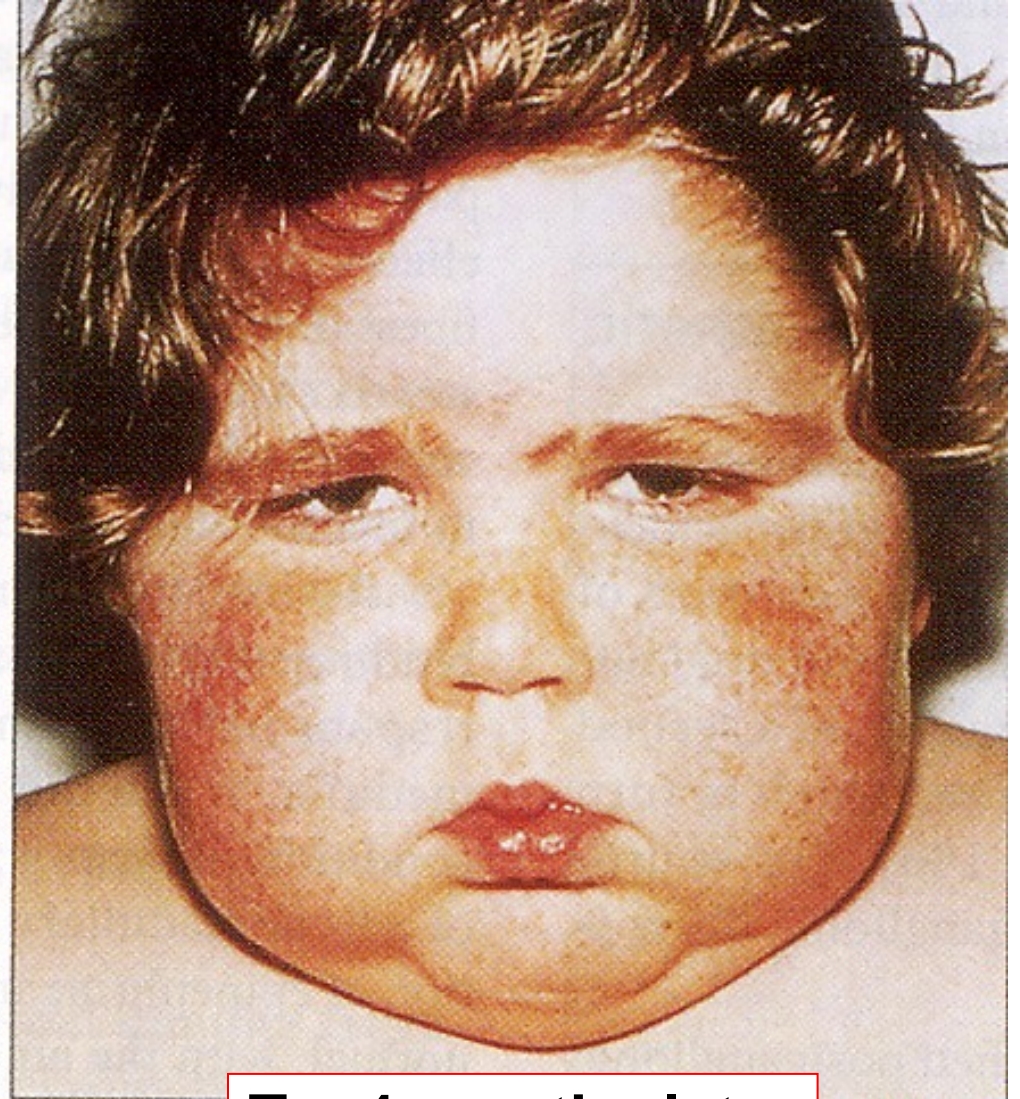
TIME OUT



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



T = 0, near normal

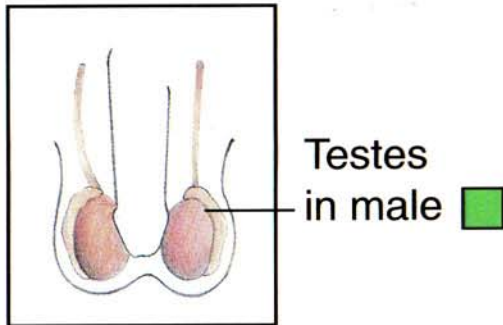
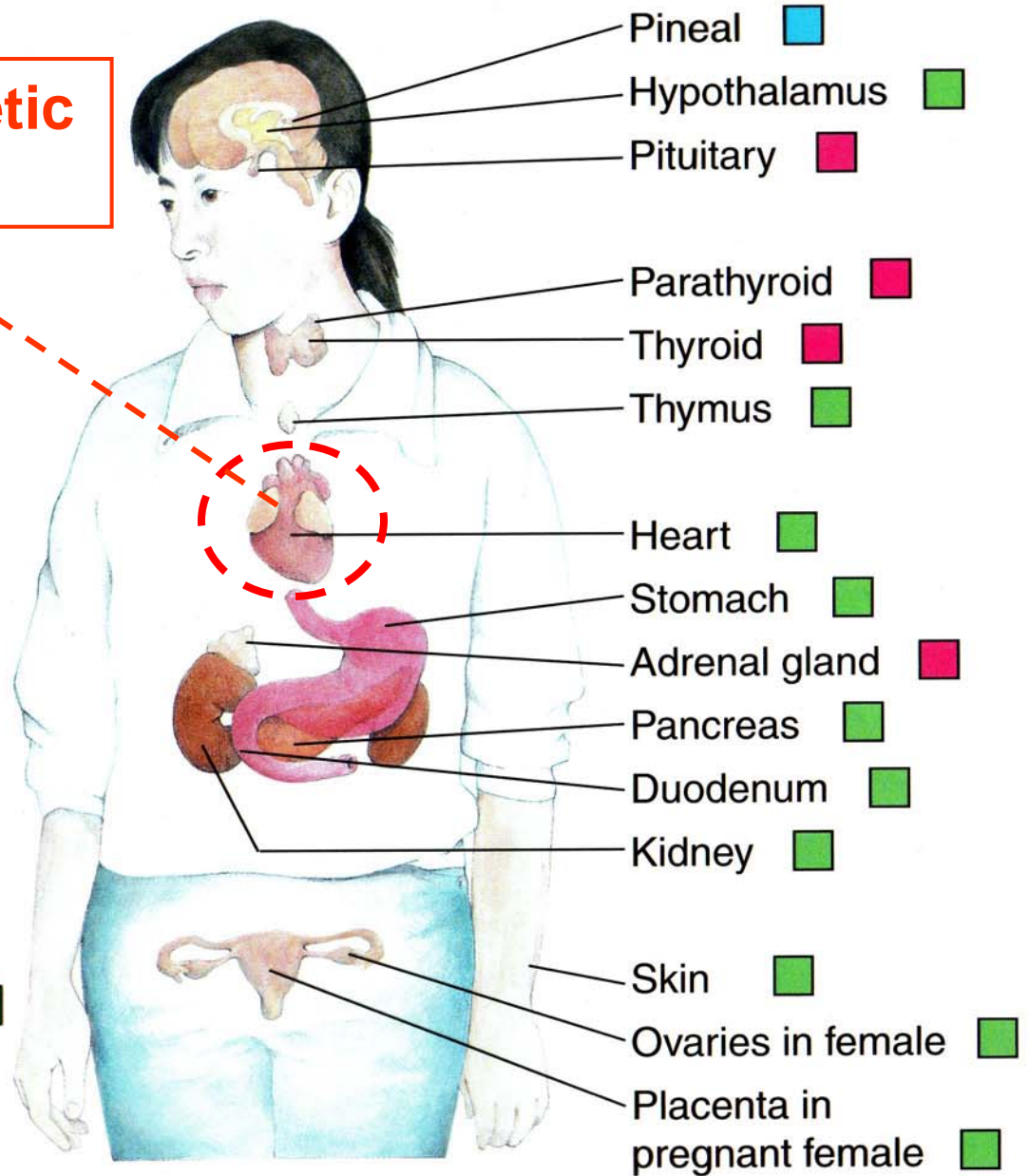


T = 4 months later

Endocrine System

ANP = Atrial Natriuretic Polypeptide

- Solely endocrine function
- Mixed function
- Complete function uncertain

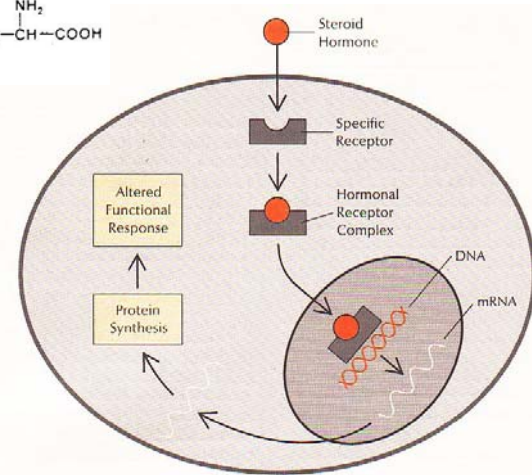
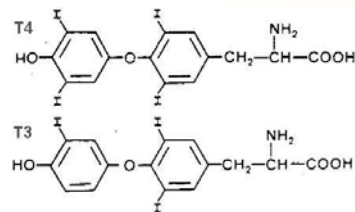
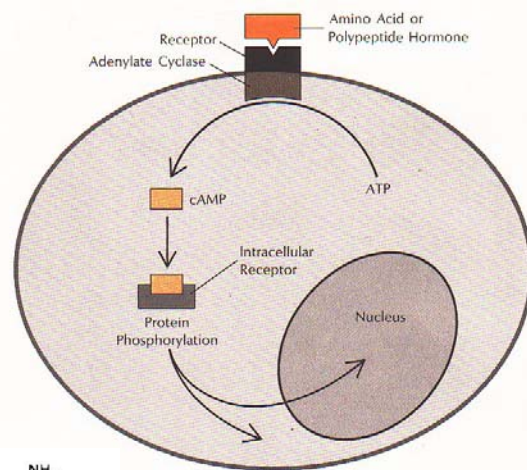


Hormone/Endocrine Classifications

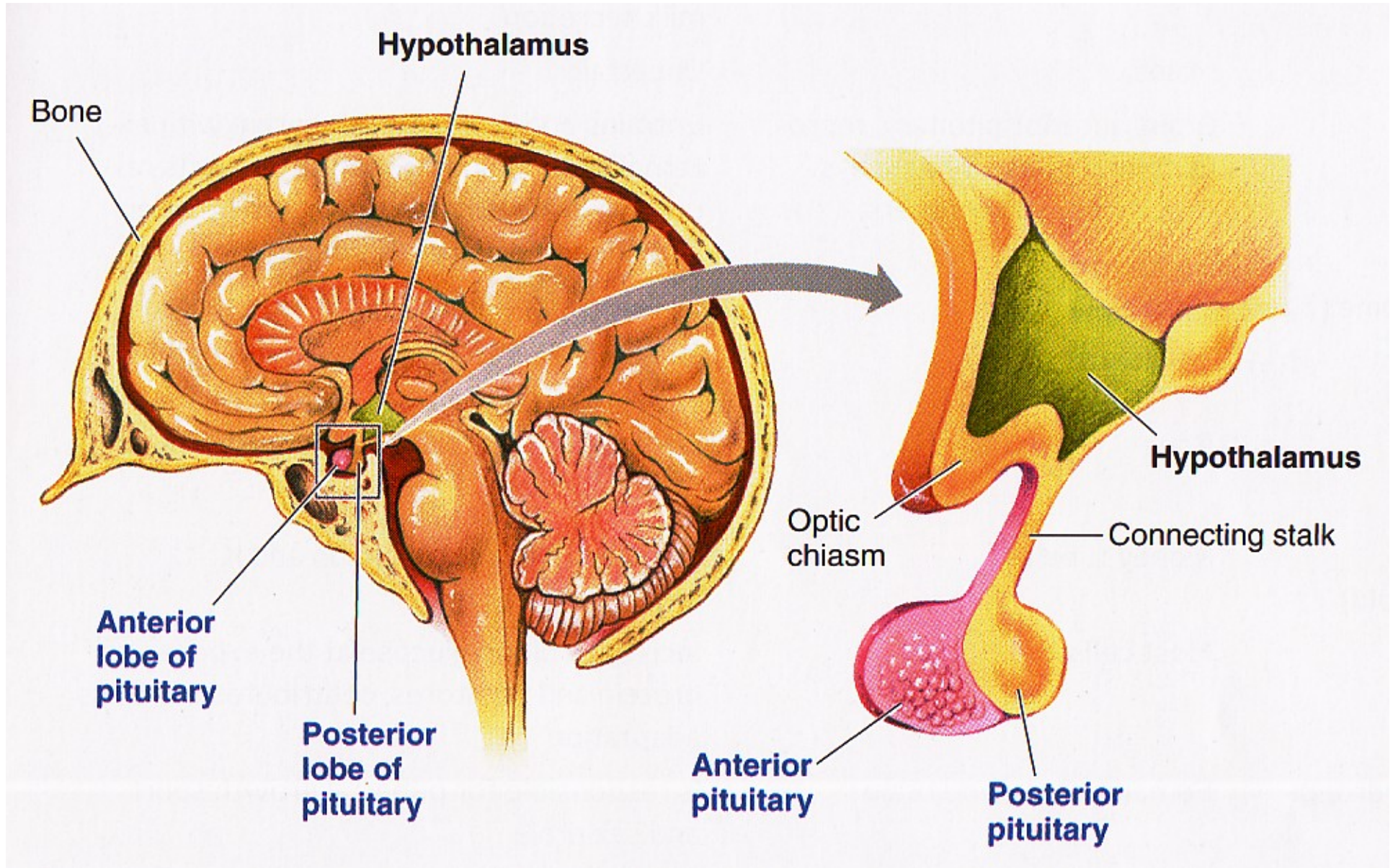
Exogenous



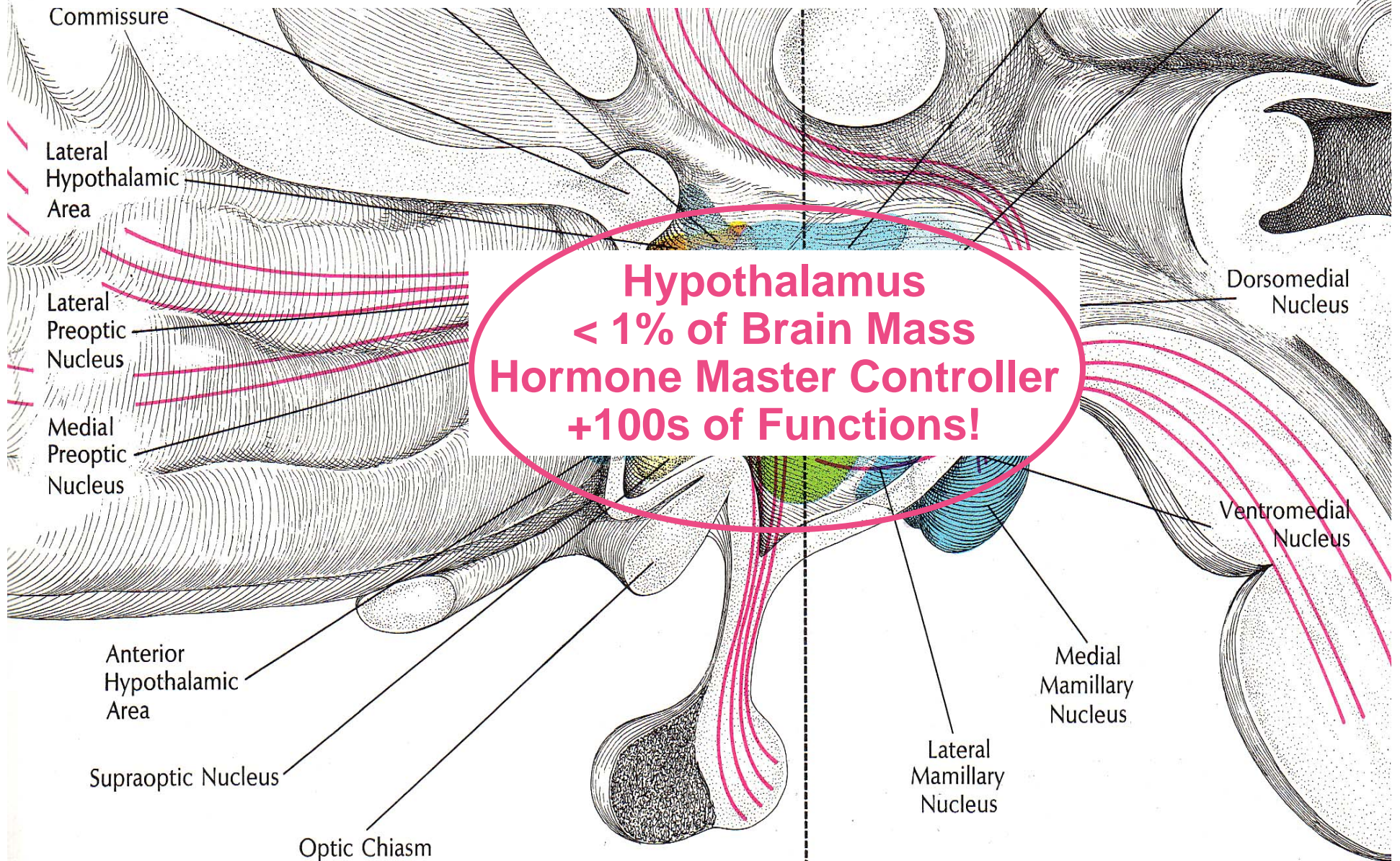
Endogenous



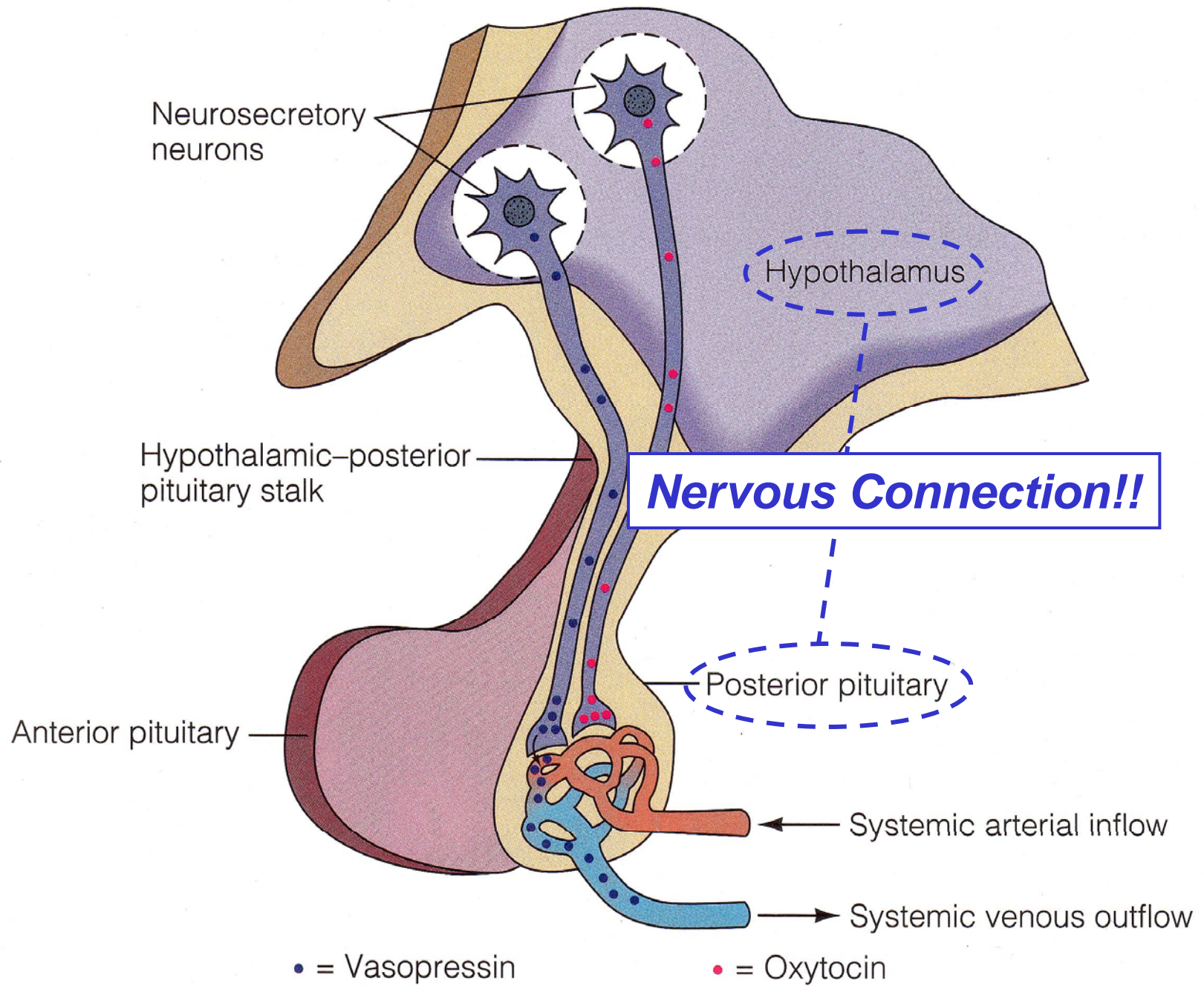
Hypothalamus & Pituitary: Intimate Relationship



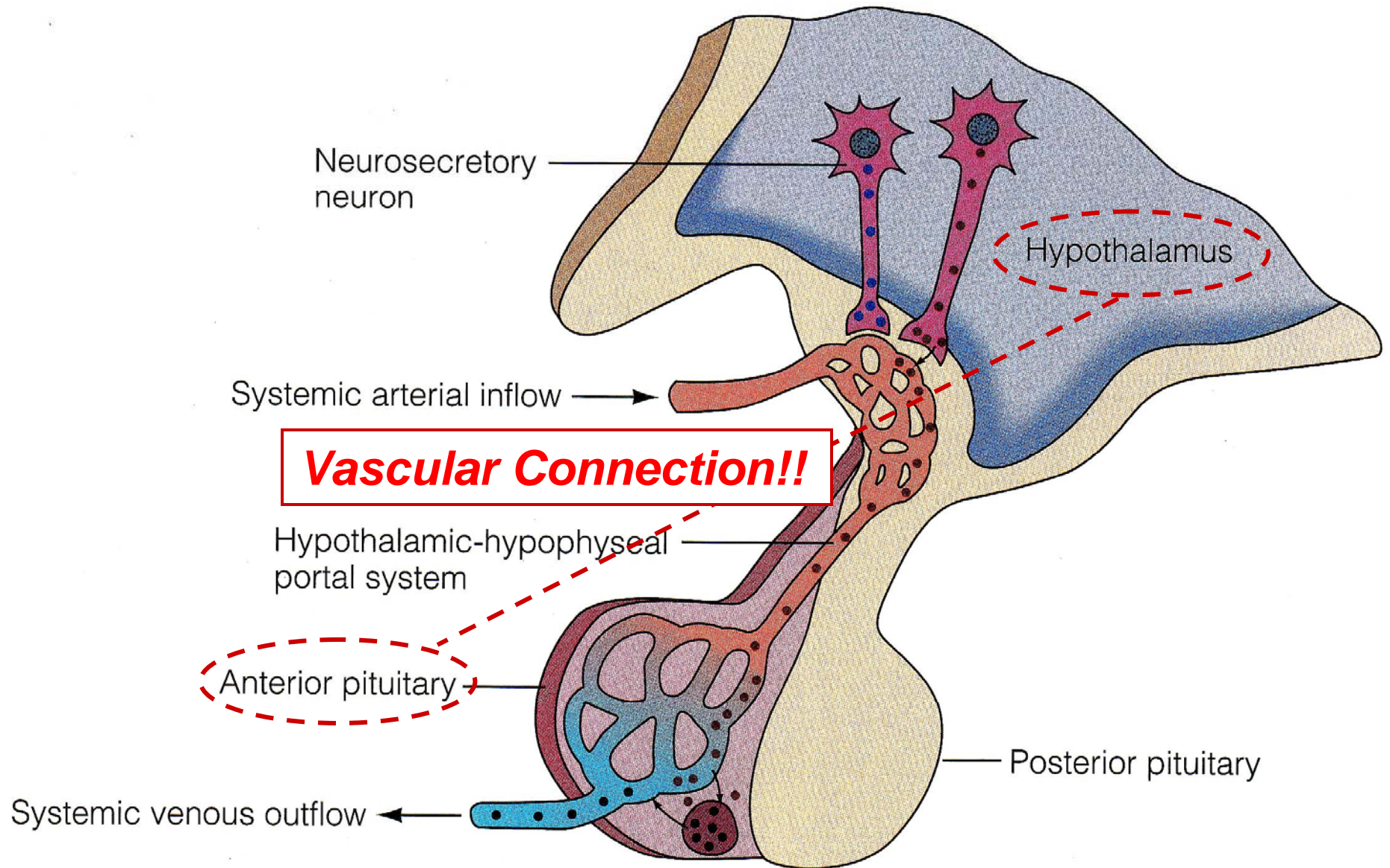
Good Things Come in Small Packages!



Kreiger & Hughes 1980

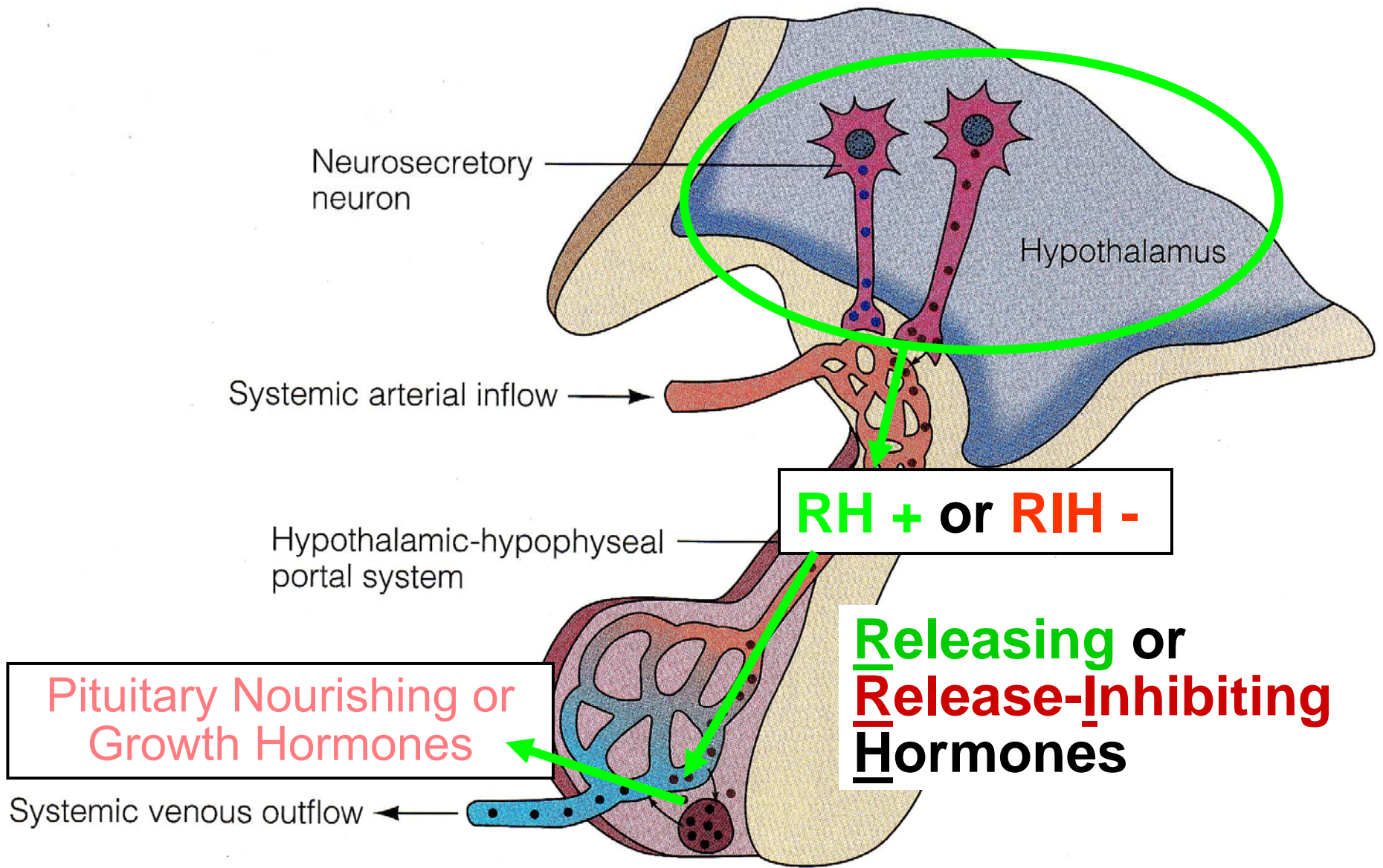


Hypothalamus-Anterior Pituitary Vascular Connection!



• • = Hypophysiotropic hormones

• = Anterior pituitary hormone



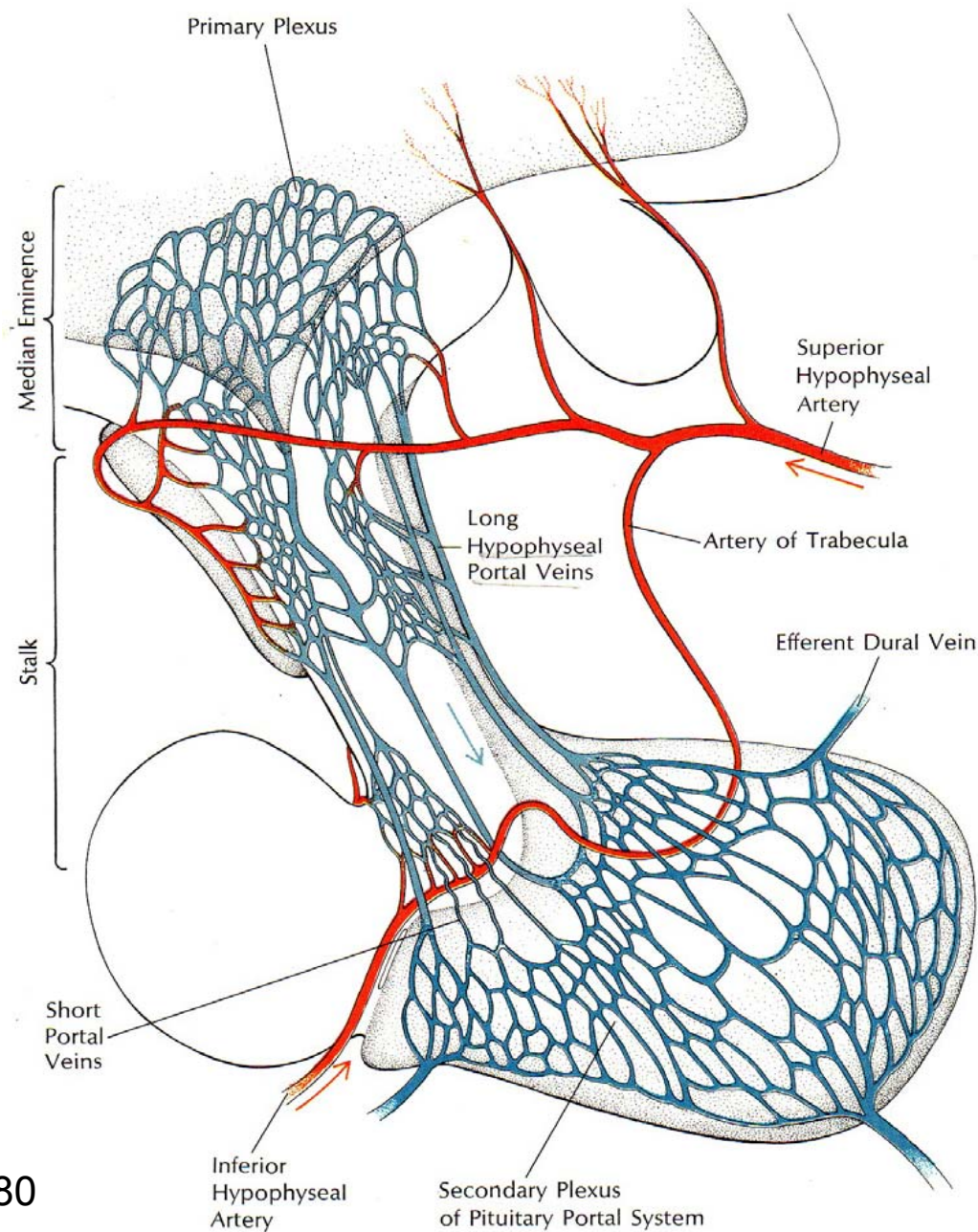
RH + or RIH -

Releasing or Release-Inhibiting Hormones

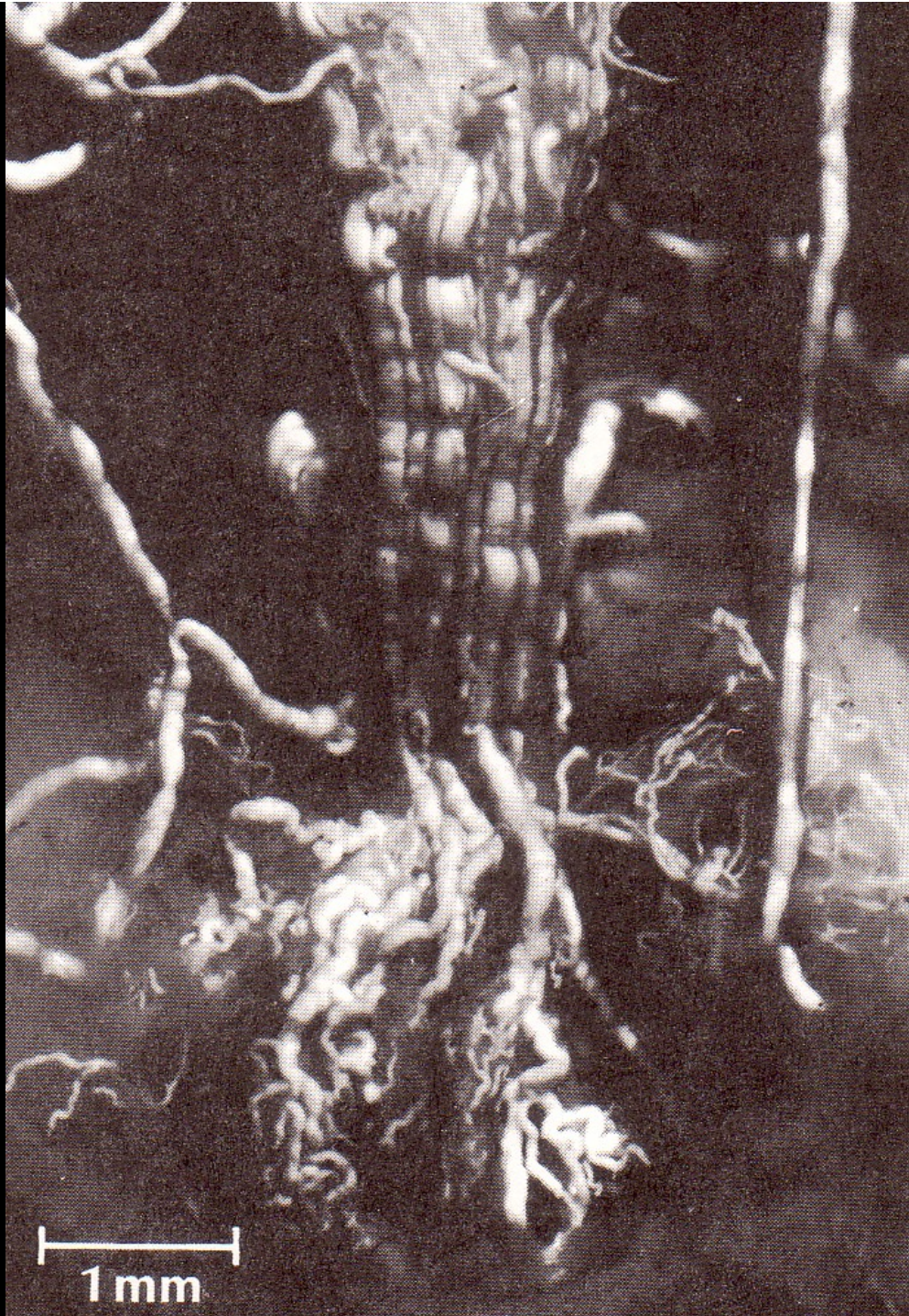
- = Hypophysiotropic hormones
- = Anterior pituitary hormone

Hypophysis = Pituitary

Capillary-Venule-Capillary Intimate Circulation



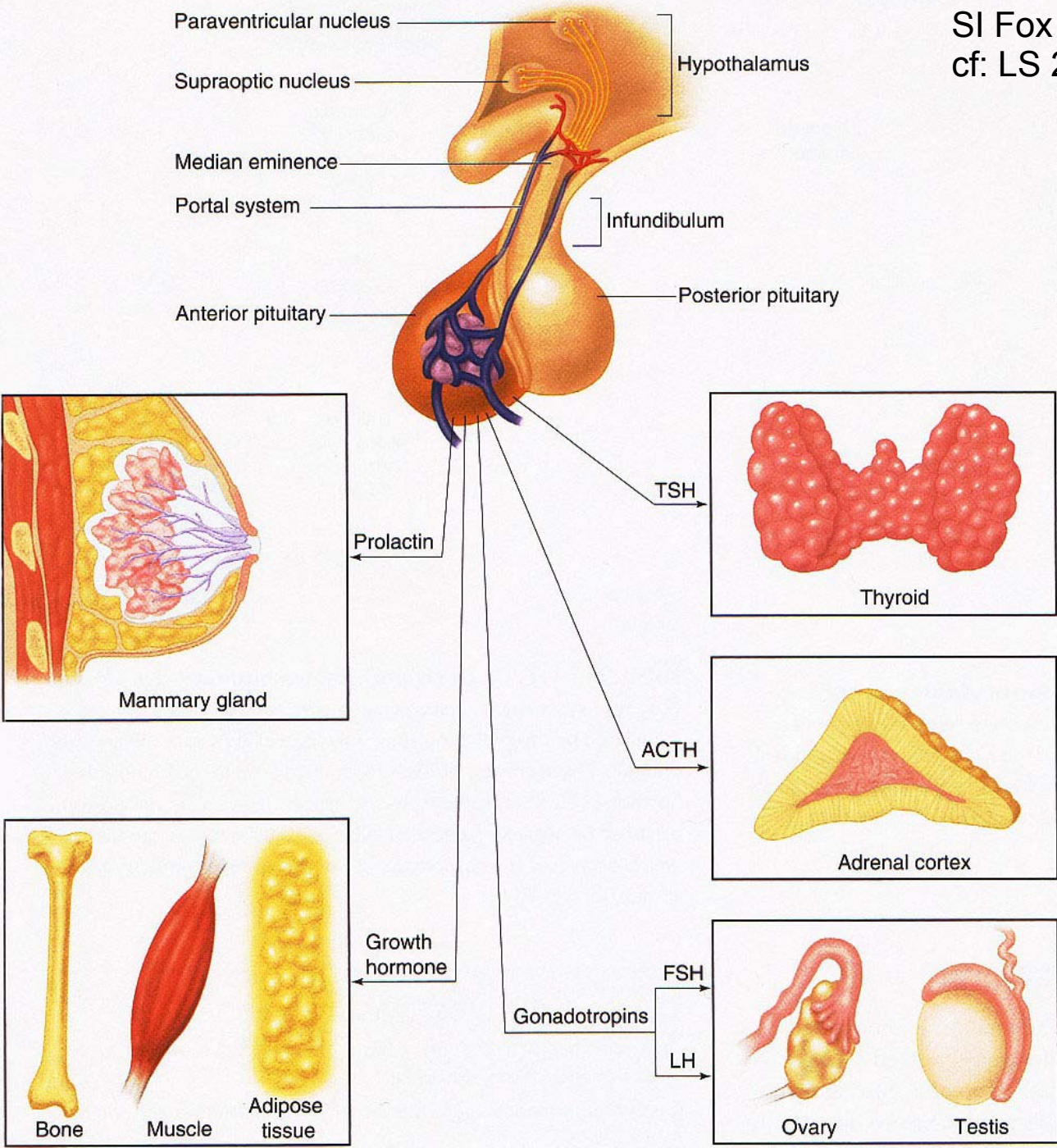
Krieger & Hughes 1980

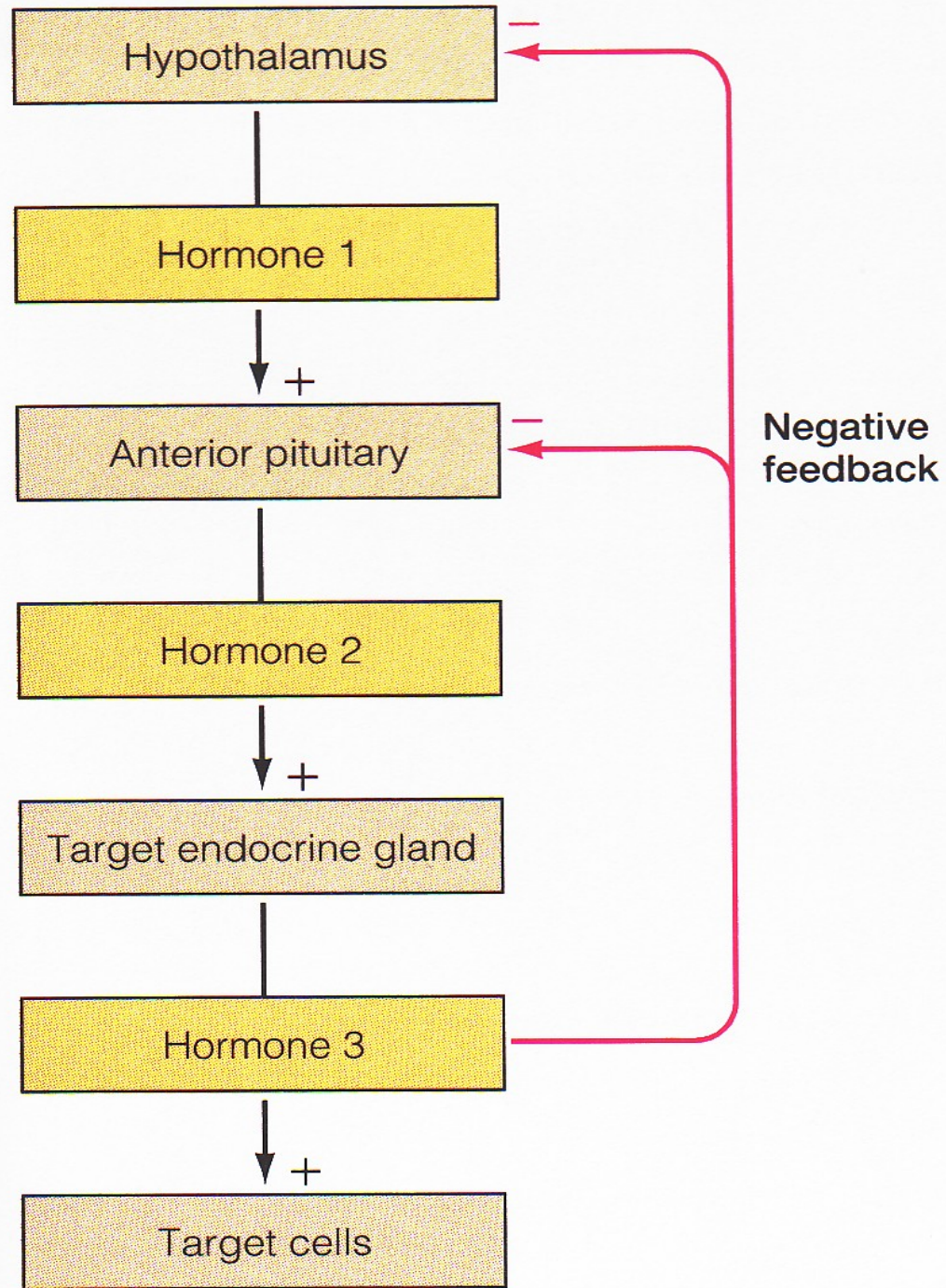


Krieger & Hughes 1980

1 mm

SI Fox 2008
cf: LS 2012 fig 17-5







LS 2006, cf: LS 2012
fig 17-10

Progression & Development of Acromegaly

Age 13

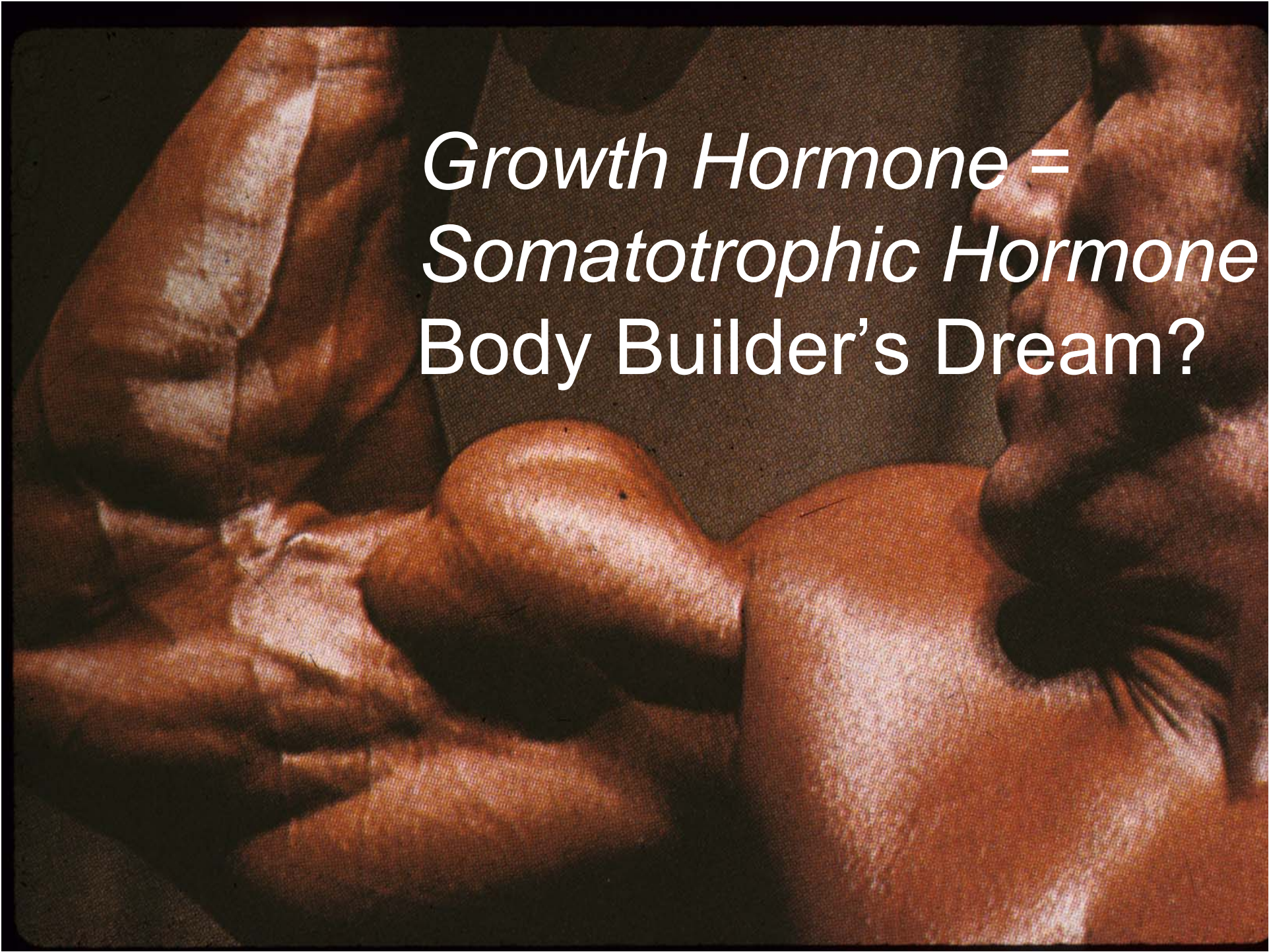


Age 21



Age 35



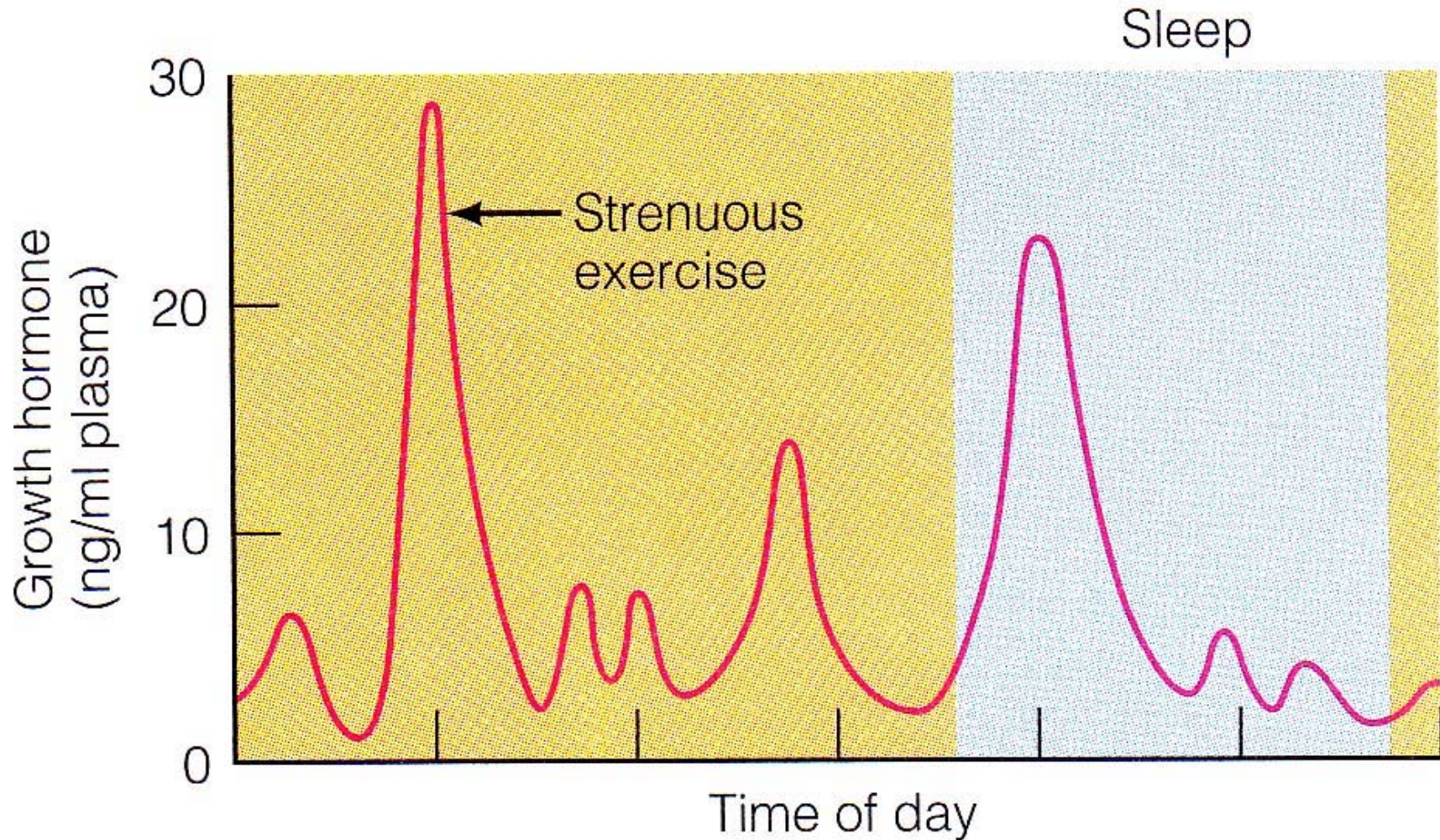


*Growth Hormone =
Somatotrophic Hormone*
Body Builder's Dream?

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

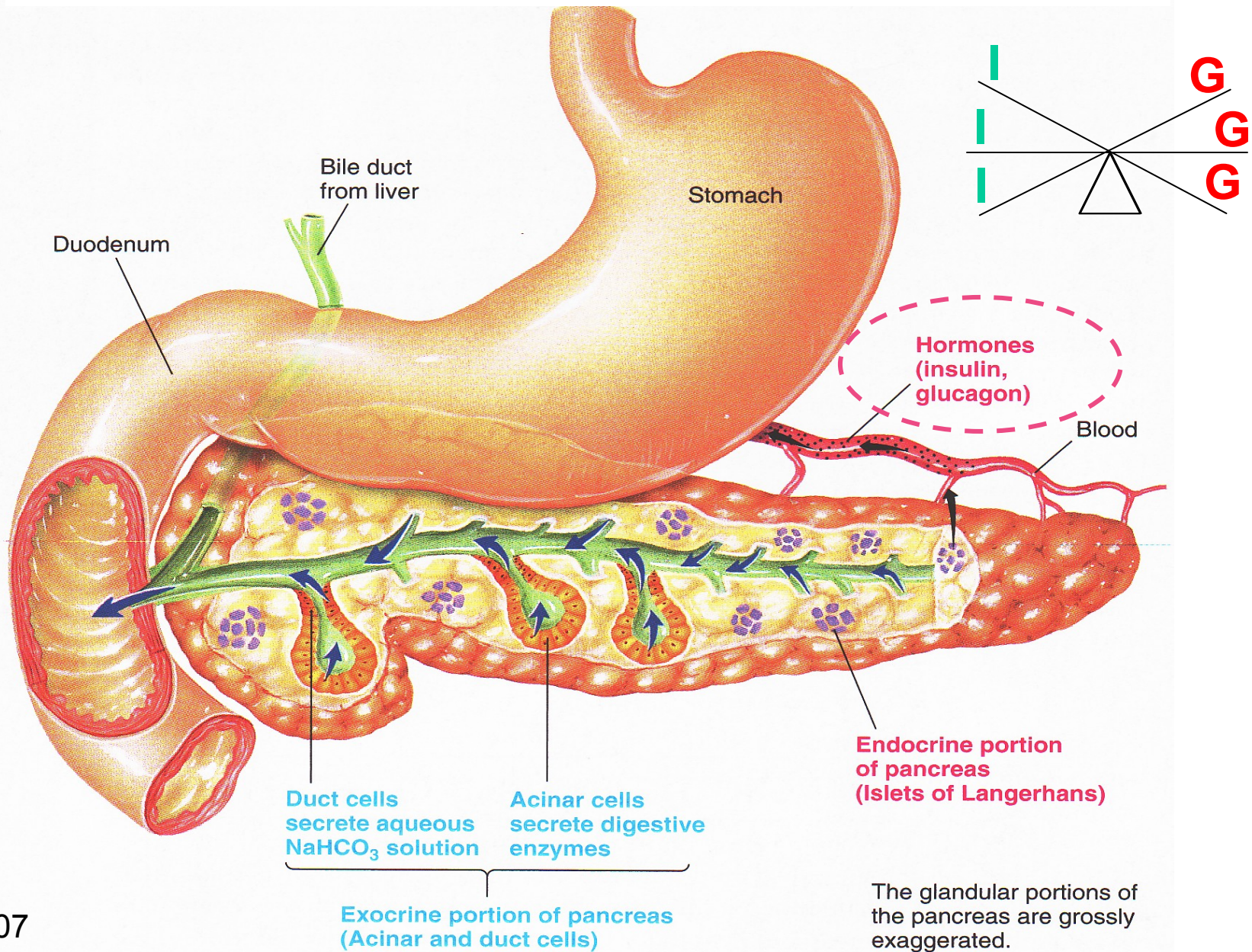
- ↑ Amino Acid uptake & Protein synthesis
- ↑ Lipolysis & Fatty Acid mobilization
- ↓ Glucose uptake
(skeletal muscle & adipocytes)
- ↑ Glucose production
(liver glycogenolysis)
- ↑ Insulin secretion

Increase GH naturally with exercise & sleep!!

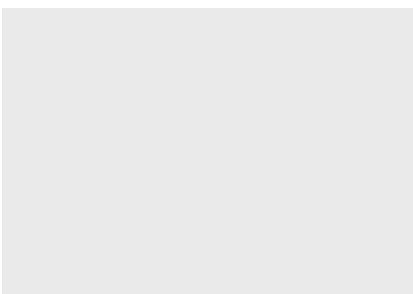
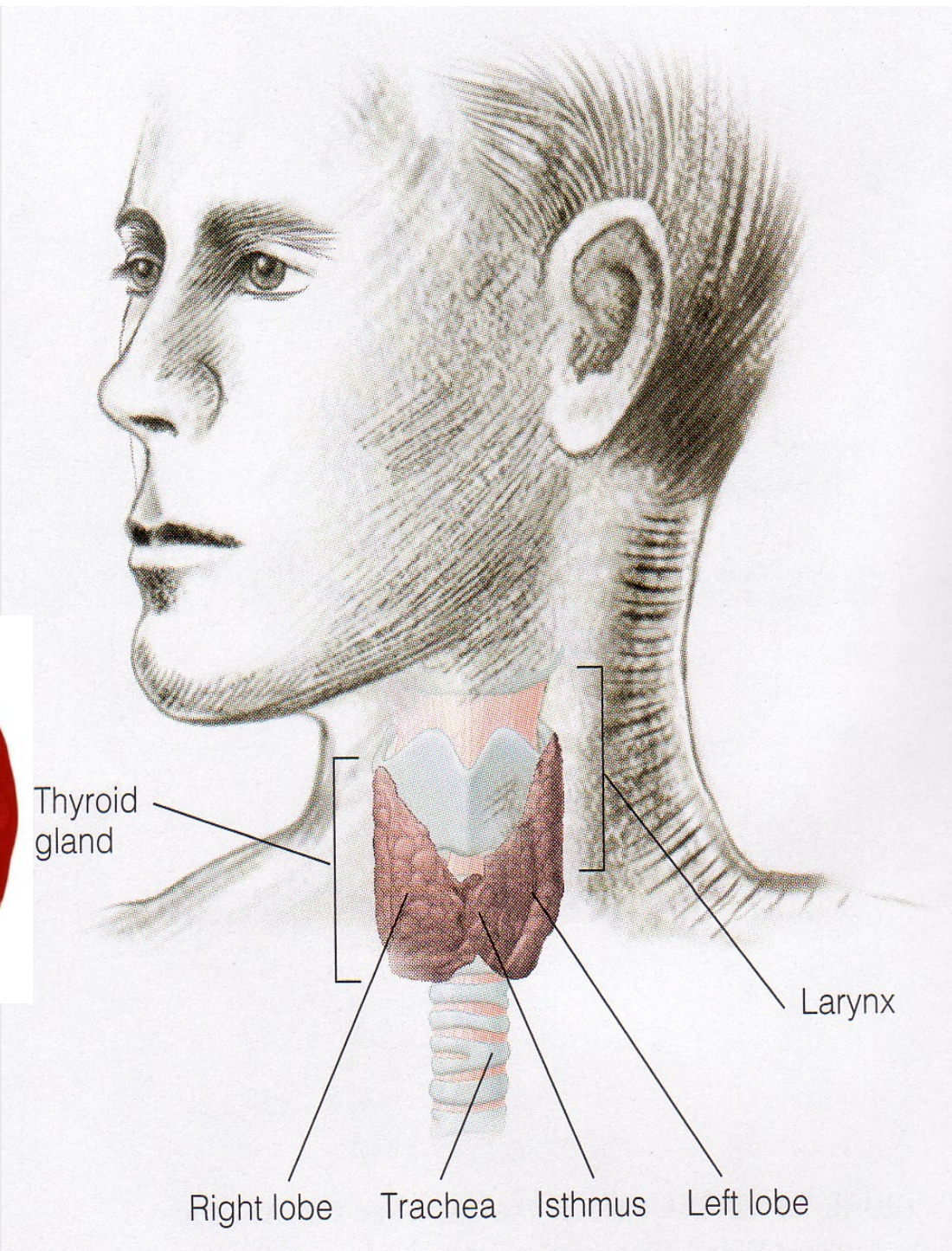
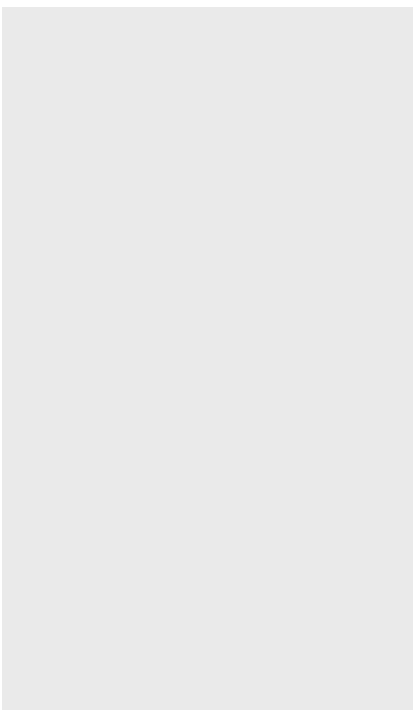


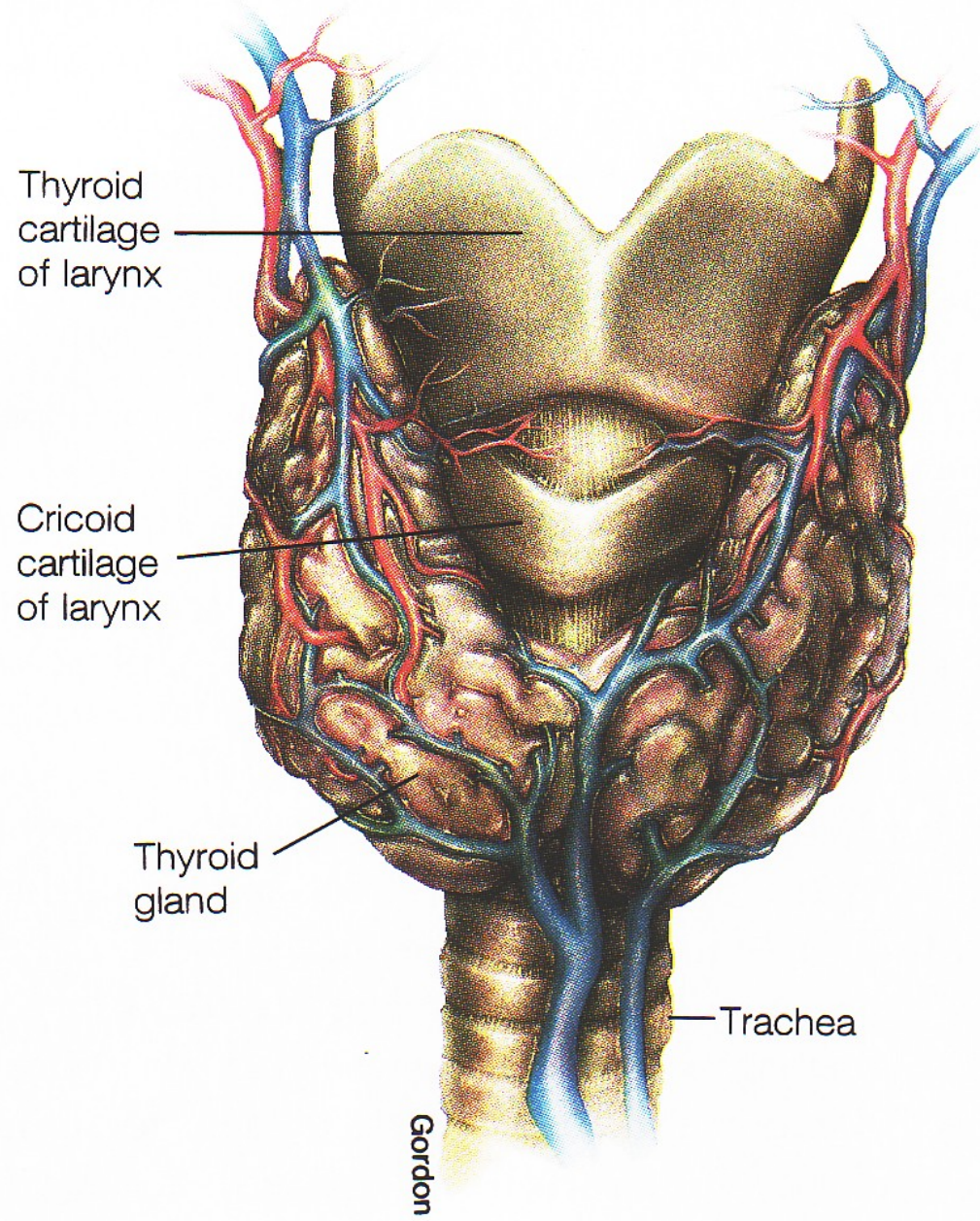
ng/ml = nanograms per milliliter

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

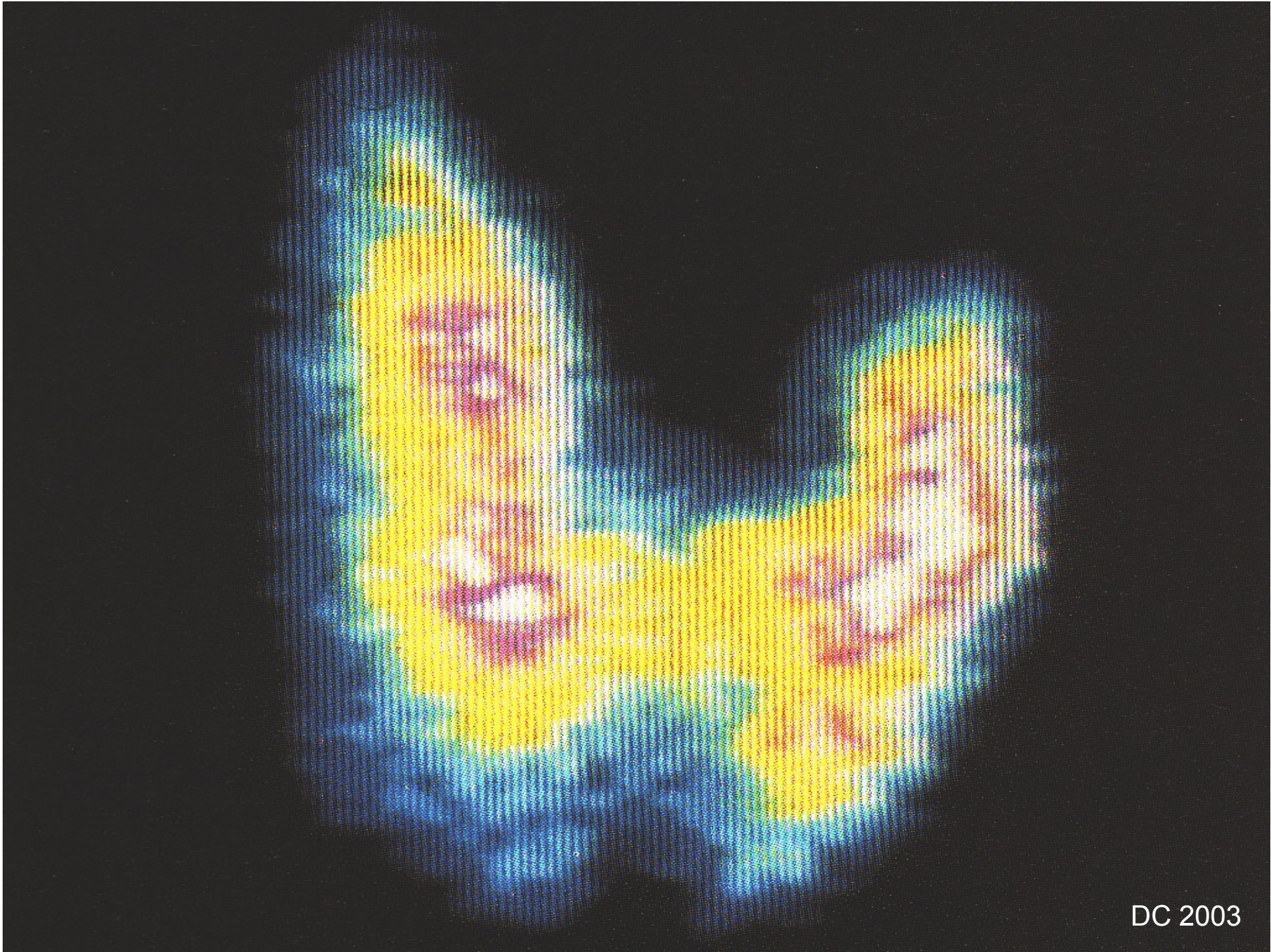


The glandular portions of the pancreas are grossly exaggerated.





(a)





LS 2012 fig 17-16





Guyton & Hall 2000

Adrenal gland

Adrenal cortex

Adrenal medulla

Kidney

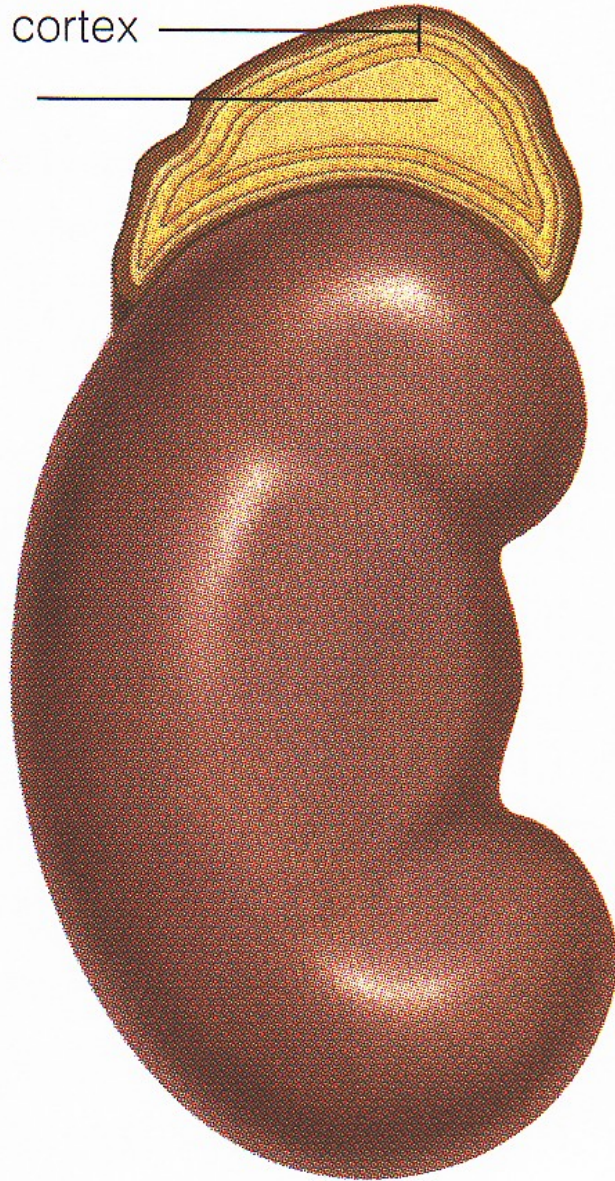


FIGURE 13-12

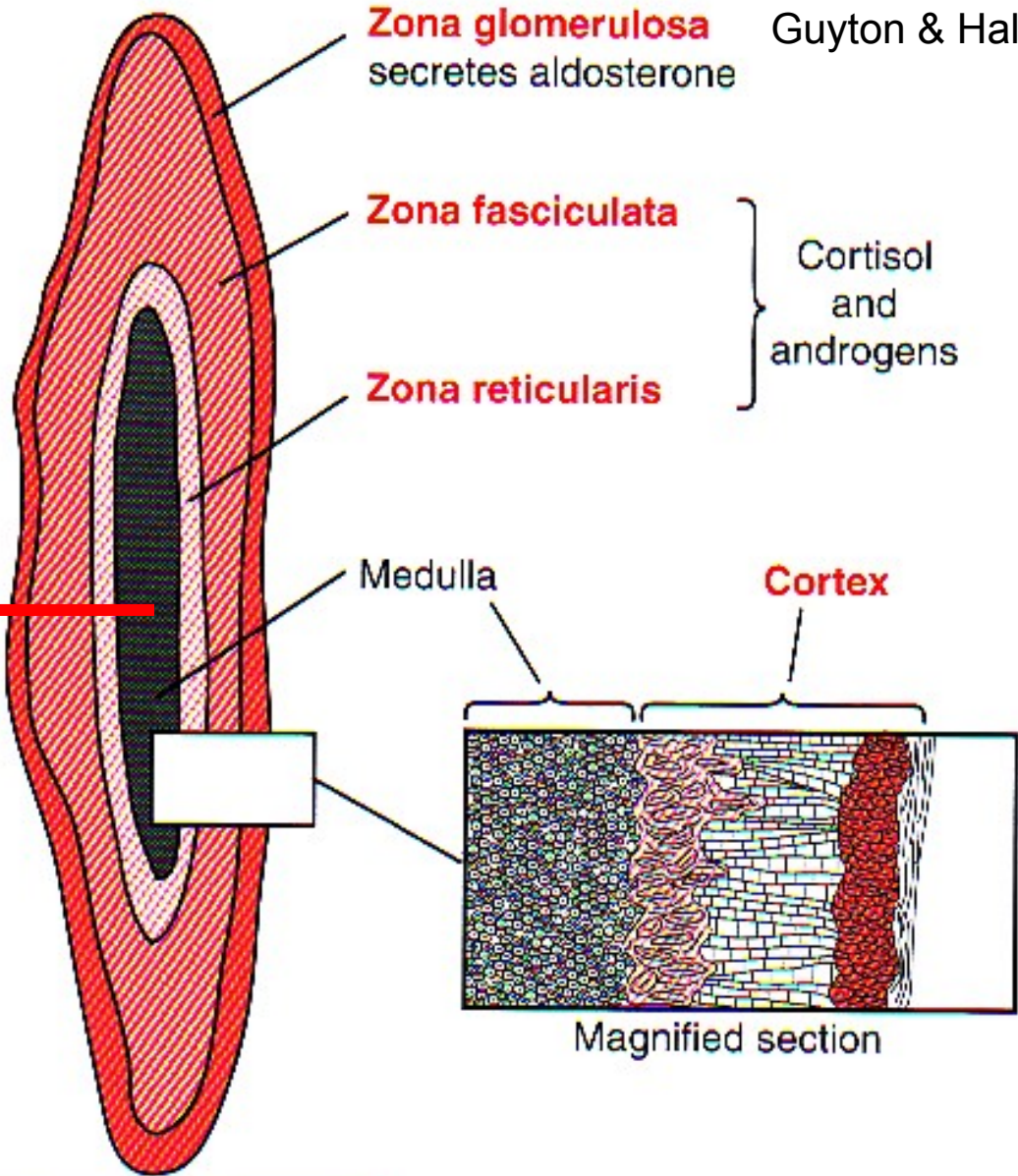
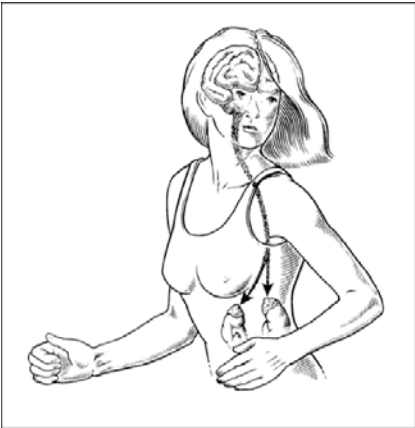
Adrenal Gland

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%**



Zona glomerulosa
secretes aldosterone

Guyton & Hall 2000

Zona fasciculata

Cortisol
and
androgens

Zona reticularis

Medulla

Cortex

Magnified section

FIGURE 77 - 1

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