

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 HUE down hall from lab. Estimate grade? Q?
- II. Blood Typing** LS ch 11 + 17, DC Module 5, Q?
- III. Blood Glucose, Insulin Diabetes Connections** DC Module 13+...
- IV. 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

  ...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 Exam II, 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!

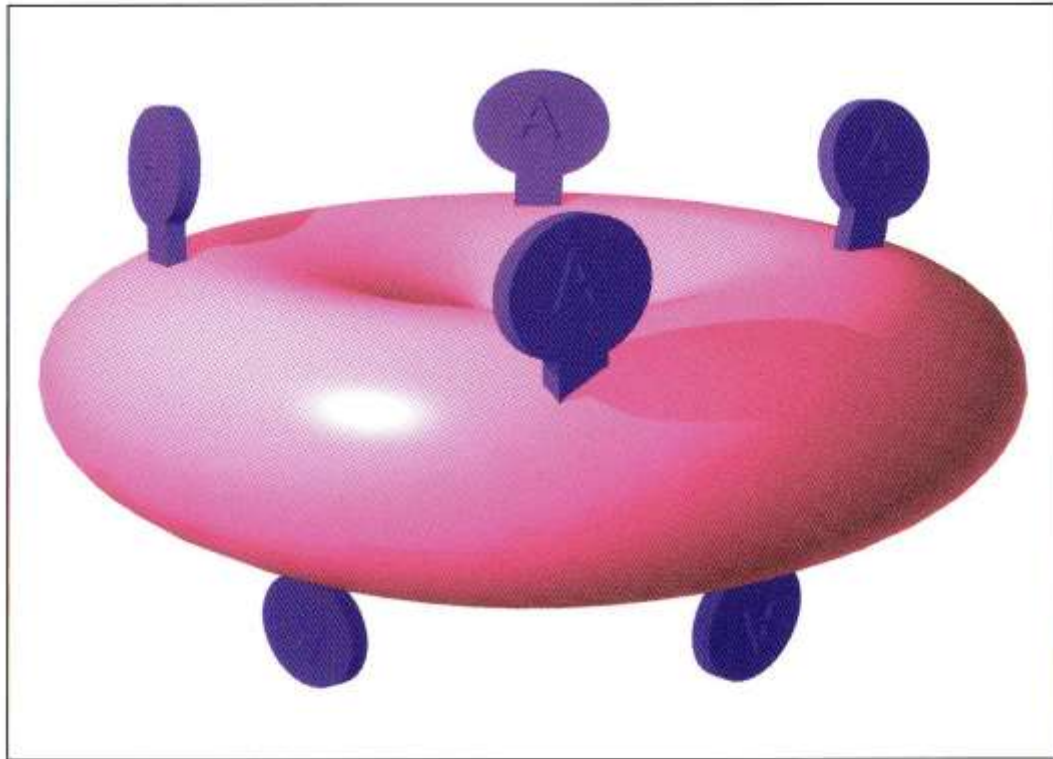


...Fortunately, the lab buffers the grade!



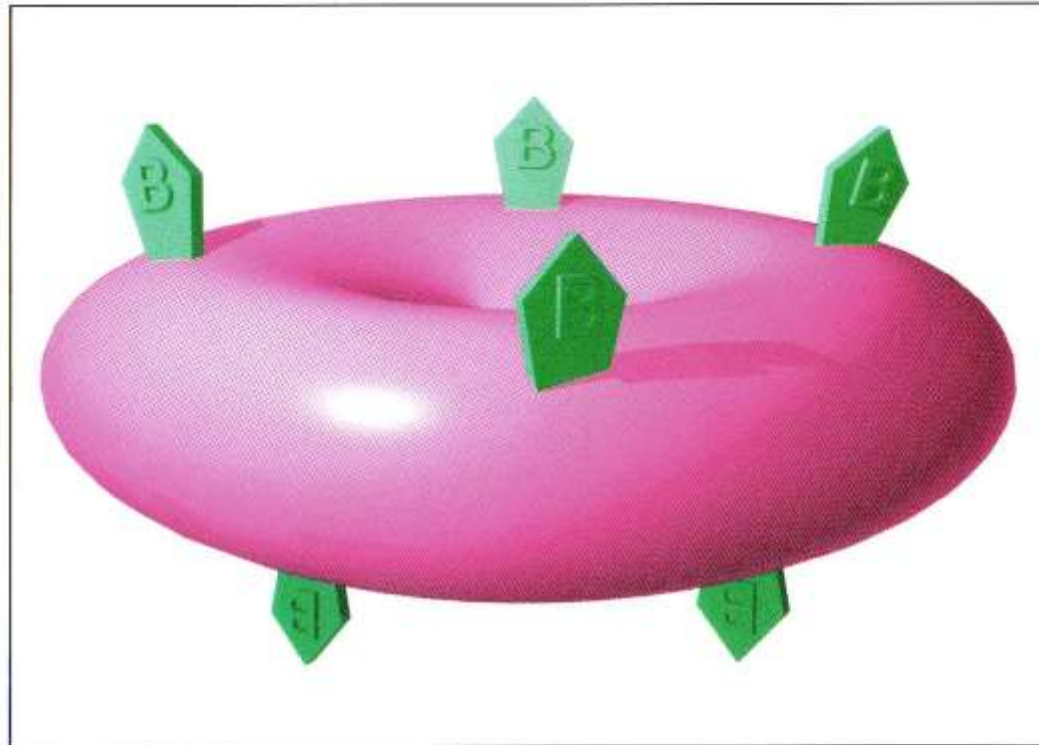
Next time, like last Thursday, we'll cover the blood chemistry lab, to ensure for adequate lab prep time. For now, we'll cover more on blood typing Abo, Rh+ vs Rh- & glucose!

A



A Antigens
(Agglutinogens)

B



B Antigens
(Agglutinogens)

AB



A & B Antigens
(Agglutinogens)

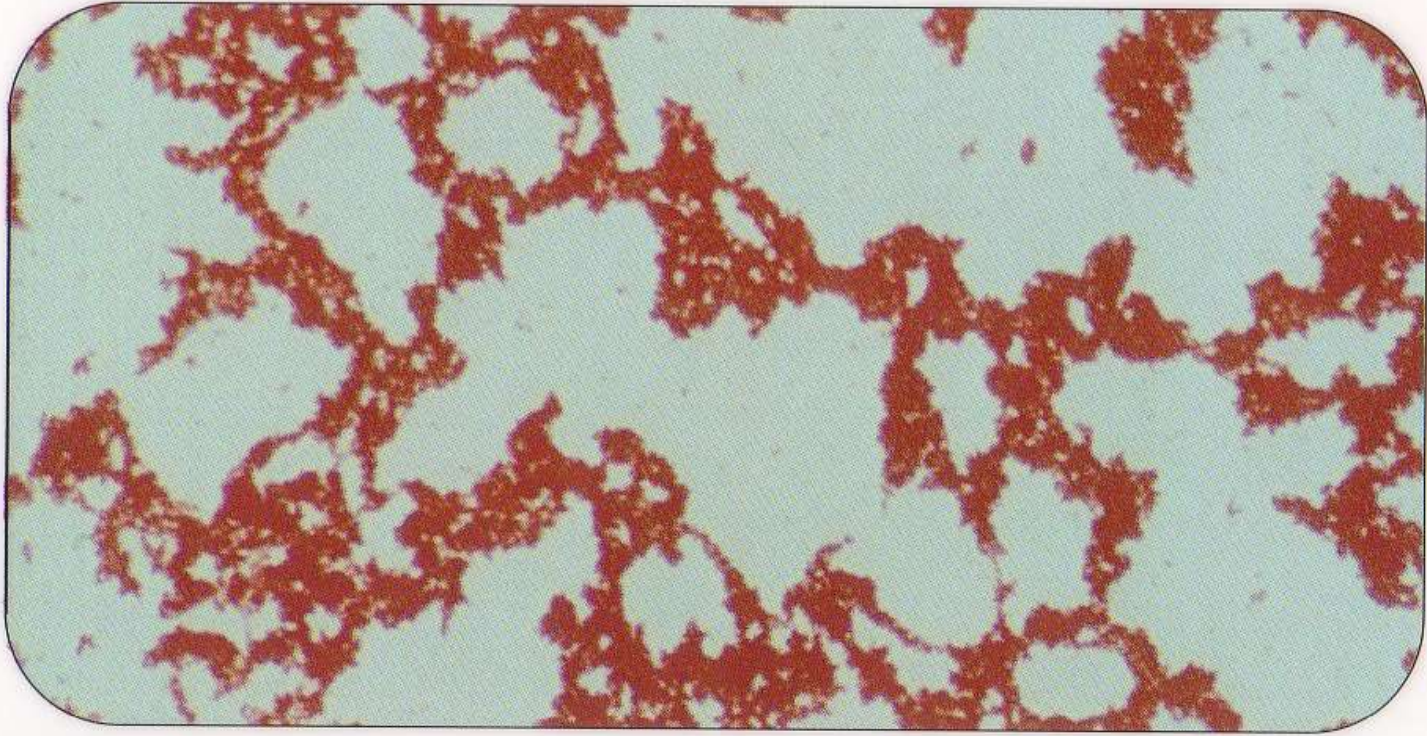


No Antigens
(Agglutinogens)

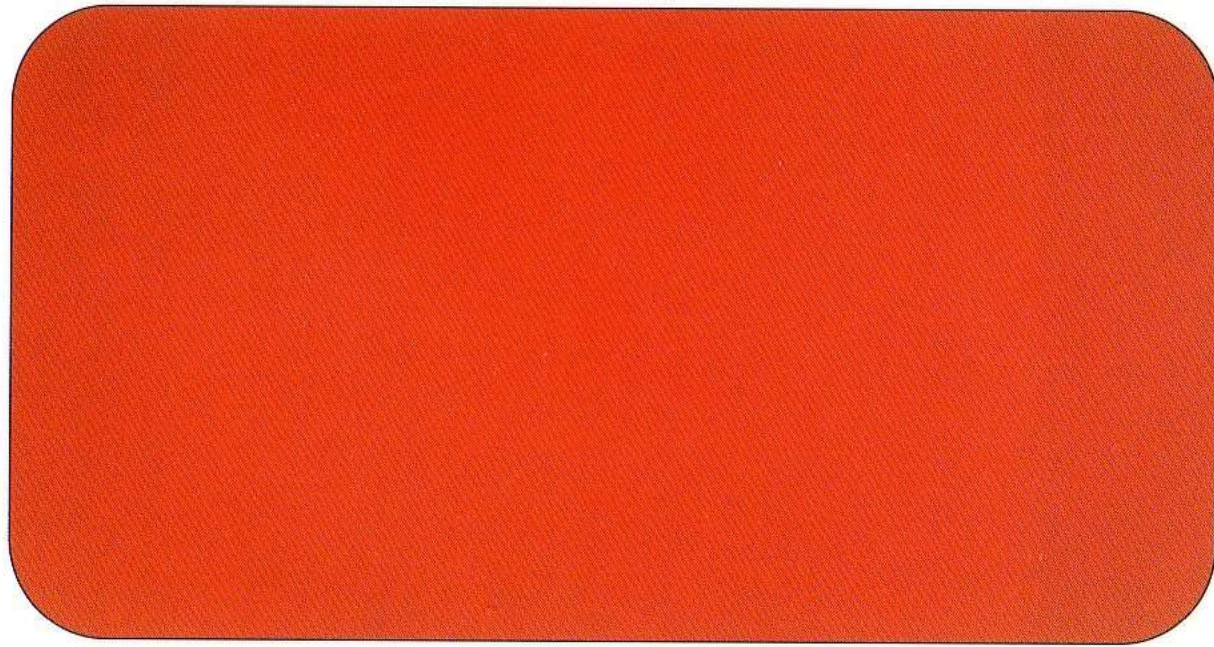


A Antibodies

(Agglutinins)

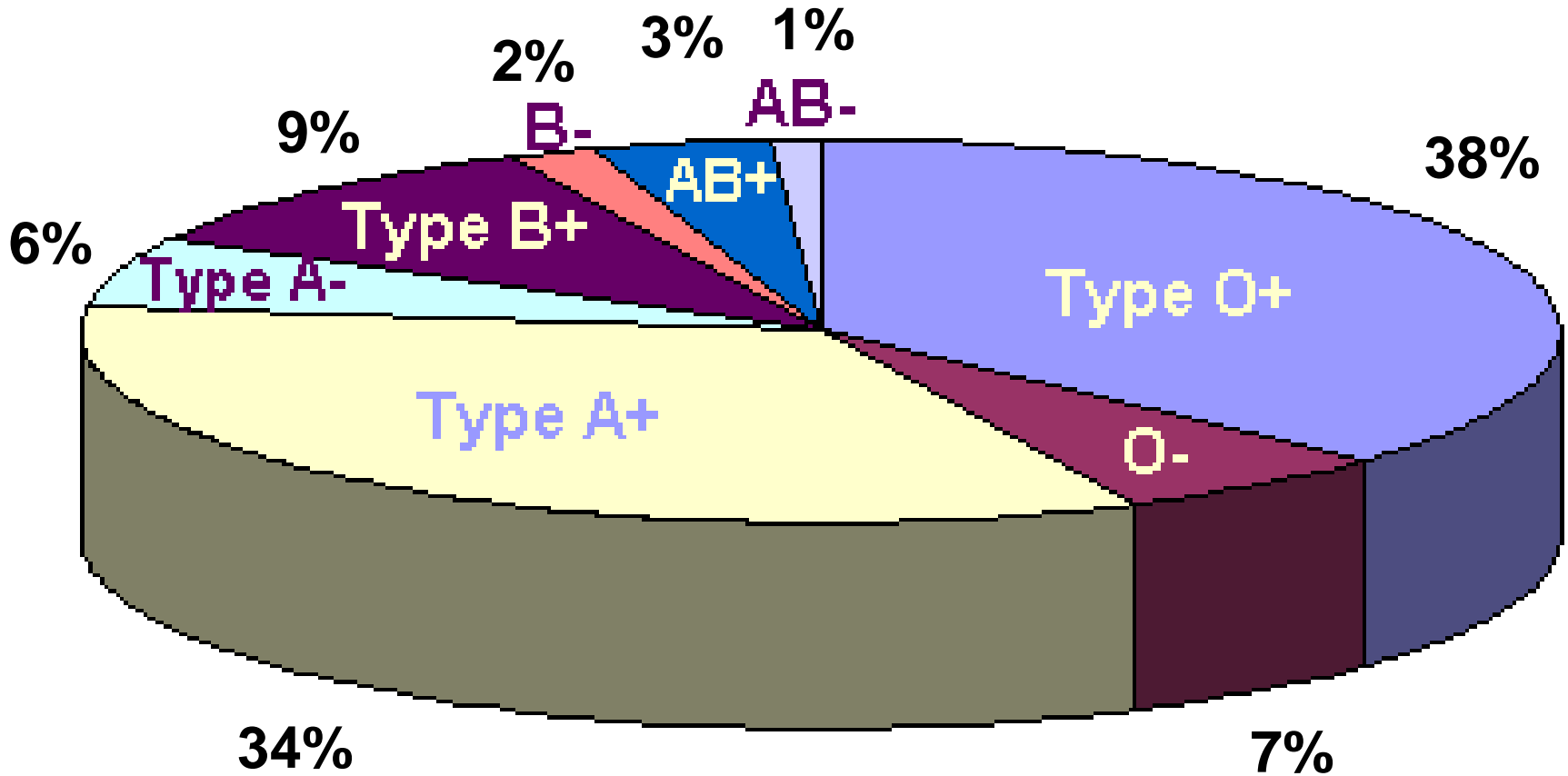


Clumping with
anti-A serum



No Clumping with
anti-A serum

Blood Type Distribution within the United States



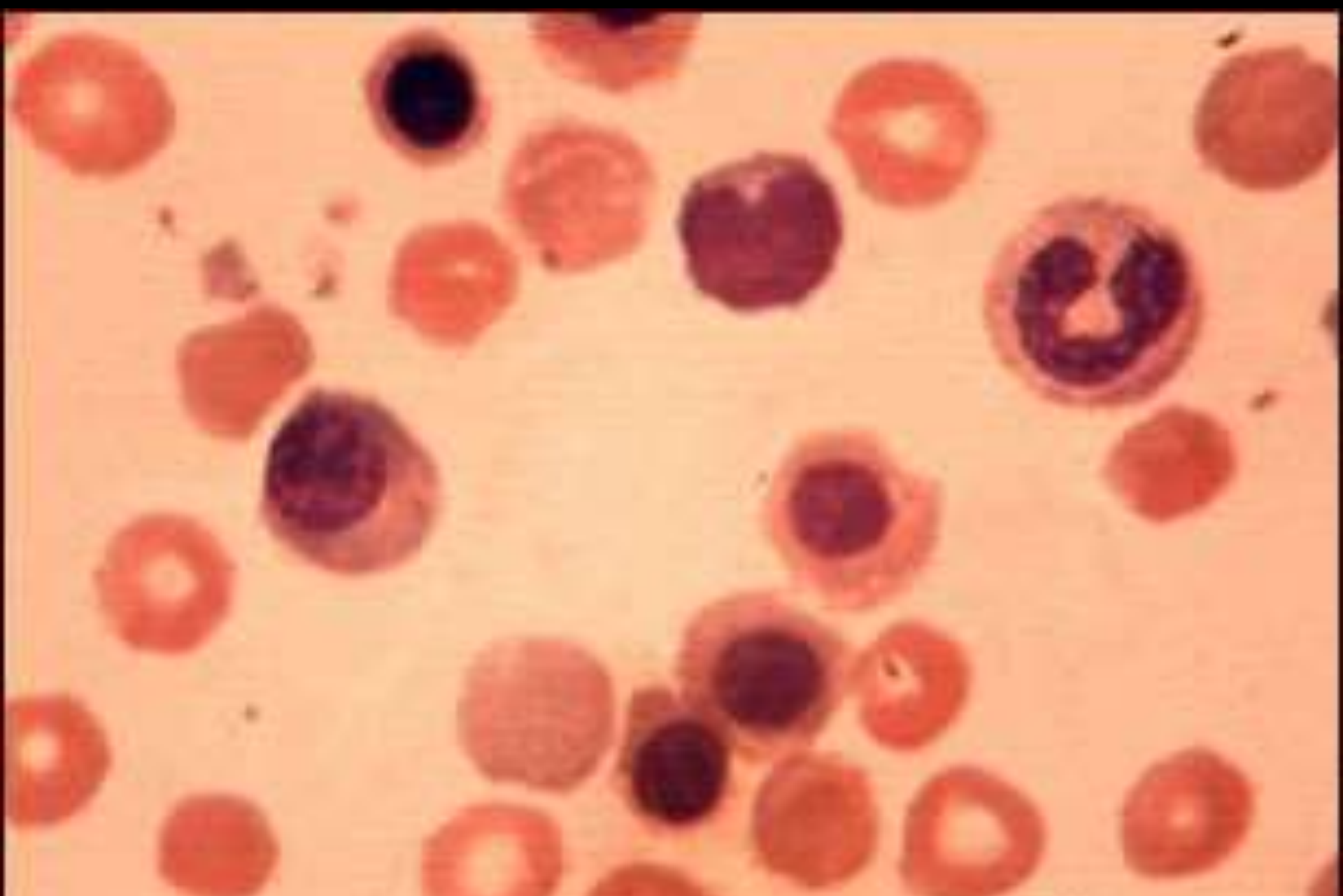
NB: O+ & A+ make up > 2/3, + > -

Erythroblastosis Fetalis?

**eg, *Rh-* mom
Rh+ baby**

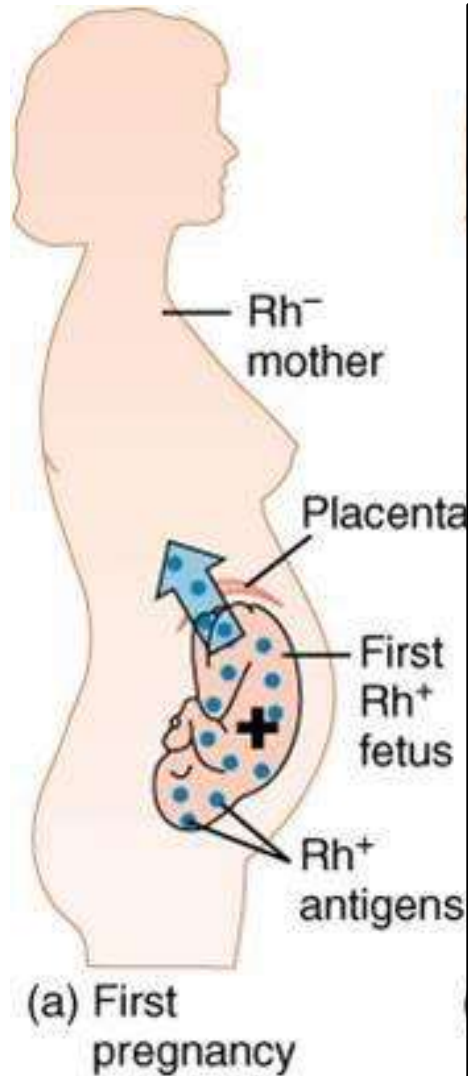
<https://www.nlm.nih.gov/medlineplus/rhincompatibility.html>

[http://www.nlm.nih.gov/MEDLINEPLUS/ency/article/001298
.htm#Alternative%20Names](http://www.nlm.nih.gov/MEDLINEPLUS/ency/article/001298.htm#Alternative%20Names)

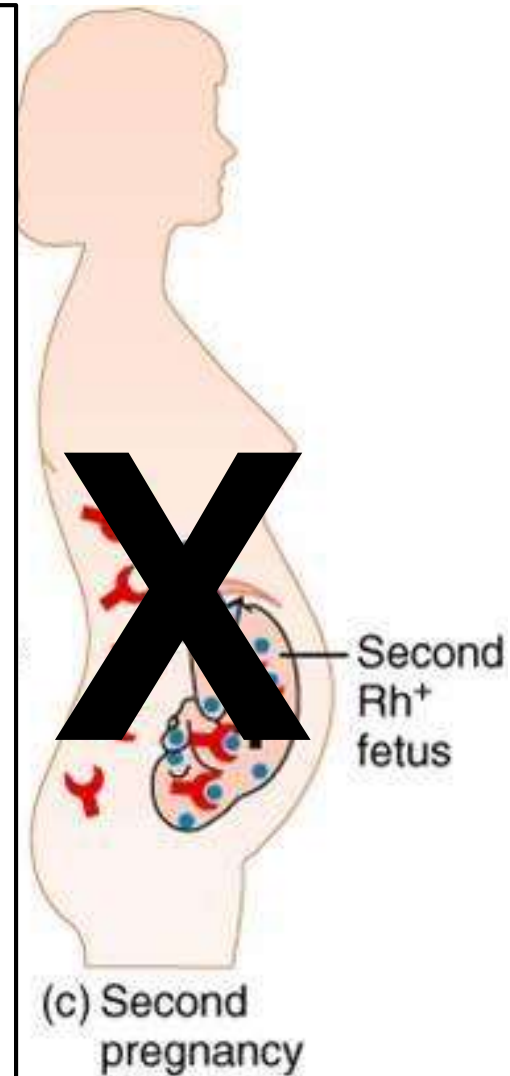


[http://www.nlm.nih.gov/medlineplus/ency/
imagepages/1665.htm](http://www.nlm.nih.gov/medlineplus/ency/imagepages/1665.htm)

Erythroblastosis Fetalis or Hemolytic Disease of the Unborn/Newborn



***Throw
Blanket
Over
This
Step!***

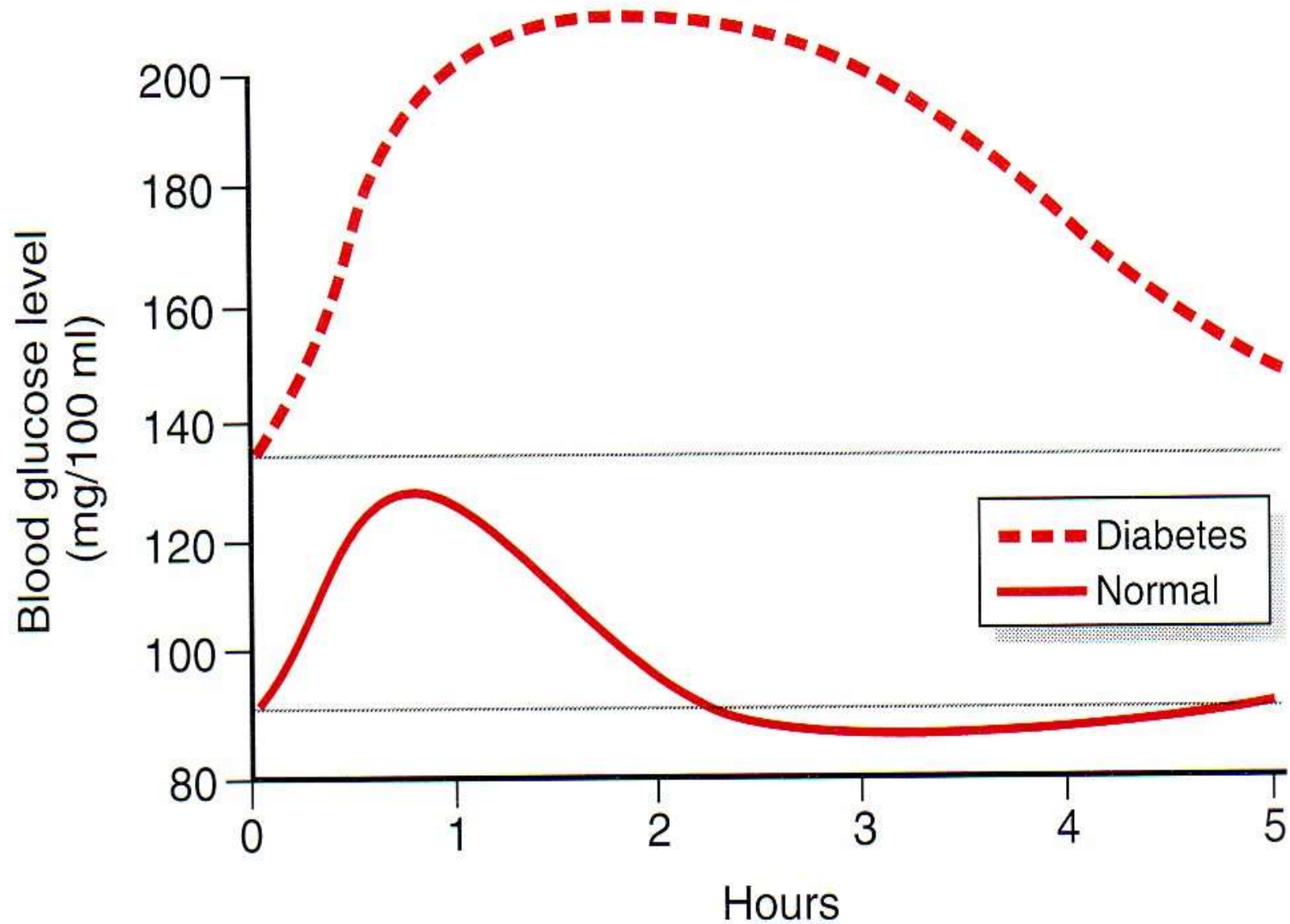


**Inject Mom with RhoGam \leq 48-72 hr
> each Rh+ Pregnancy**



**The Blanket is RhoGam → Masks
the Mom's Immune System!**

Diabetic & Normal Response to Glucose Load



Proinsulin with C-Connecting Peptide

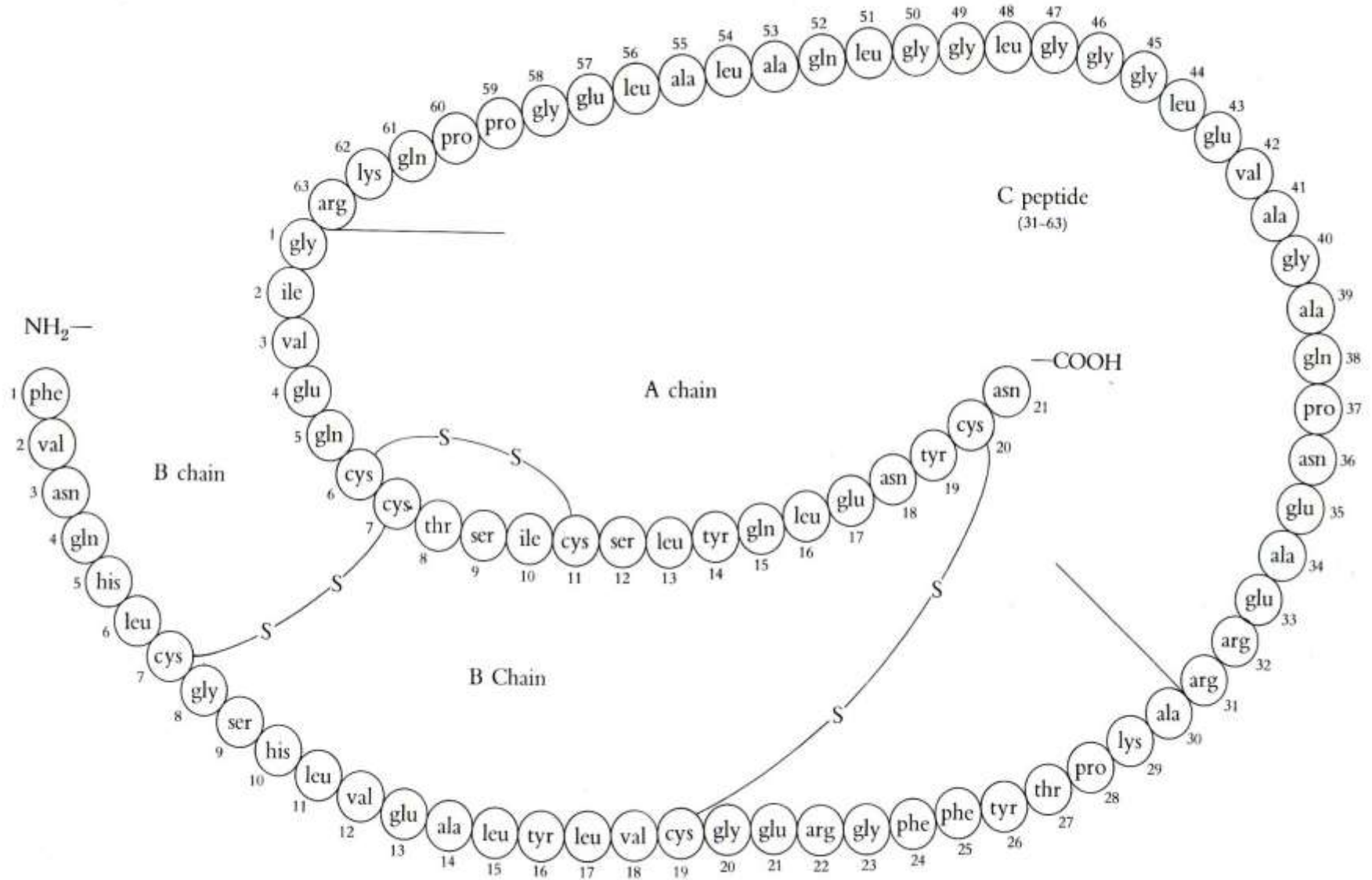
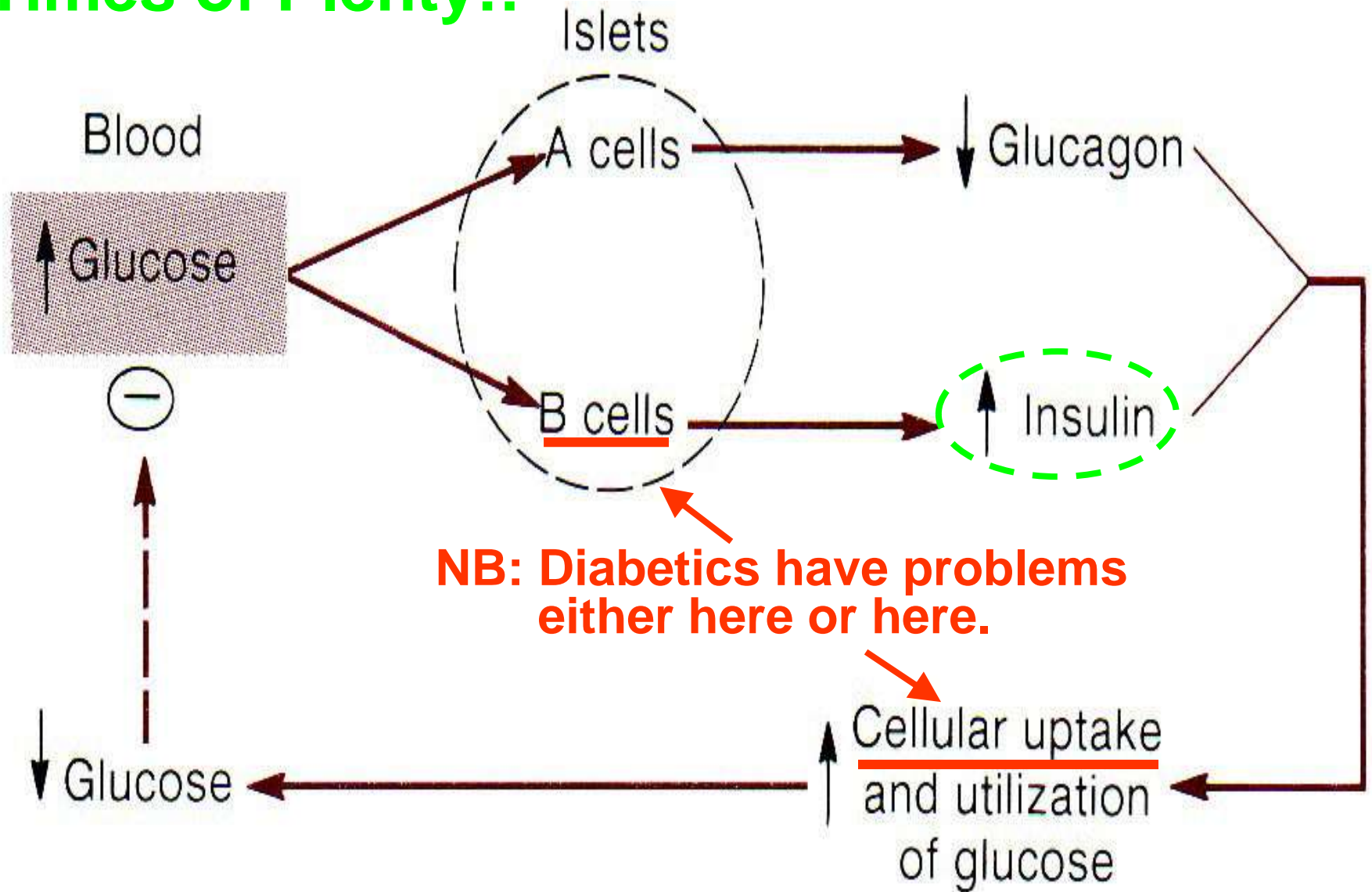


FIG. 10-4. Amino acid sequence of a mammalian proinsulin molecule. Note how the insulin molecule can be formed by cleaving this polypeptide chain at two locations to liberate the C peptide.

Times of Plenty!!



NB: Diabetics have problems either here or here.

Cellular uptake and utilization of glucose

Store!

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)

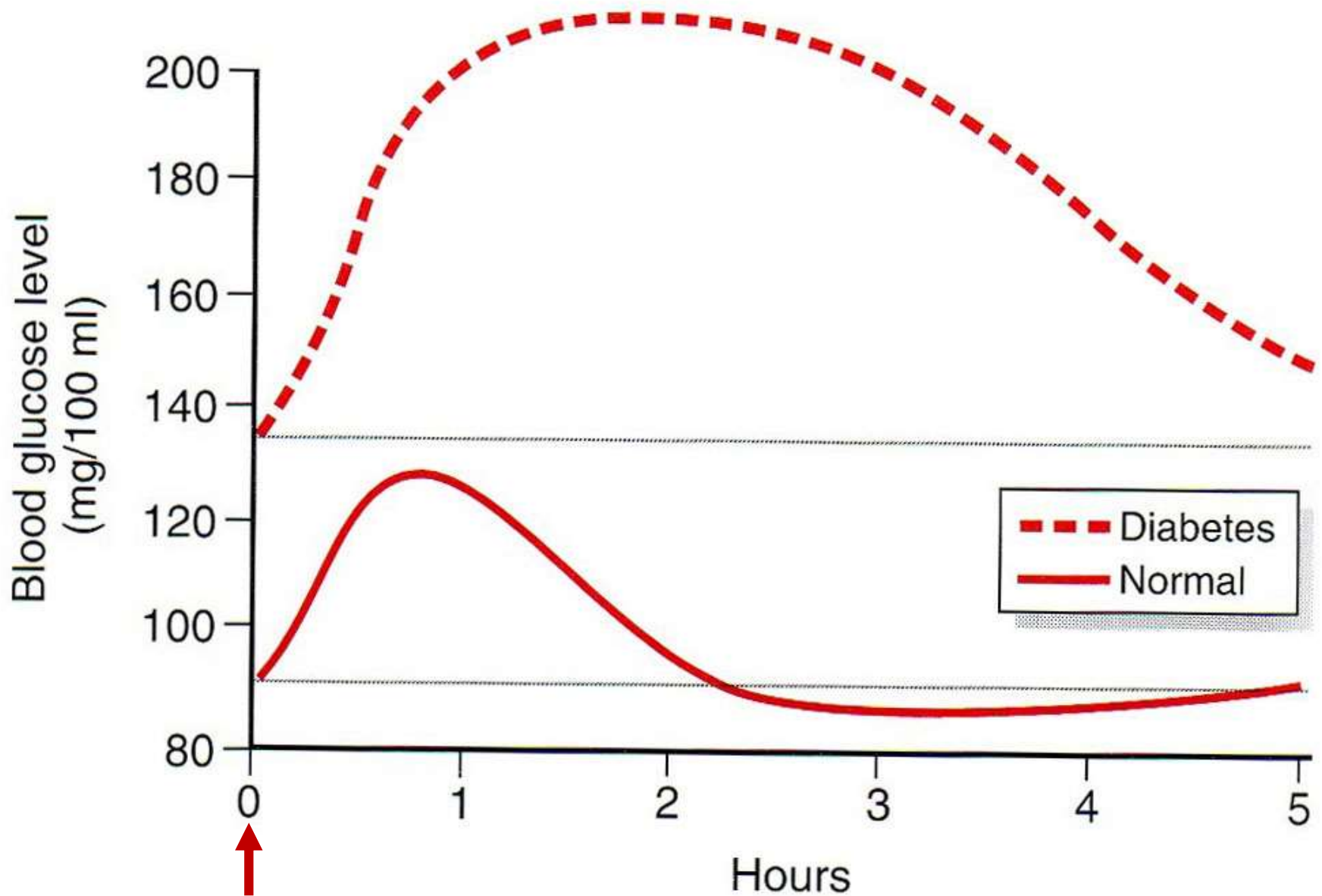
Table 4–9

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

Diabetic & Normal Response to Glucose Load



Ingest Glucola or eat meal

Proinsulin with C-Connecting Peptide

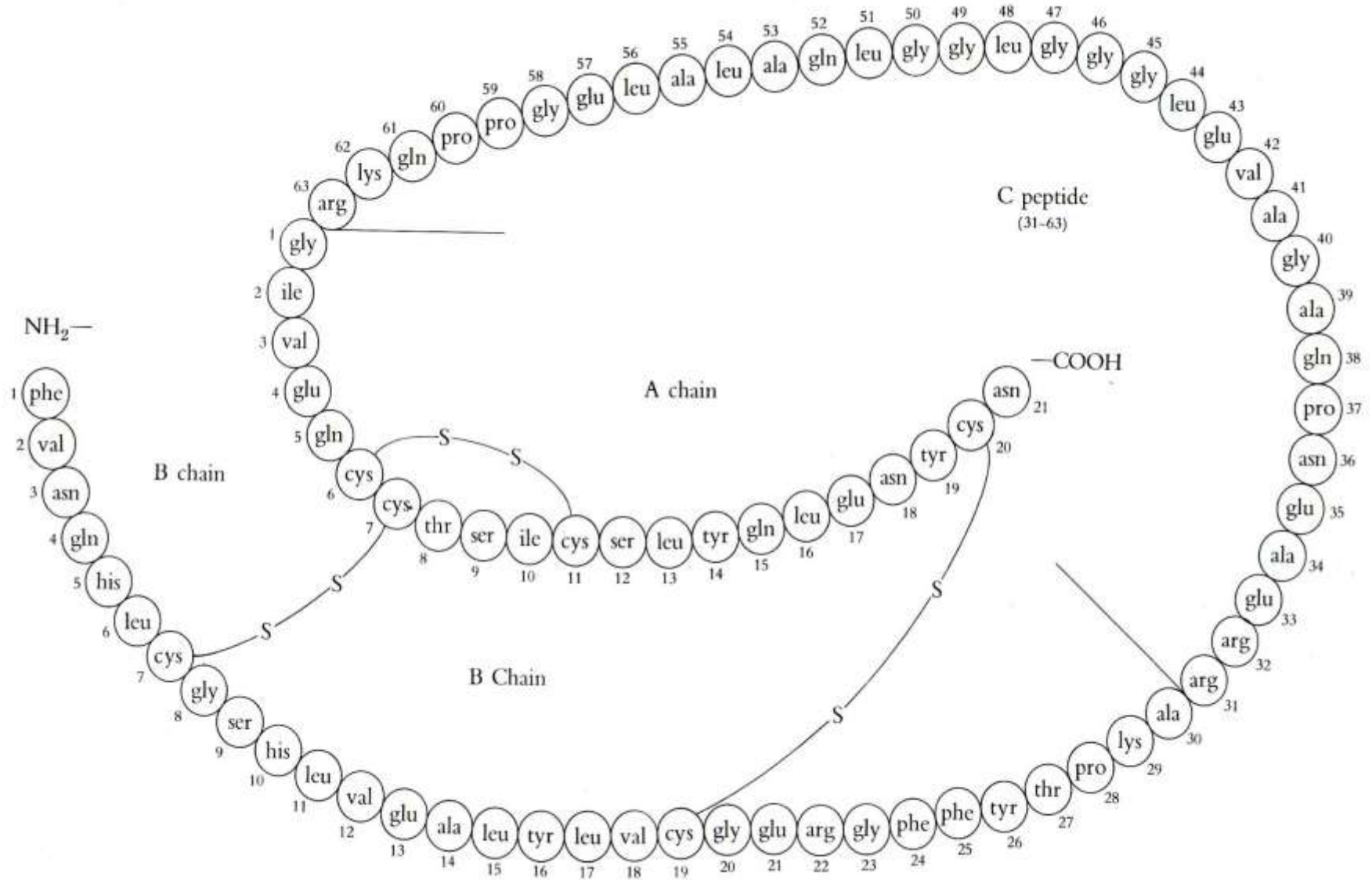
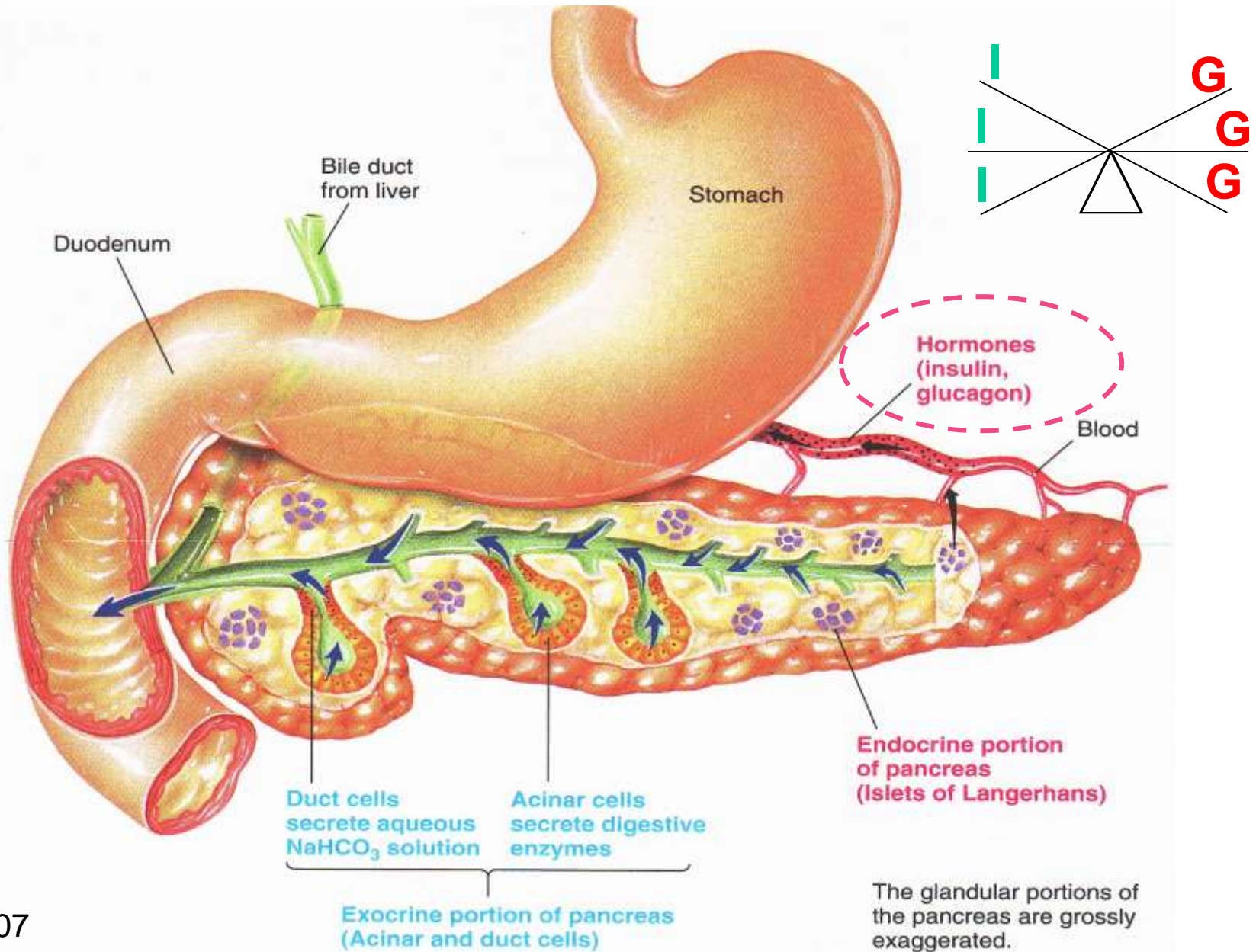


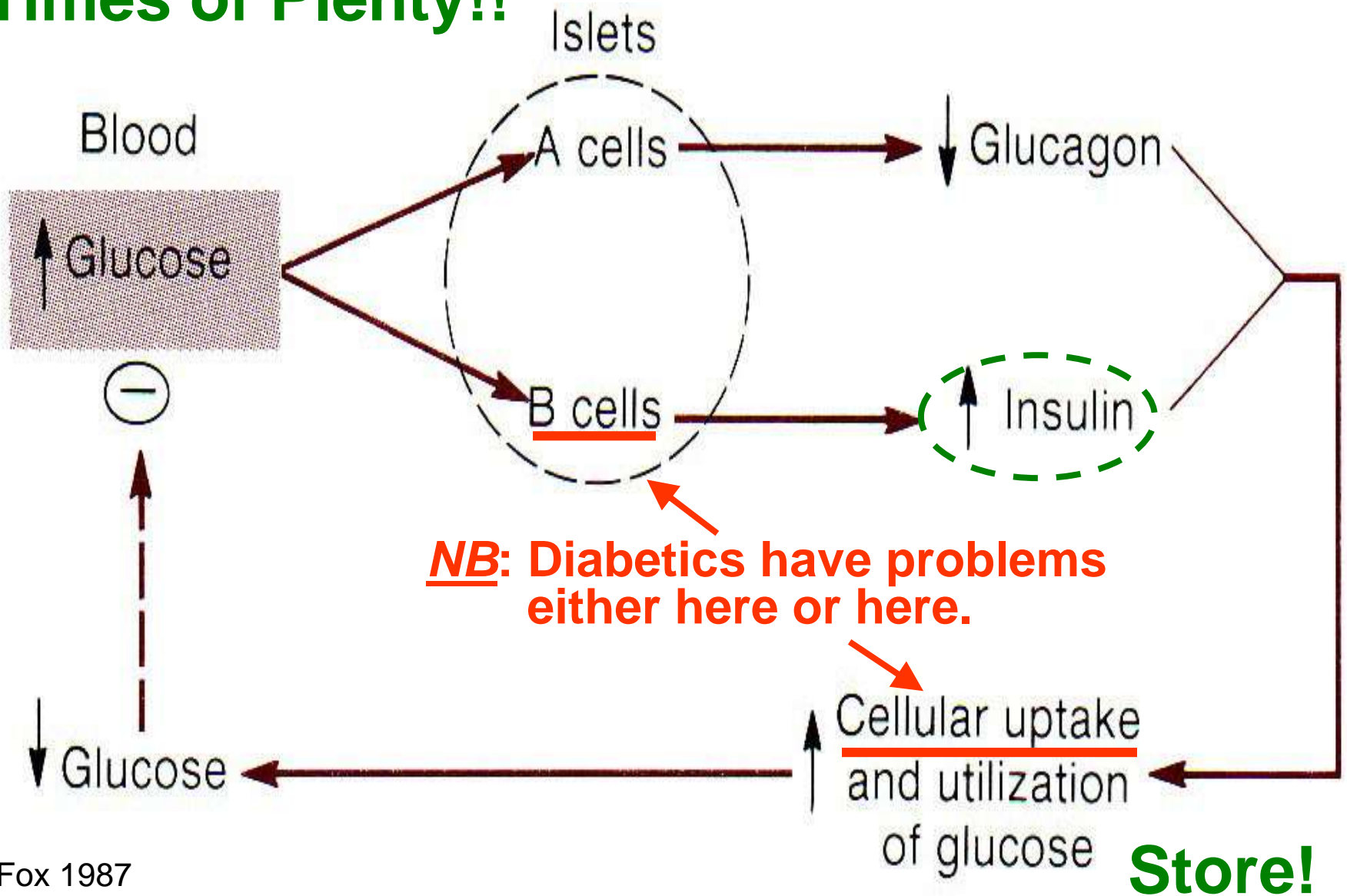
FIG. 10-4. Amino acid sequence of a mammalian proinsulin molecule. Note how the insulin molecule can be formed by cleaving this polypeptide chain at two locations to liberate the C peptide.



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



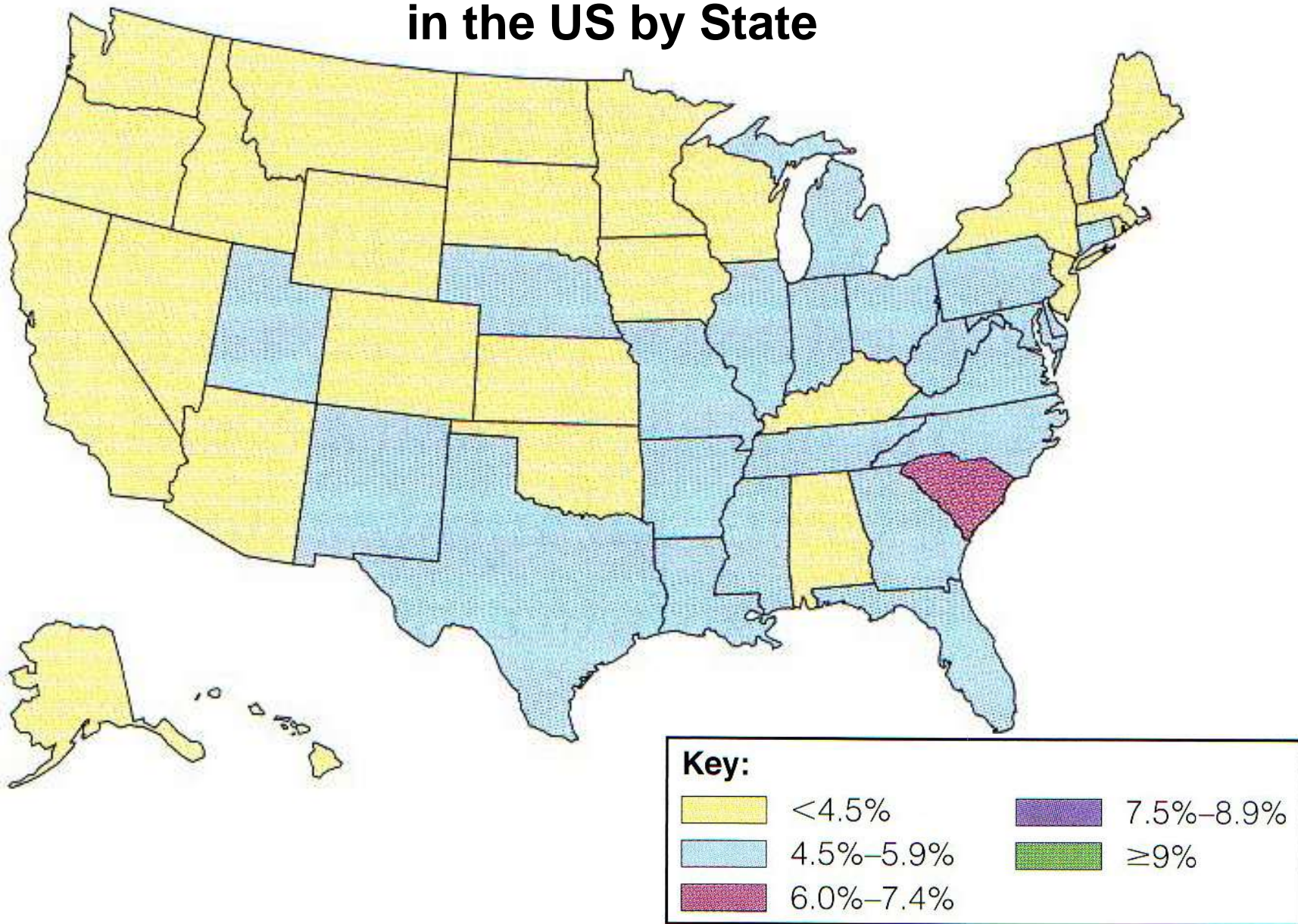
Times of Plenty!!



Fox 1987

<https://ed.ted.com/lessons/what-does-the-pancreas-do-emma-bryce>
<https://www.youtube.com/watch?v=8dgoeYPoE-0>

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.

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

Medication



Exercise

Diet

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



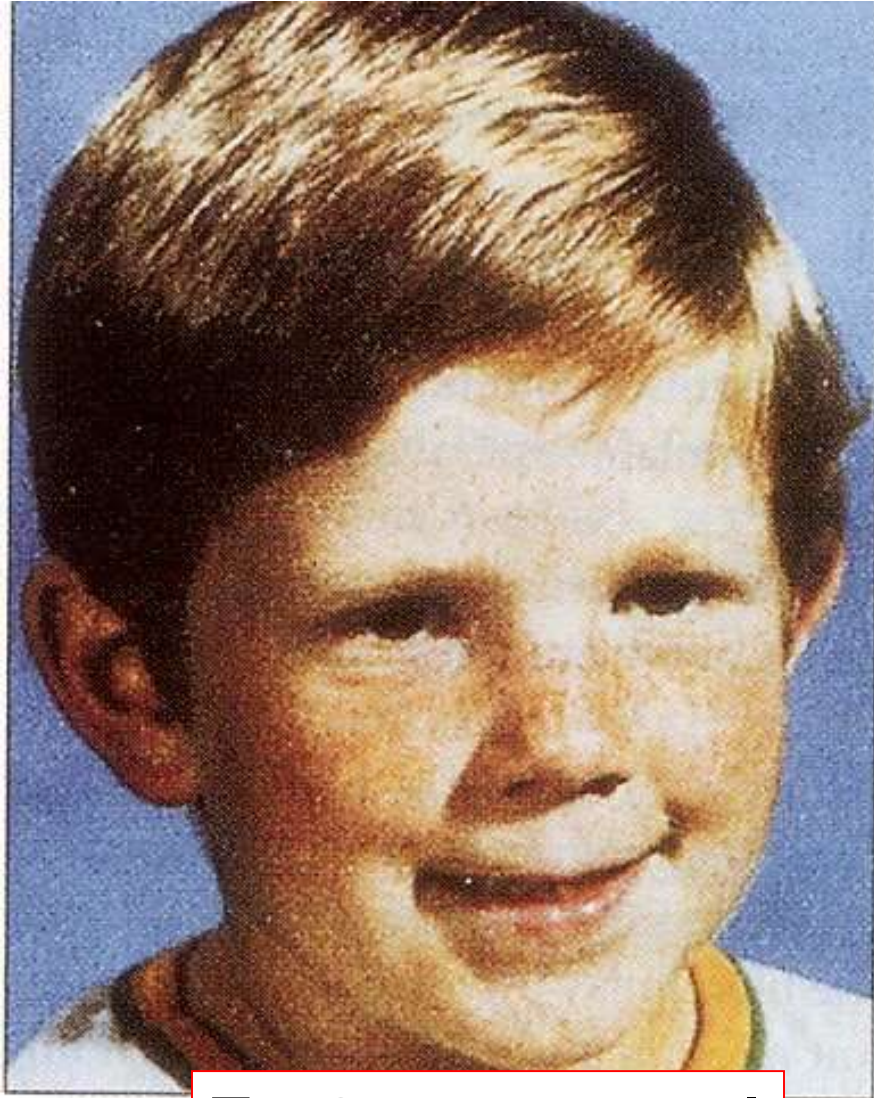
***Exercise is a must based on
its insulin-like effect!***



TIME OUT



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



T = 0, near normal

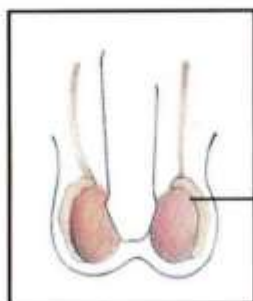


T = 4 months later

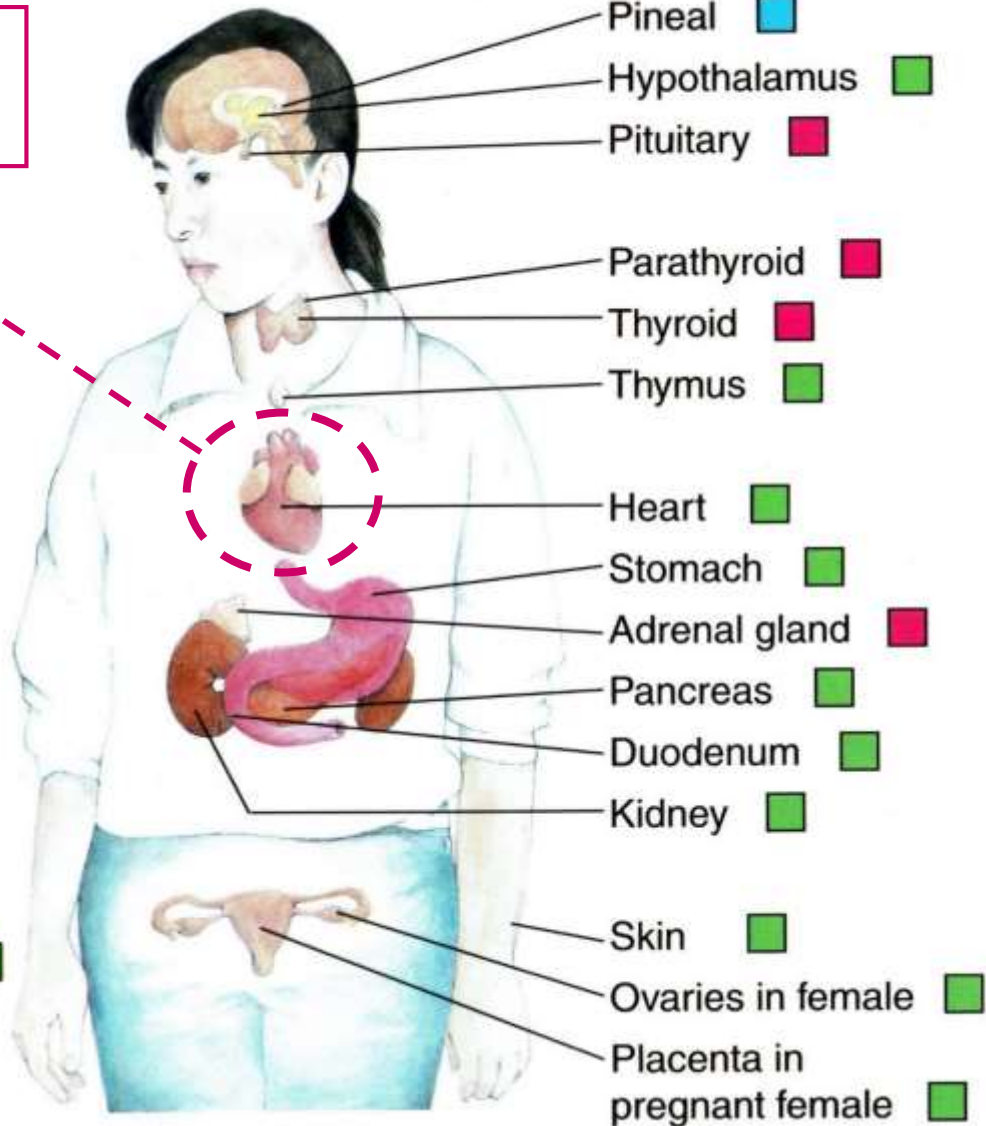
Endocrine System

ANP = Atrial Natriuretic Polypeptide

- Solely endocrine function
- Mixed function
- Complete function uncertain



Testes in male ■



https://www.ted.com/talks/emma_bryce_how_do_your_hormones_work

<https://www.youtube.com/watch?v=IRJE8c3qhRE>

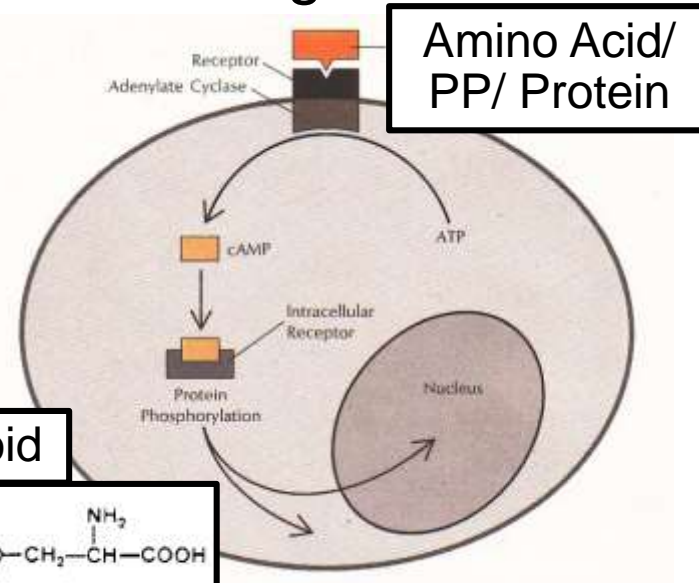
<https://www.hopkinsallchildrens.org/Patients-Families/Health-Library/HealthDocNew/Movie-Endocrine-System>

Hormone/Endocrine Classifications?

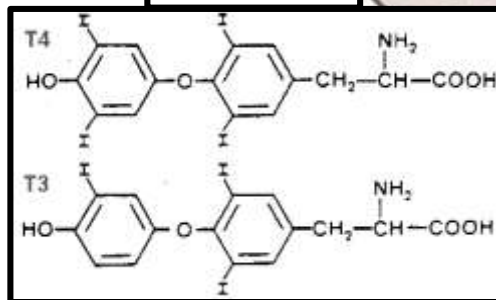
Exogenous



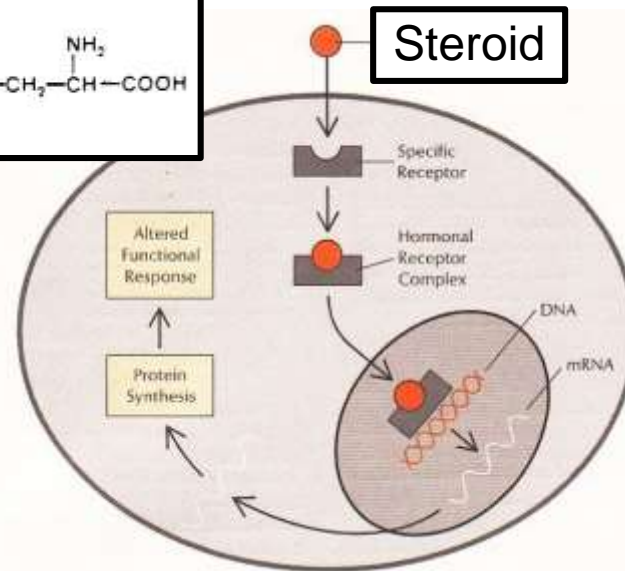
Endogenous



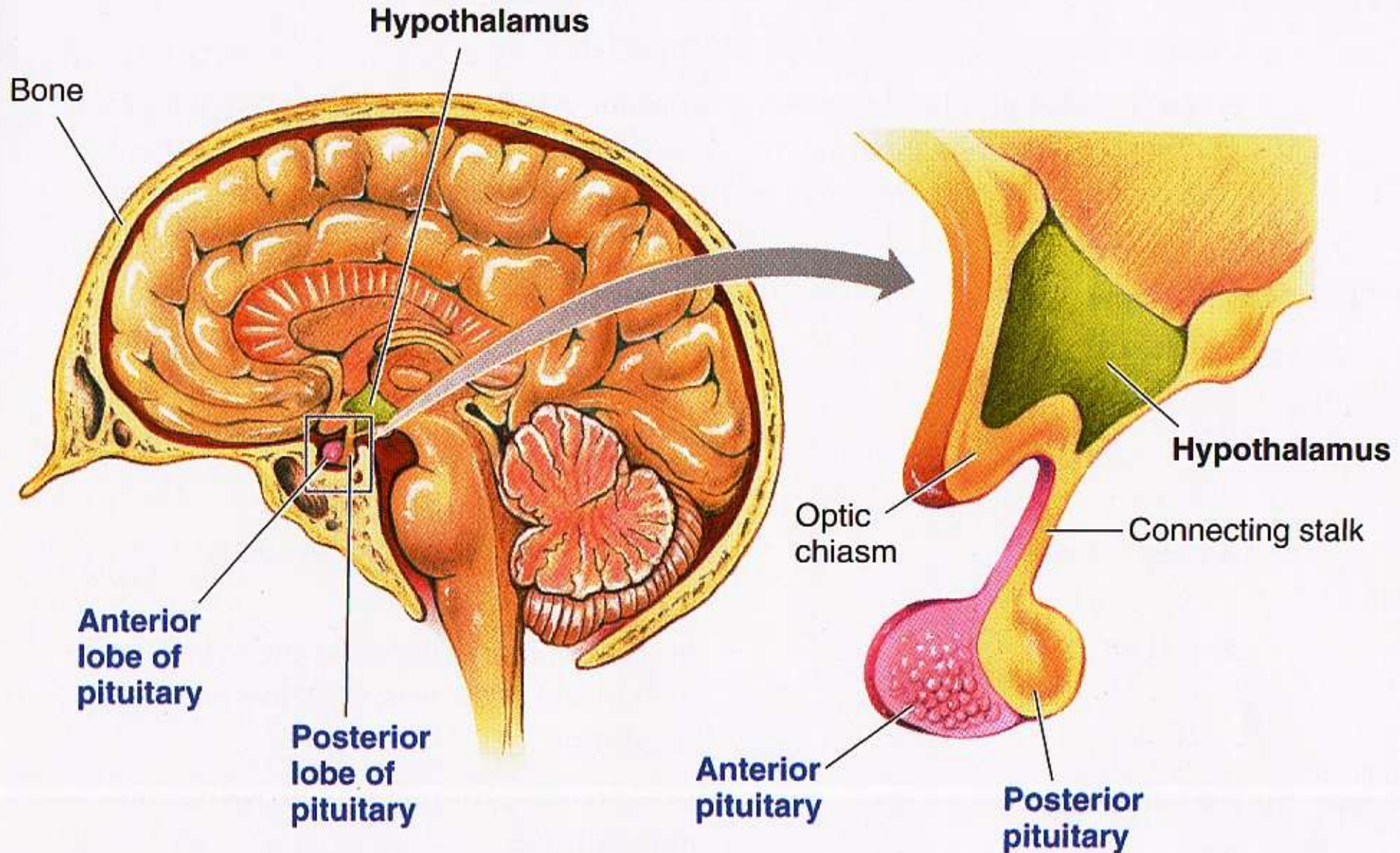
Thyroid



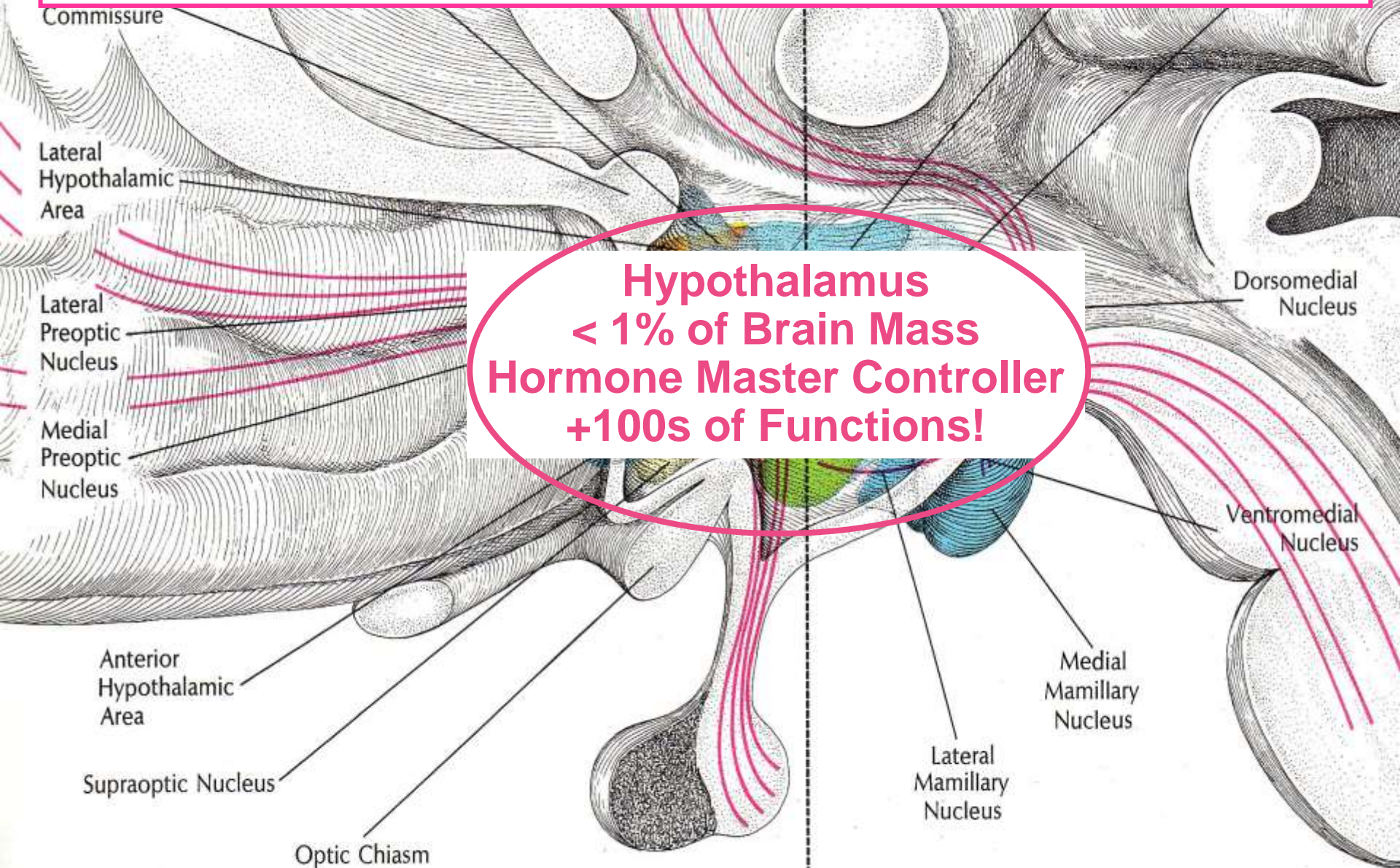
Steroid

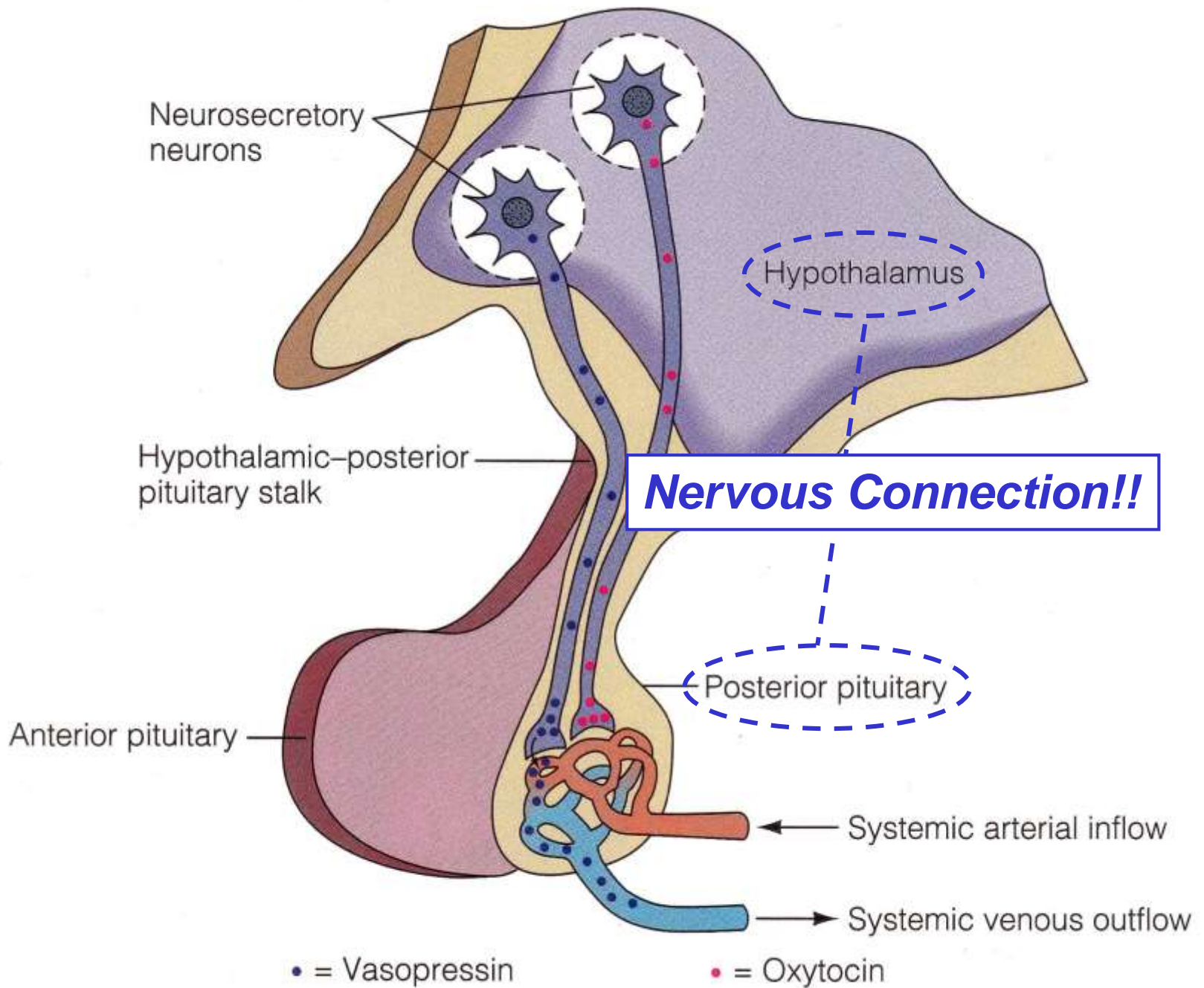


Hypothalamus & Pituitary: Intimate Relationship

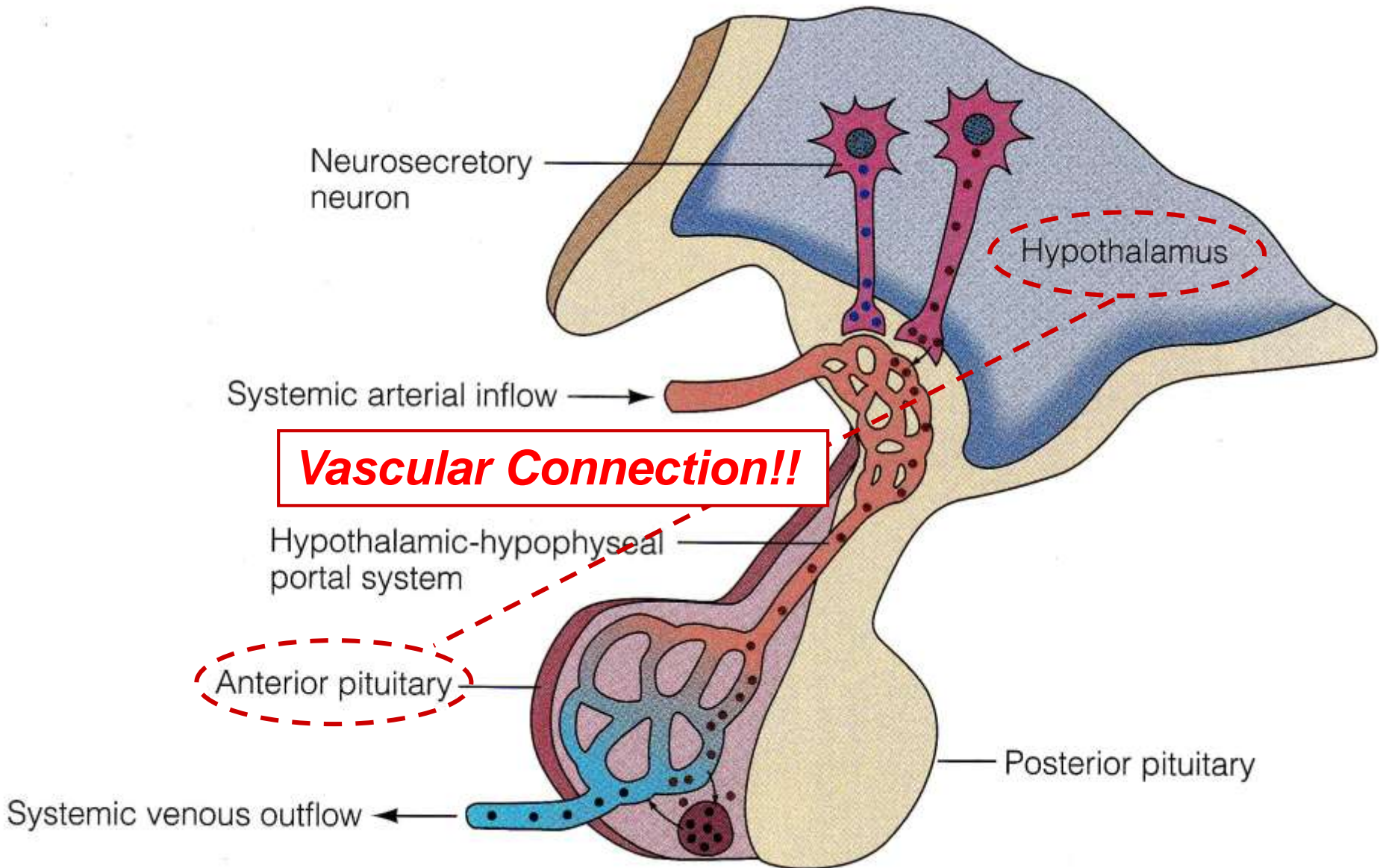


Good Things Come in Small Packages!



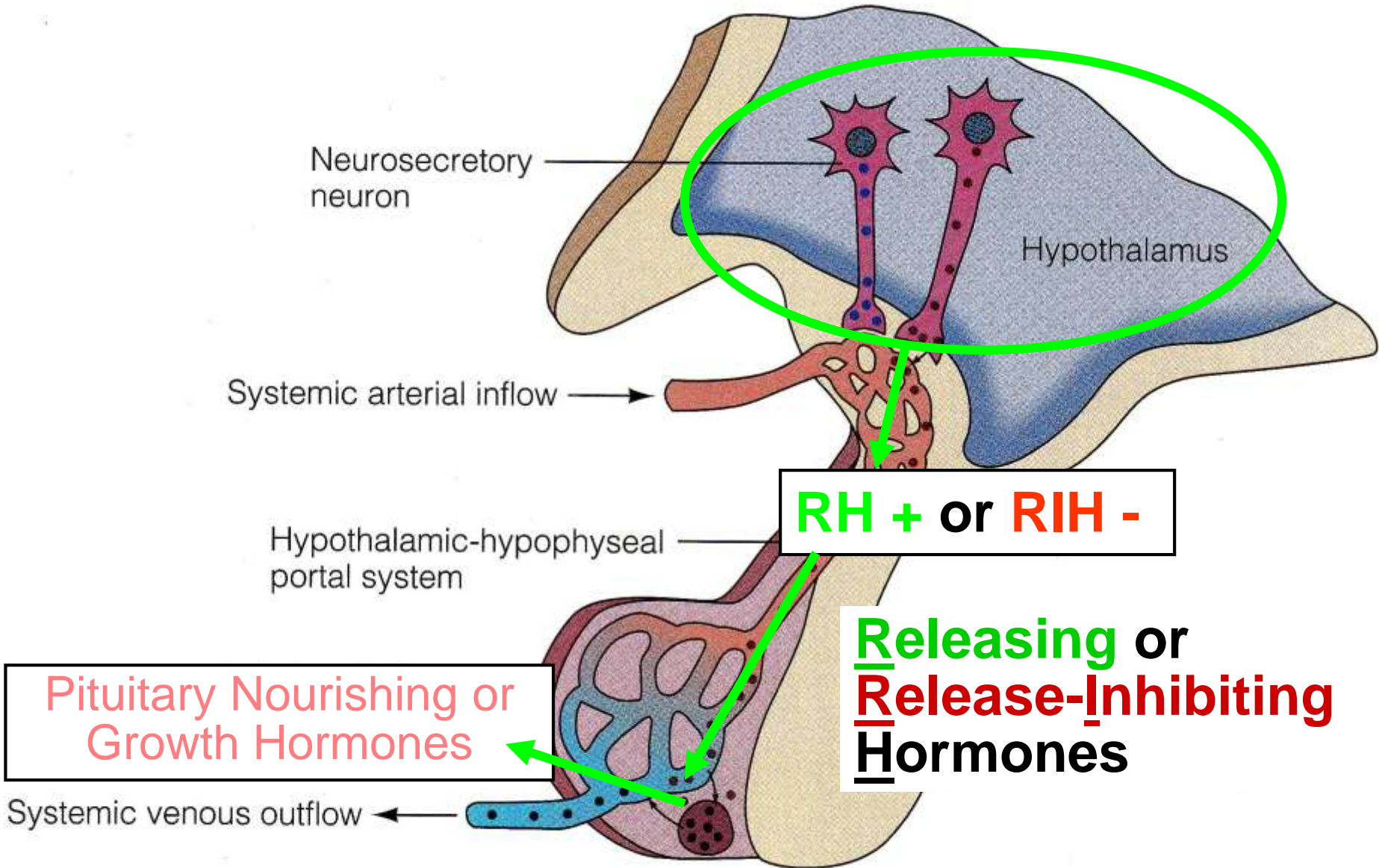


Hypothalamus-Anterior Pituitary Vascular Connection!



• = Hypophysiotropic hormones

• = Anterior pituitary hormone

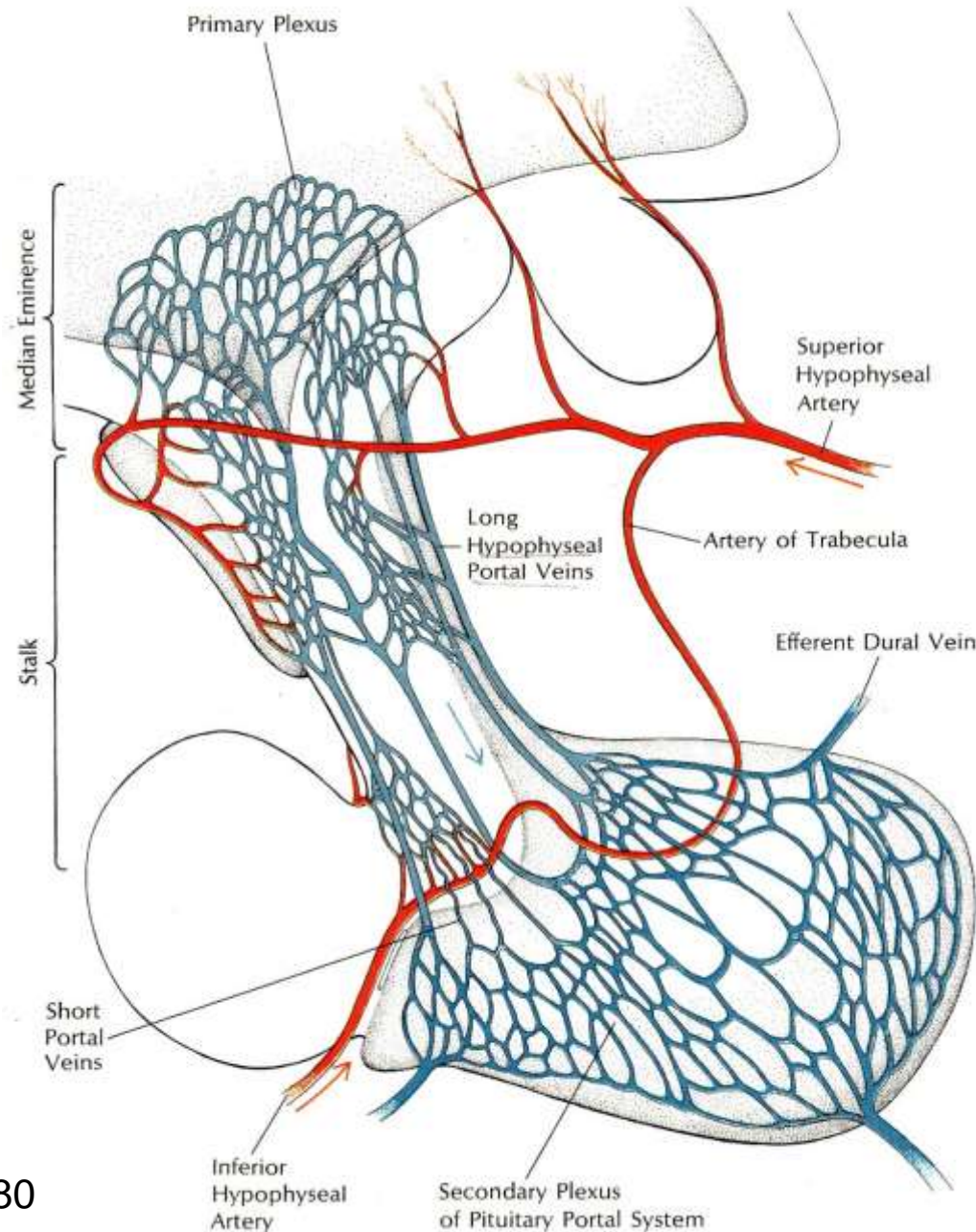


• • = Hypophysiotropic hormones

• = Anterior pituitary hormone

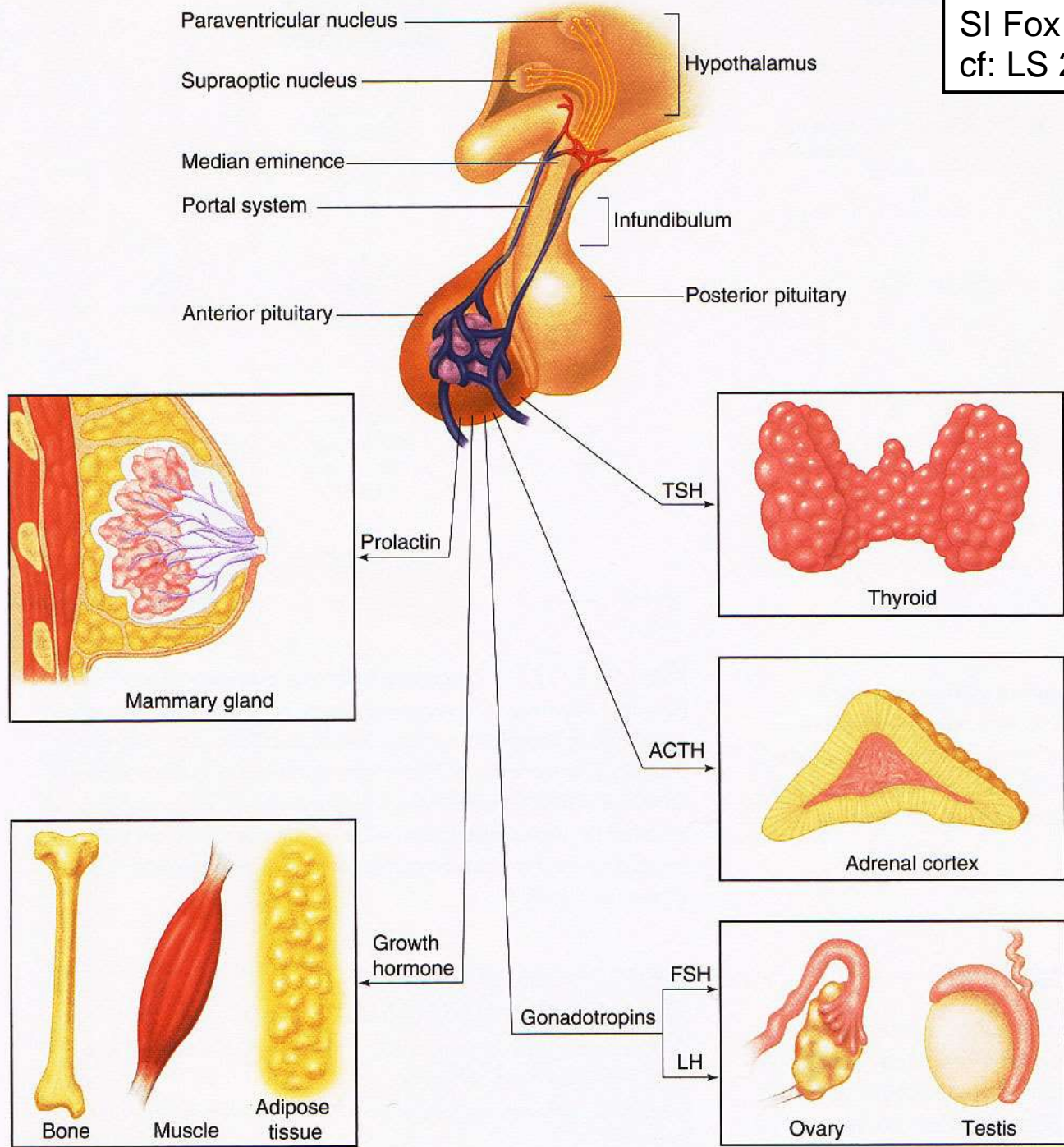
Hypophysis ≡ Pituitary

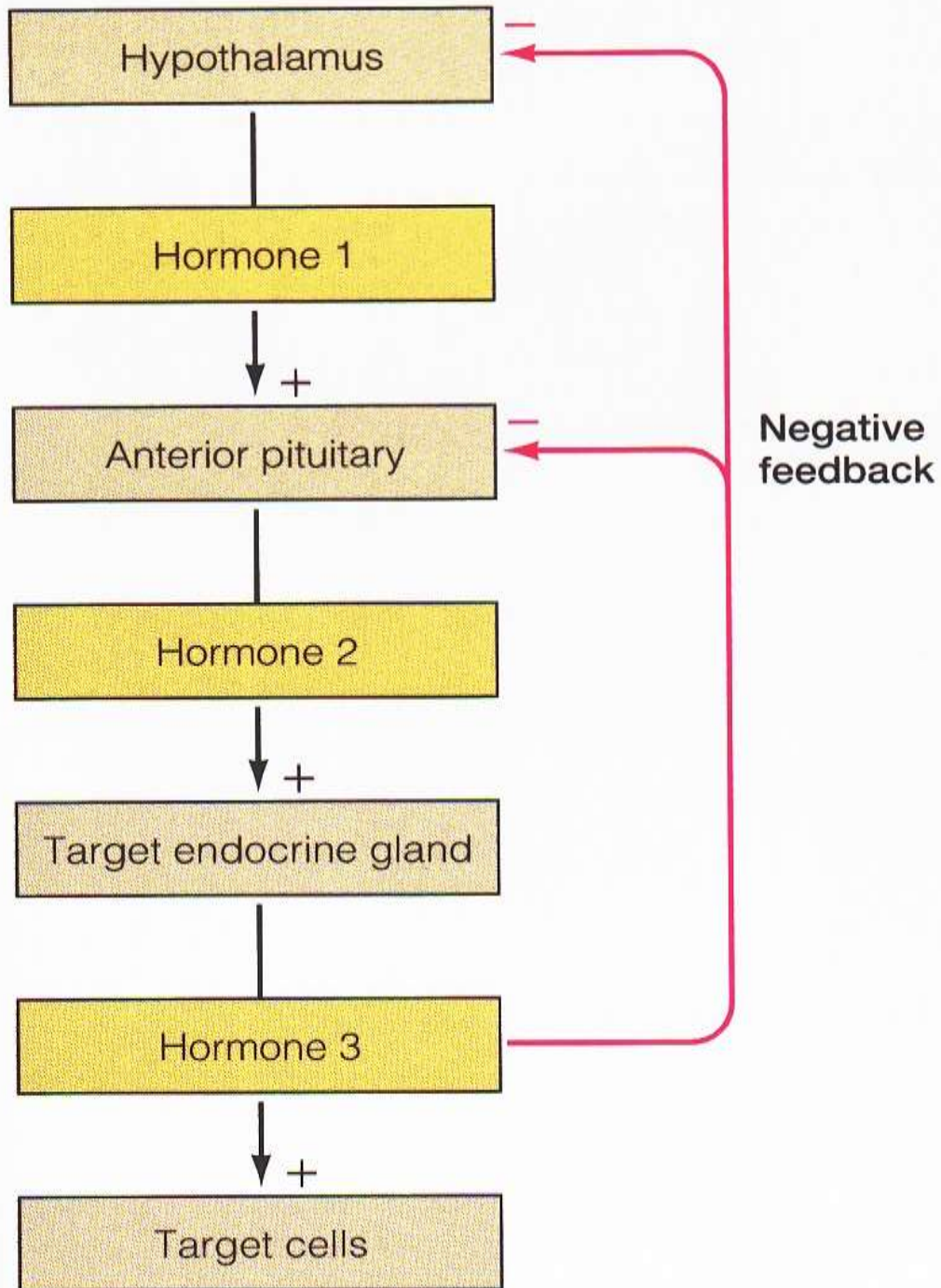
Capillary-Venule-Capillary Intimate Circulation





1 mm





**Often,
more than
simply 1
feedback
loop!**





LS 2006, cf: LS 2012
fig 17-10

Progression & Development of Acromegaly

Age 13

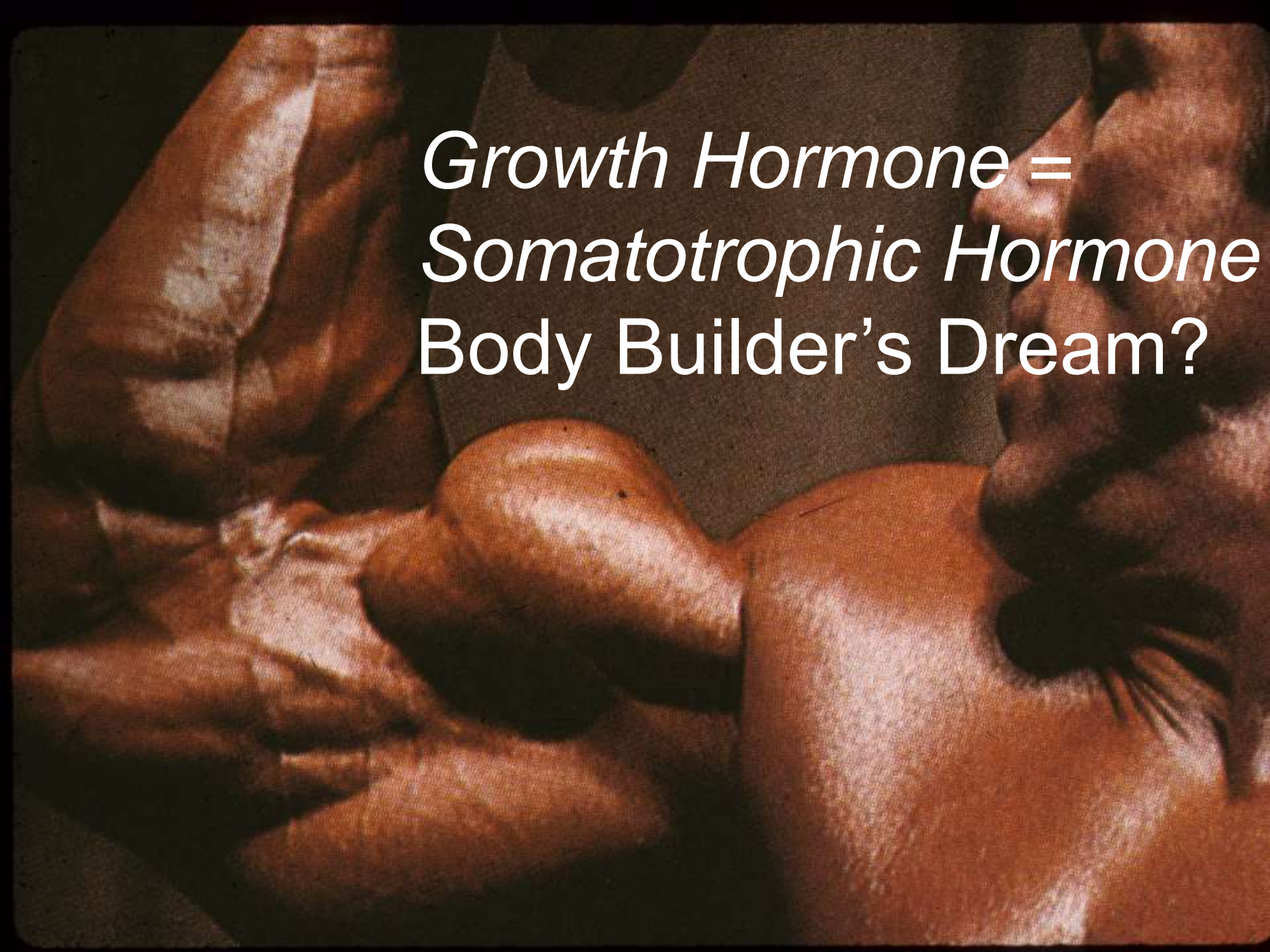


Age 21



Age 35





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

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

↑ Amino Acid uptake & Protein synthesis

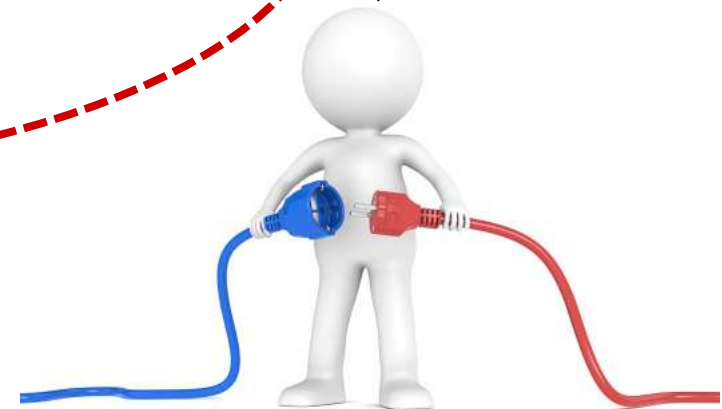
↑ Lipolysis & Fatty Acid mobilization

↓ Glucose uptake
(skeletal muscle & adipocytes)

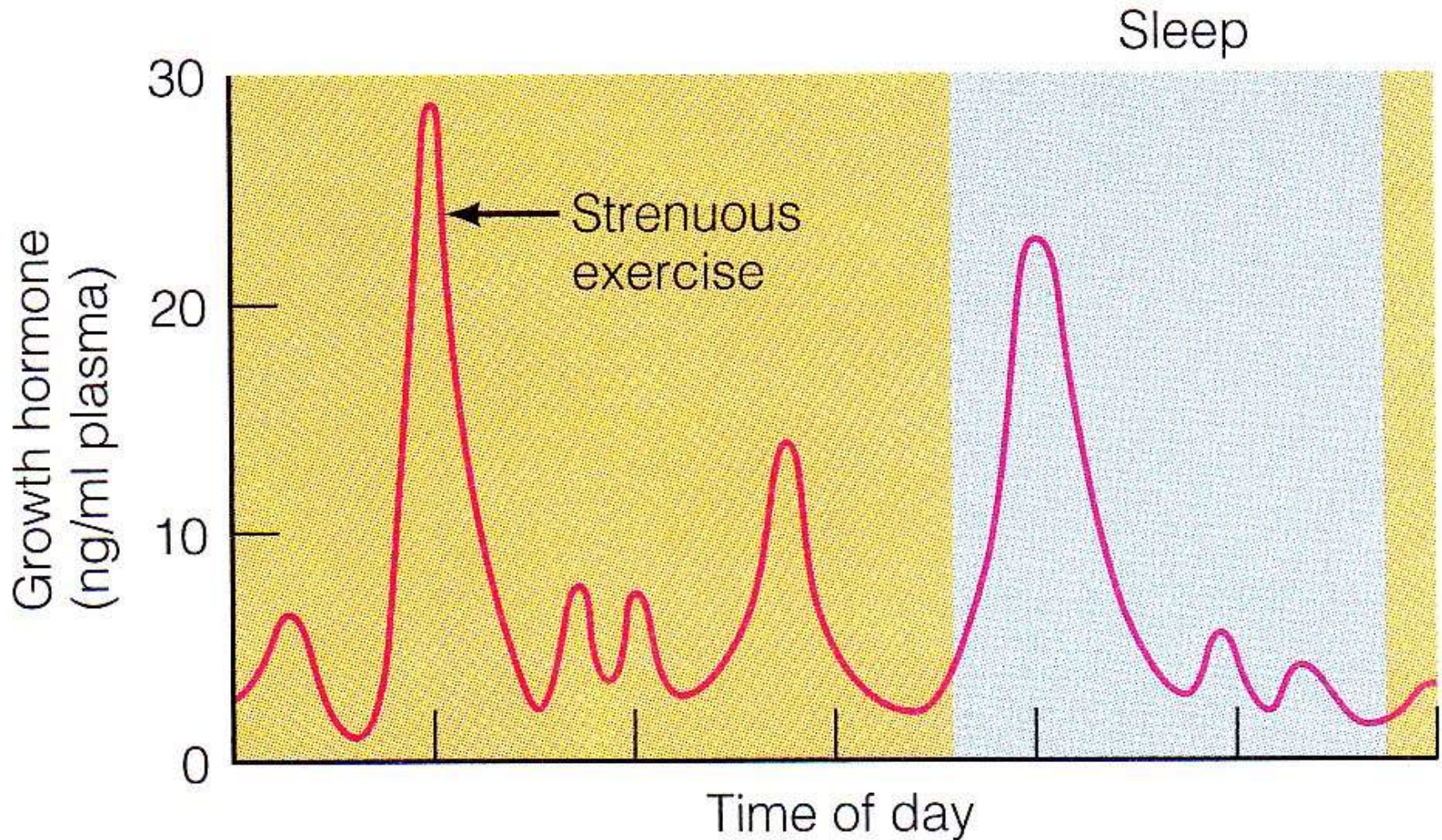
↑ Glucose production
(liver glycogenolysis)

↑ Insulin secretion

Mismatch!!



Increase GH naturally with exercise & sleep!!



ng/ml = nanograms per milliliter