

Clinical Case “A”

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Be honest, did you read the clinical case already?

- A. True
- B. False

Presentation

A 23-year-old woman visits her family physician with complaints of a 12-month history of increasing nervousness, irritability, and palpitations (a noticeable increase in the force of her heartbeat). Furthermore, she feels very warm in a room when everyone else feels comfortable. Her skin is unusually warm and moist to the touch. She has lost 30 pounds of body weight over this period despite having a voracious appetite and increased food intake.

More Presentation

Two years ago, she was jogging about 20 miles per week. However, she had not done any running for the past year because she “didn’t feel up to it” and complained of general muscle weakness. She said she often felt irritable and had mood swings. Her menstrual periods have been less frequent over the past year. Her previous medical history was normal for a person her age. She states that she has double vision when looking to the side but does not have any loss of vision when using only one eye or the other.

MENSTRUAL CYCLE

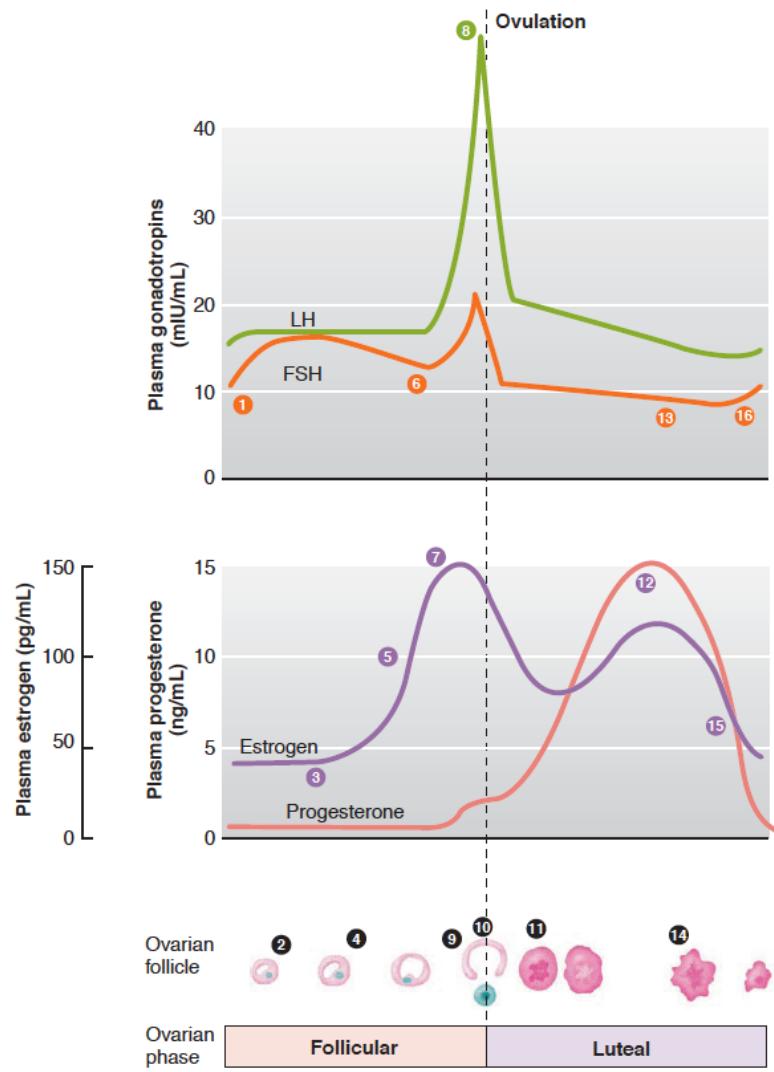
Which hormone does not control the menstrual cycle?

- A. LH
- B. FSH
- C. Estrogen
- D. Progesterone
- E. GHRH
- F. They all do

Which hormone(s) is/are released from the anterior pituitary

- A. FSH/LH
- B. Estrogen
- C. Progesterone
- D. GHRH
- E. They all are

Menstrual Cycle Control



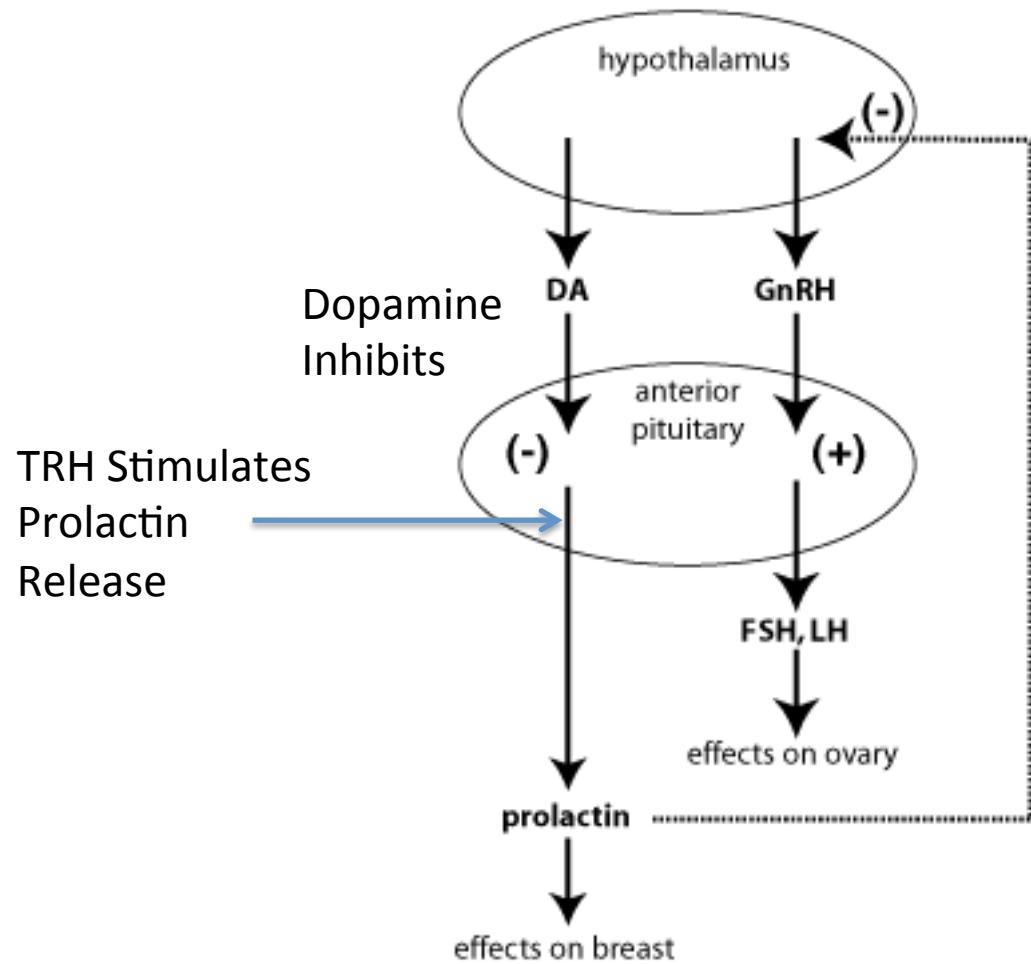
Menstrual Cycle Control

TABLE 17.7

Summary of the Menstrual Cycle

Day(s)	Major Events
1–5	<p>Estrogen and progesterone are low because the previous corpus luteum is regressing.</p> <p><i>Therefore:</i> a. Endometrial lining sloughs.</p> <p>b. Secretion of FSH and LH is released from inhibition, and their plasma concentrations increase.</p> <p><i>Therefore:</i> Several growing follicles are stimulated to mature.</p>
7	A single follicle (usually) becomes dominant.
7–12	<p>Plasma estrogen increases because of secretion by the dominant follicle.</p> <p><i>Therefore:</i> Endometrium is stimulated to proliferate.</p>
7–12	<p>LH and FSH decrease due to estrogen and inhibin negative feedback.</p> <p><i>Therefore:</i> Degeneration (atresia) of nondominant follicles occurs.</p>
12–13	<p>LH surge is induced by increasing plasma estrogen.</p> <p><i>Therefore:</i> a. Oocyte is induced to complete its first meiotic division and undergo cytoplasmic maturation.</p> <p>b. Follicle is stimulated to secrete digestive enzymes and prostaglandins.</p>
14	Ovulation is mediated by follicular enzymes and prostaglandins.
15–25	<p>Corpus luteum forms and, under the influence of low but adequate levels of LH, secretes estrogen and progesterone, increasing plasma concentrations of these hormones.</p> <p><i>Therefore:</i> a. Secretory endometrium develops.</p> <p>b. Secretion of FSH and LH from the anterior pituitary gland is inhibited, lowering their plasma concentrations.</p> <p><i>Therefore:</i> No new follicles develop.</p>
25–28	<p>Corpus luteum degenerates (if implantation of the conceptus does not occur).</p> <p><i>Therefore:</i> Plasma estrogen and progesterone concentrations decrease.</p> <p><i>Therefore:</i> Endometrium begins to slough at conclusion of day 28, and a new cycle begins.</p>

Prolactin Feedback



Which disorder could reduce menstrual cycle frequency AND loss of vision?

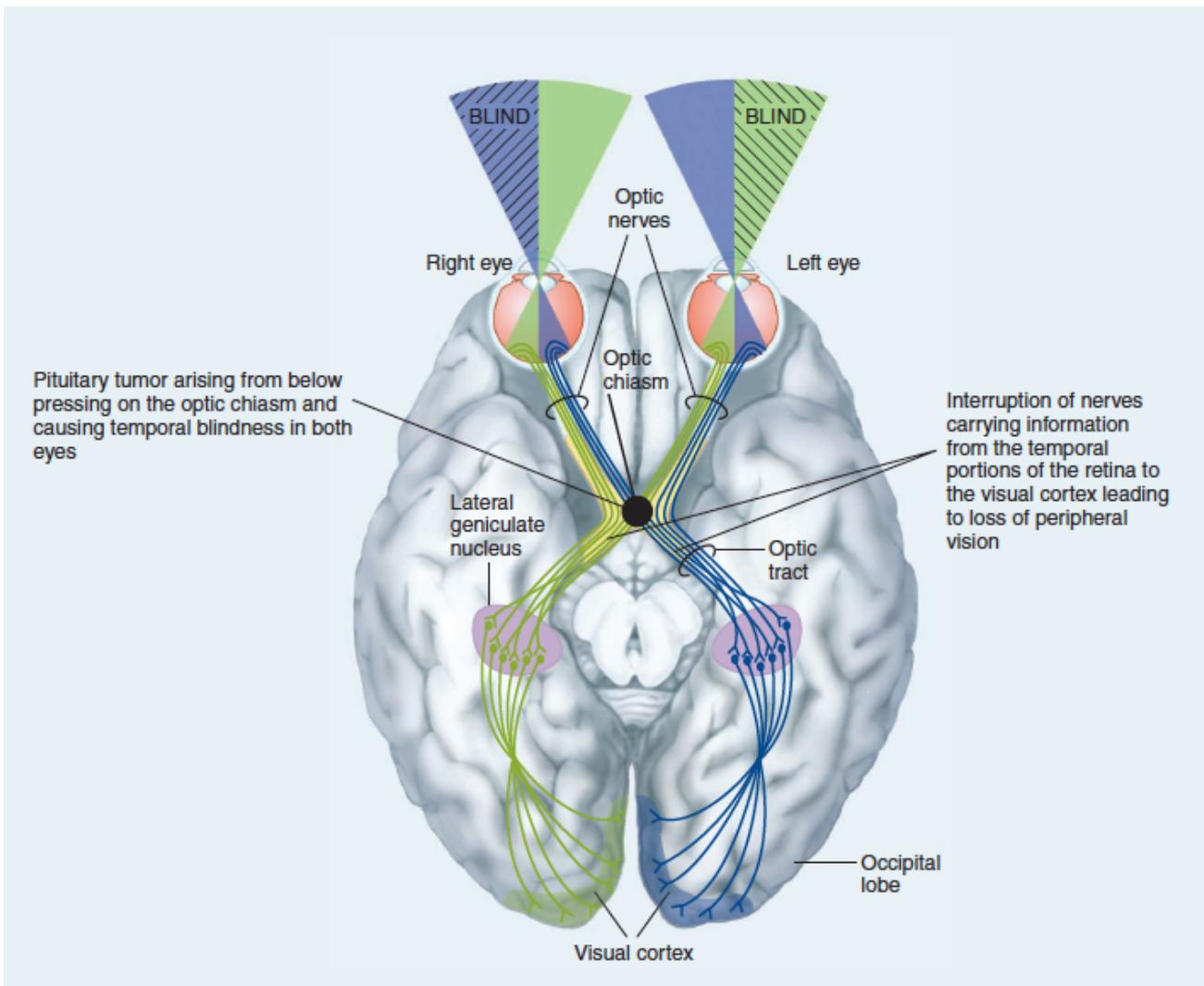
- A. Breakage of infundibulum
- B. Anterior pituitary adenoma arising from somatotropes
- C. Anterior pituitary adenoma arising from thyrotropes
- D. Anterior pituitary adenoma arising from gonadotropes
- E. Anterior pituitary adenoma arising from lactotropes

Where are TRH and DA coming from

- A. Hypothalamus via infundibulum
- B. Hypothalamus via neurohypophysial portal system
- C. Anterior pituitary
- D. Posterior pituitary

VISION PROBLEMS

Putuitary Tumors



Physical examination



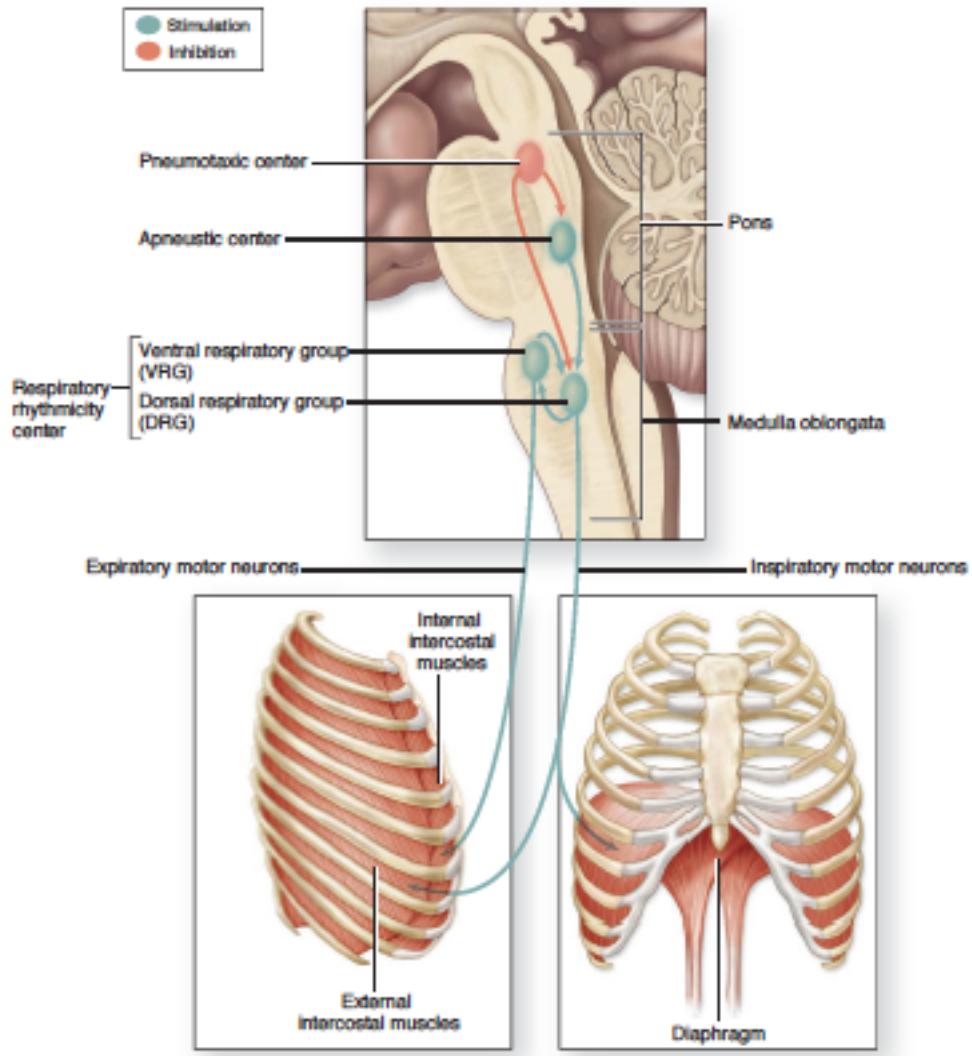
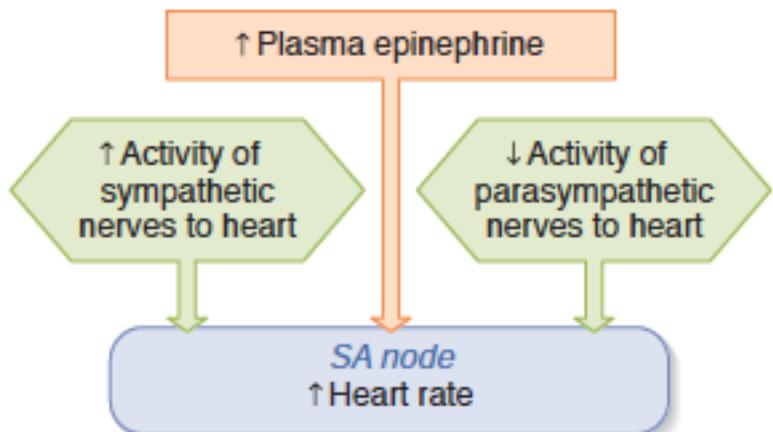
The patient is a 5' 7" (170 cm), 110-pound (50 kg) woman. Her systolic/diastolic blood pressure is 140/60 mmHg (normal for a young, healthy woman is about 110/70 mmHg). Her resting pulse rate is 100 beats per minute. Before she became ill, her resting heart rate was about 60–70 beats per minute. Her respiratory rate is 17 breaths per minute (normal for her was approximately 12–14 breaths per minute). Her skin is warm and moist. Her eyes are bulging out (proptosis or exophthalmos). Finally, when she is asked to gaze to the far right, her right eye does not move as far as does her left eye and she says she has double vision (diplopia).

TACHYCARDIA

Question

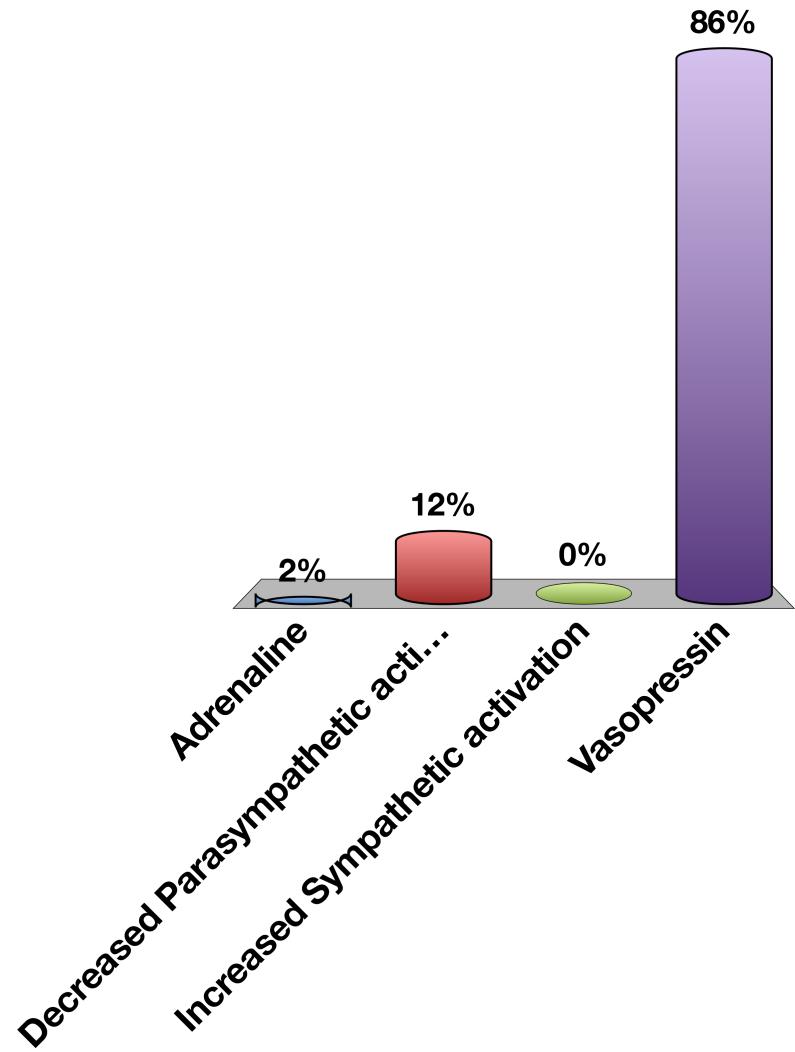
- What could be causing her tachycardia and tachypnea

Helpful Pictures



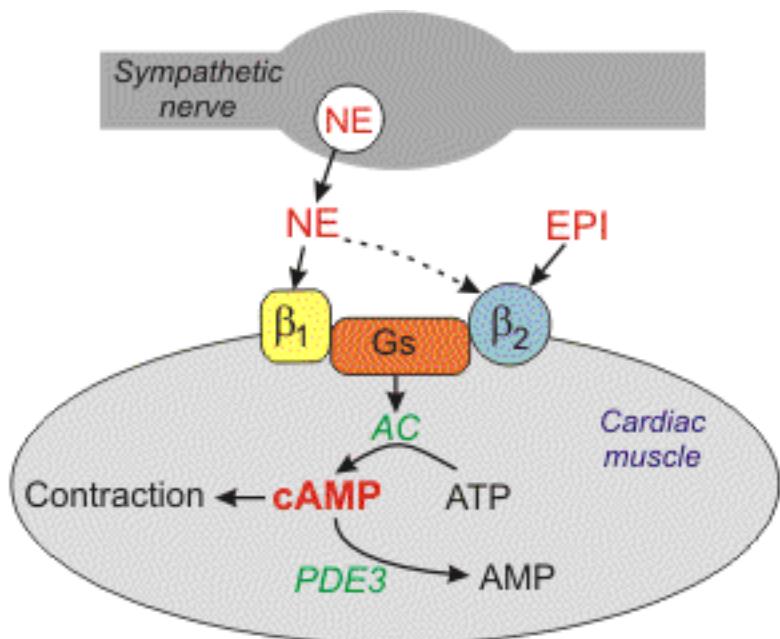
Which does not cause tachycardia

- A. Adrenaline
- B. Decreased Parasympathetic activation
- C. Increased Sympathetic activation
- D. Vasopressin



How can we get tachycardia

1. More adrenaline
(adrenal gland)
2. More noradrenaline
(sympathetic)
3. Less acetylcholine
(parasympathetic)
4. More sensitivity to
catecholamines



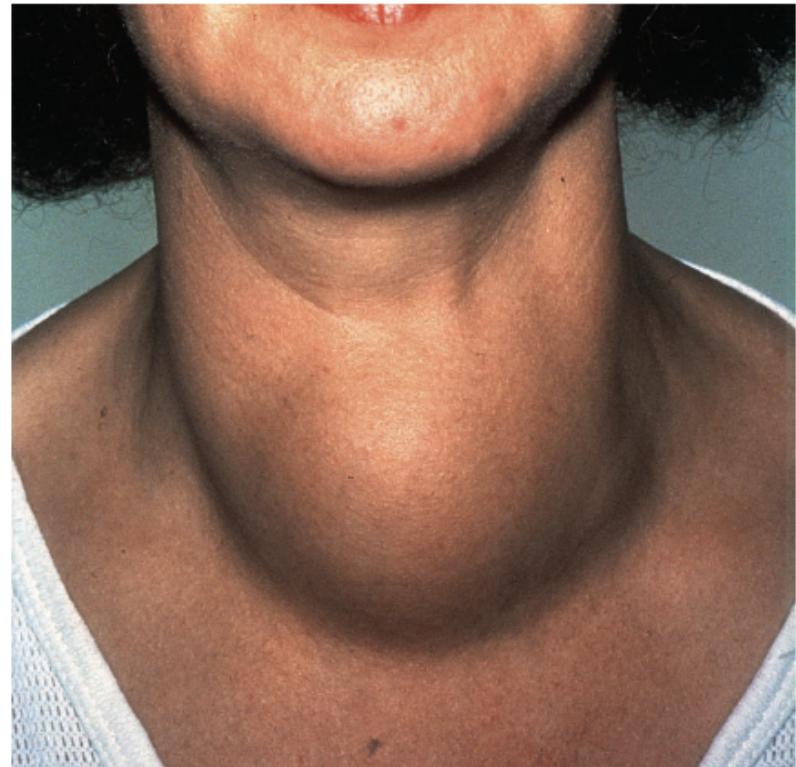
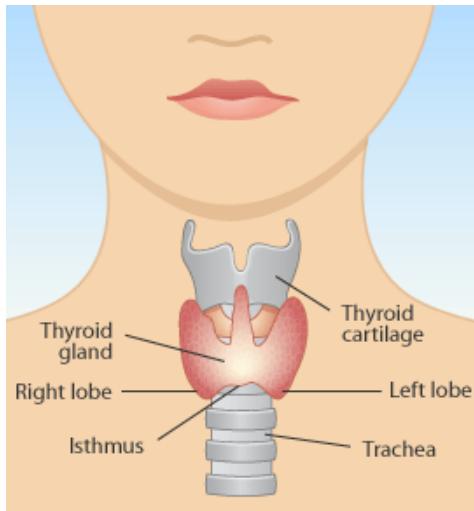
SWOLLEN NECK

More Physical Evaluation

Upon further examination, the physician notes an enlargement of a structure in the front, lower part of her neck (**Figure 19.1b**). It is smooth (no bumps or nodules felt) and painless. When the patient swallows, this enlarged structure moves up and down. When a stethoscope is placed over this structure, the physician can hear a swishing sound (called a *bruit* [BREW-ee]) with each heartbeat.

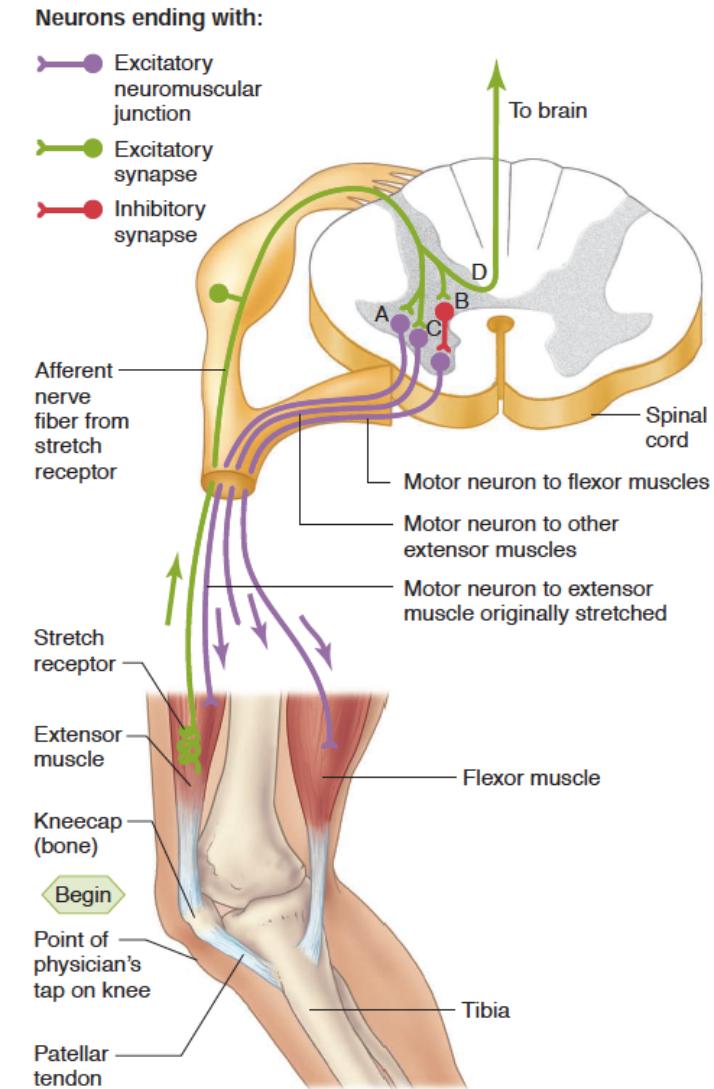
Reflect and Review #4

- What structure might be responsible for the swelling in the patient's lower neck? (See Figures 11.20a and 15.16.) What are the major functions of this structure?



More Physical Evaluation

- Hyperactive tendon response
- What neural pathways are involved in the knee-jerk reflex
- Could the enlarged structure account for abnormal reflexes?



Do you think the enlarged structure
could account for increased tendon
responses

- A. True
- B. False

HORMONE LEVELS

Lab Results

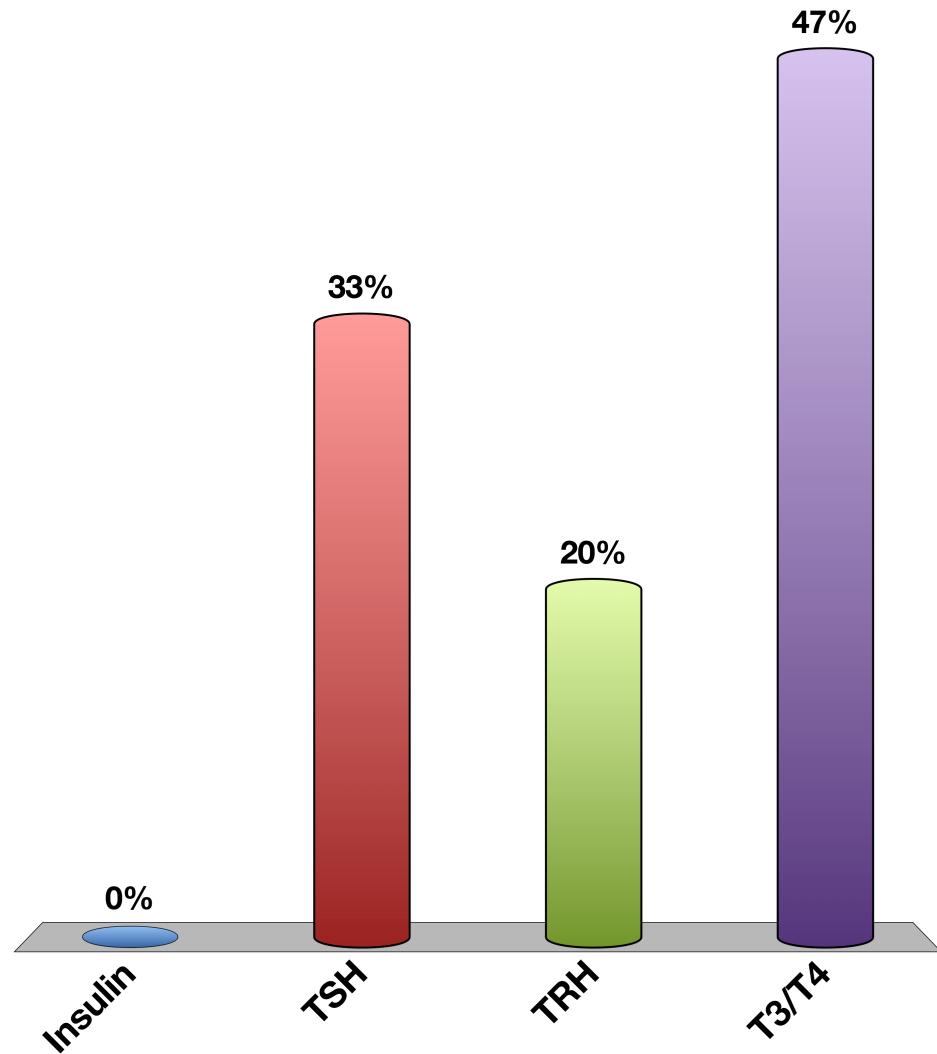
- Think about feedback control of hormones who are abnormal, which if any are consistent with the symptoms
- Why is glucose obtained from fasted?
- Is this person diabetic?

TABLE 19.1 Laboratory Results for Patient

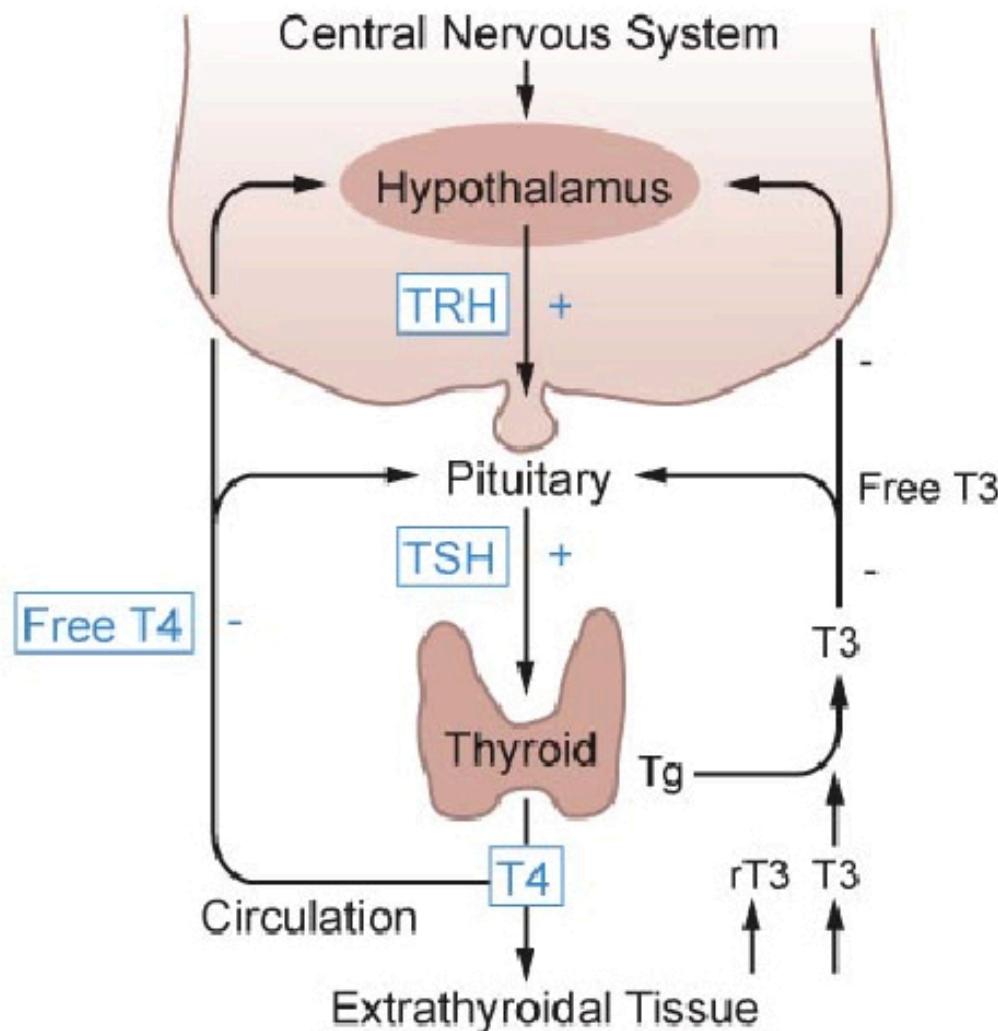
Blood Measurements*	Result	Normal Range
Sodium	136 mmol/L	135–146 mmol/L
Potassium	5.0 mmol/L	3.8–5.0 mmol/L
Chloride	102 mmol/L	97–110 mmol/L
pH	7.39	7.38–7.45
Calcium (total)	9.6 mg/dL	9.0–10.5 mg/dL
Parathyroid hormone	15 pg/mL	10–75 pg/mL
Glucose (fasting)	80 mg/dL	70–110 mg/dL
Prolactin	10.4 ng/mL	1.4–24.2 ng/mL
Estrogen (midcycle)	100 pg/mL	150–750 pg/mL
Total T ₄ [†]	20 ng/dL	5–11 ng/dL
Free T ₄	2.8 ng/dL	0.8–1.6 ng/dL
Thyroid-stimulating hormone (TSH)	0.01 mU/mL	0.3–4.0 mU/mL

What hormone is the primary problem?

- A. Insulin
- B. TSH
- C. TRH
- D. T₃/T₄

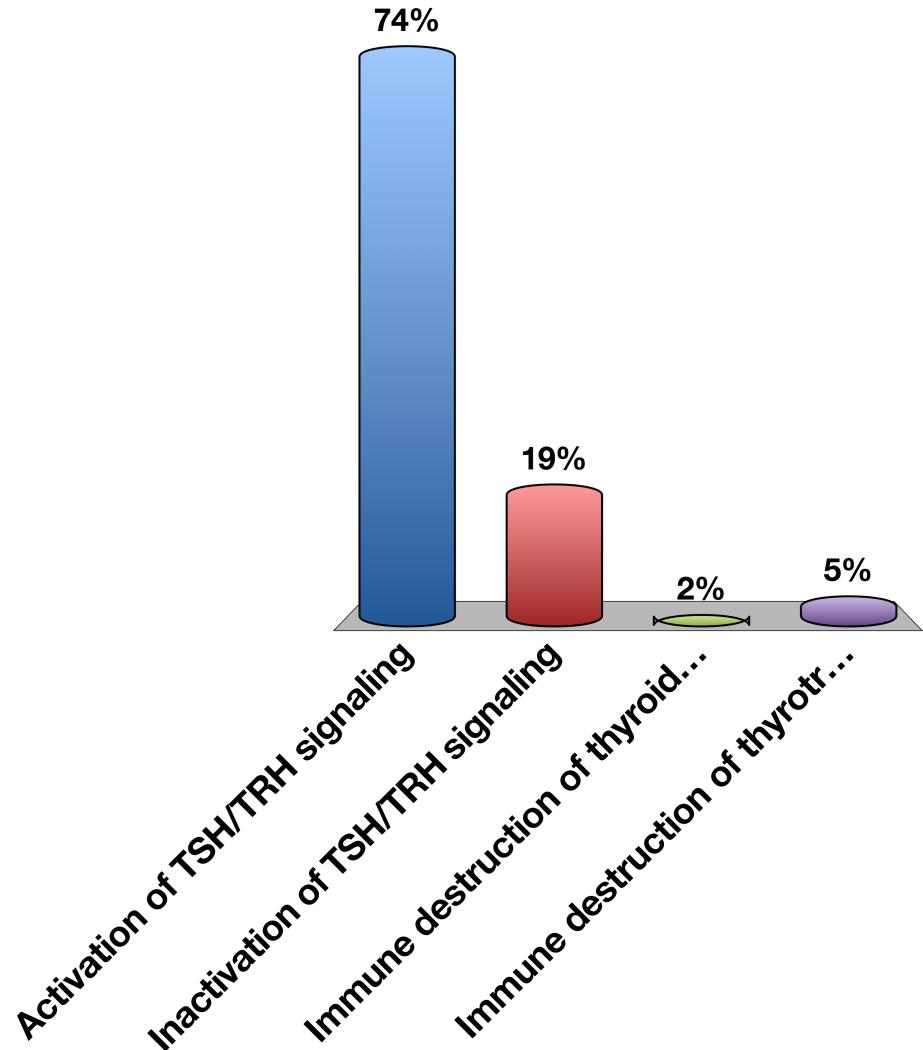


HPT Axis



How could you end up with hyperthyroidism?

- A. Activation of TSH/TRH signaling
- B. Inactivation of TSH/TRH signaling
- C. Immune destruction of thyroid gland
- D. Immune destruction of thyrotropes



Graves Disease

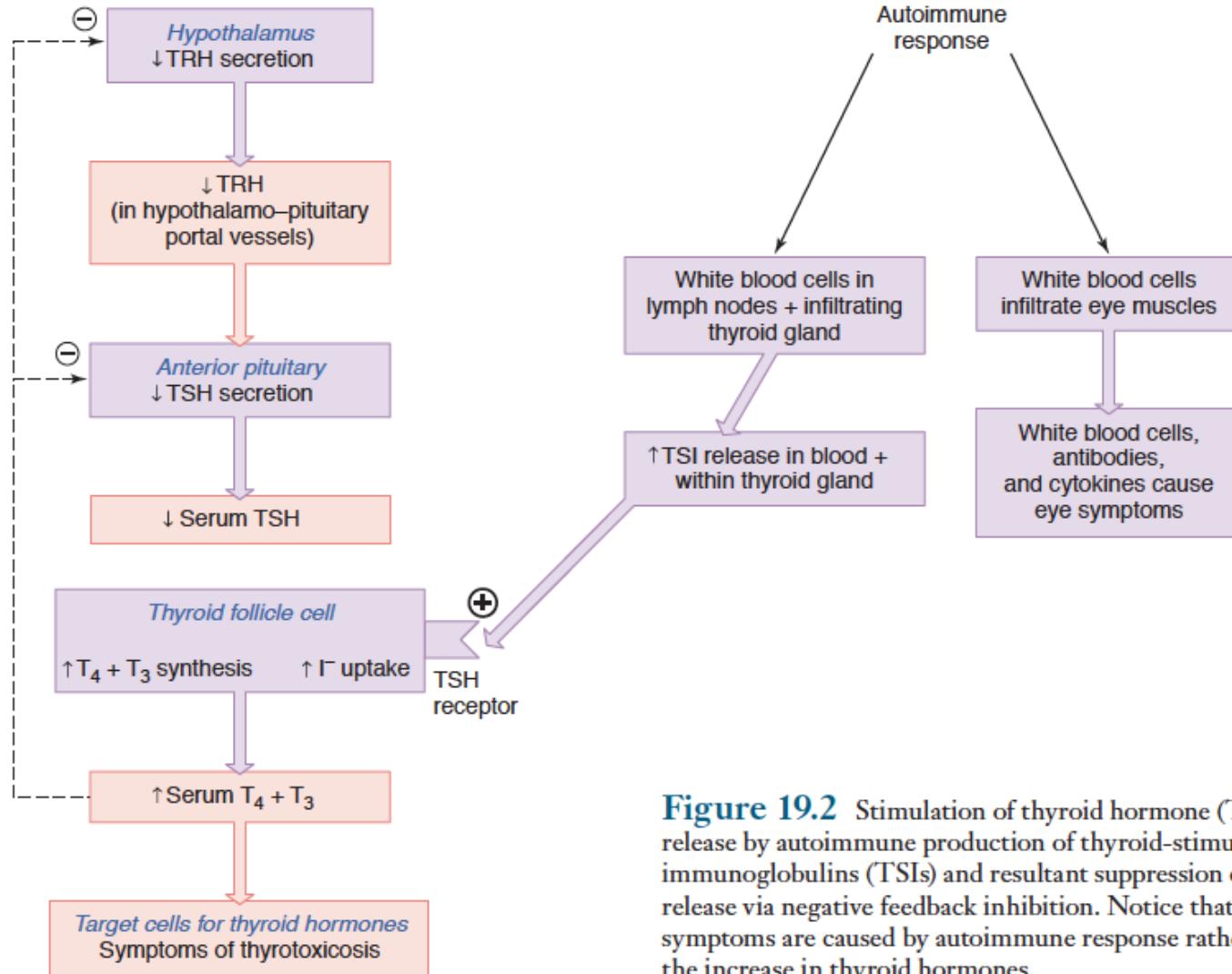
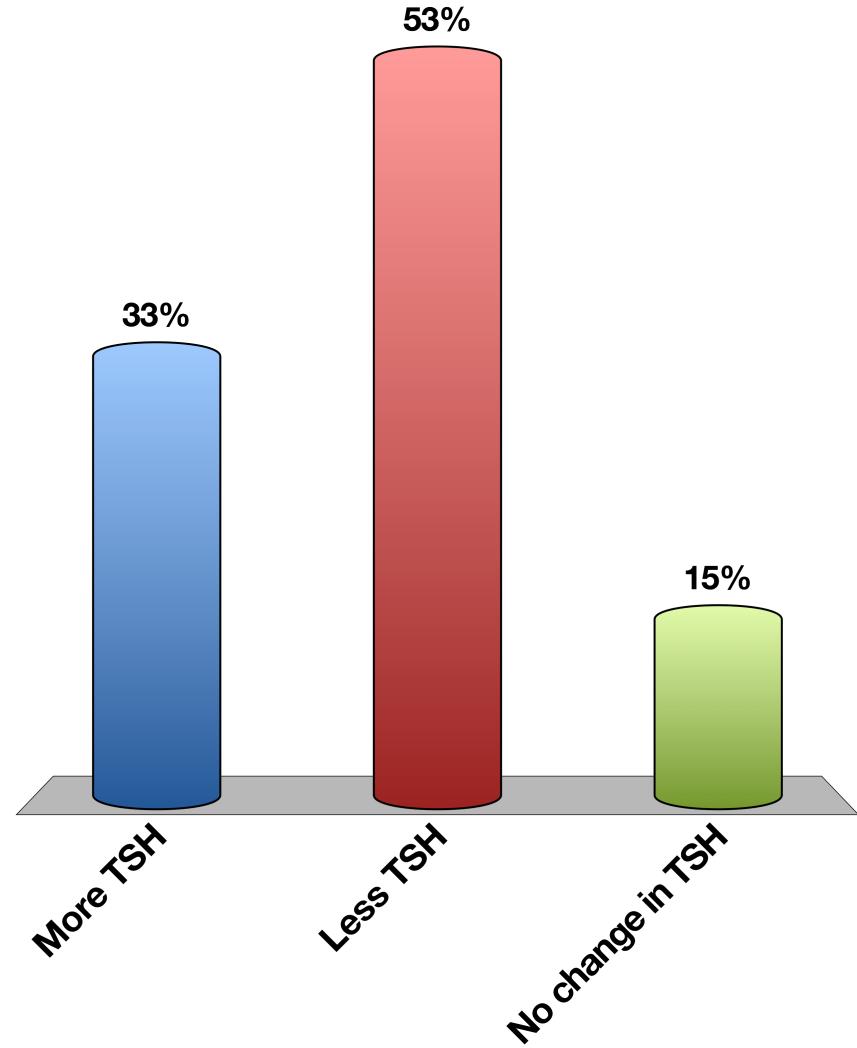


Figure 19.2 Stimulation of thyroid hormone (T_4 and T_3) release by autoimmune production of thyroid-stimulating immunoglobulins (TSIs) and resultant suppression of TSH release via negative feedback inhibition. Notice that the eye symptoms are caused by autoimmune response rather than by the increase in thyroid hormones.

This kind of hyperthyroidism should have what?

- A. More TSH
- B. Less TSH
- C. No change in TSH



Question

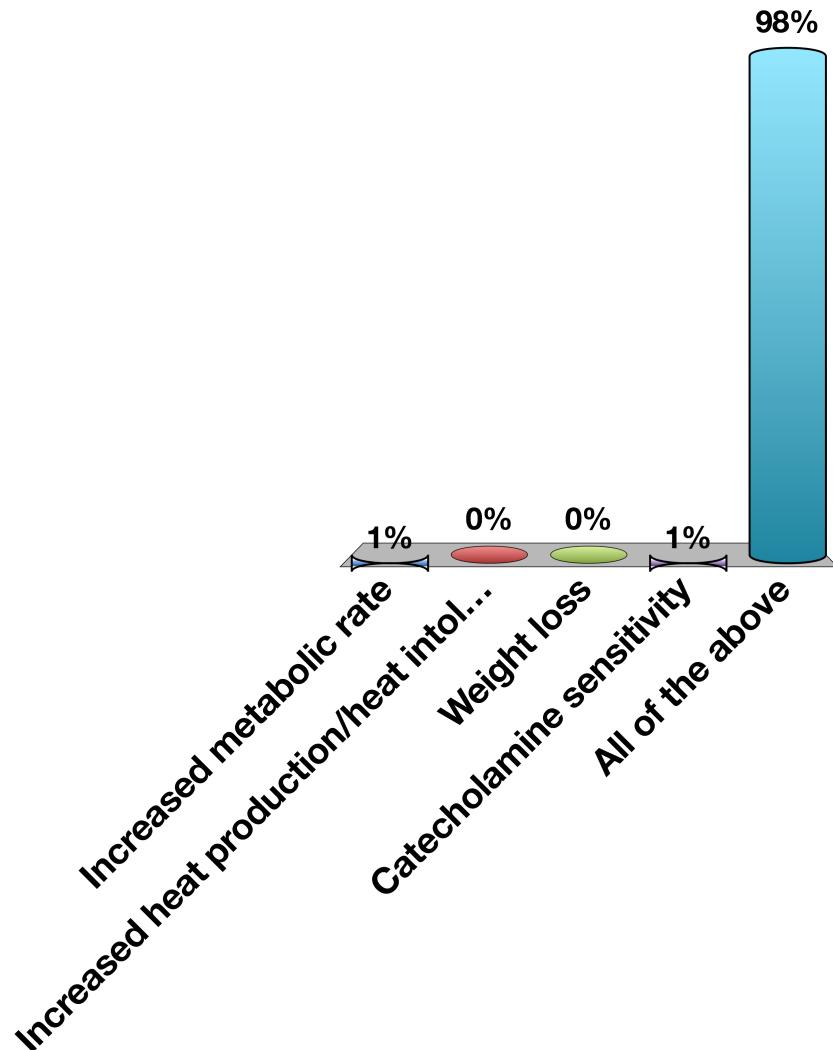
- Based on the labs, how do we know that this isn't the result of a pituitary adenoma of the thyrotropes?

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Blood Measurements*	Result	Normal Range
Sodium	136 mmol/L	135–146 mmol/L
Potassium	5.0 mmol/L	3.8–5.0 mmol/L
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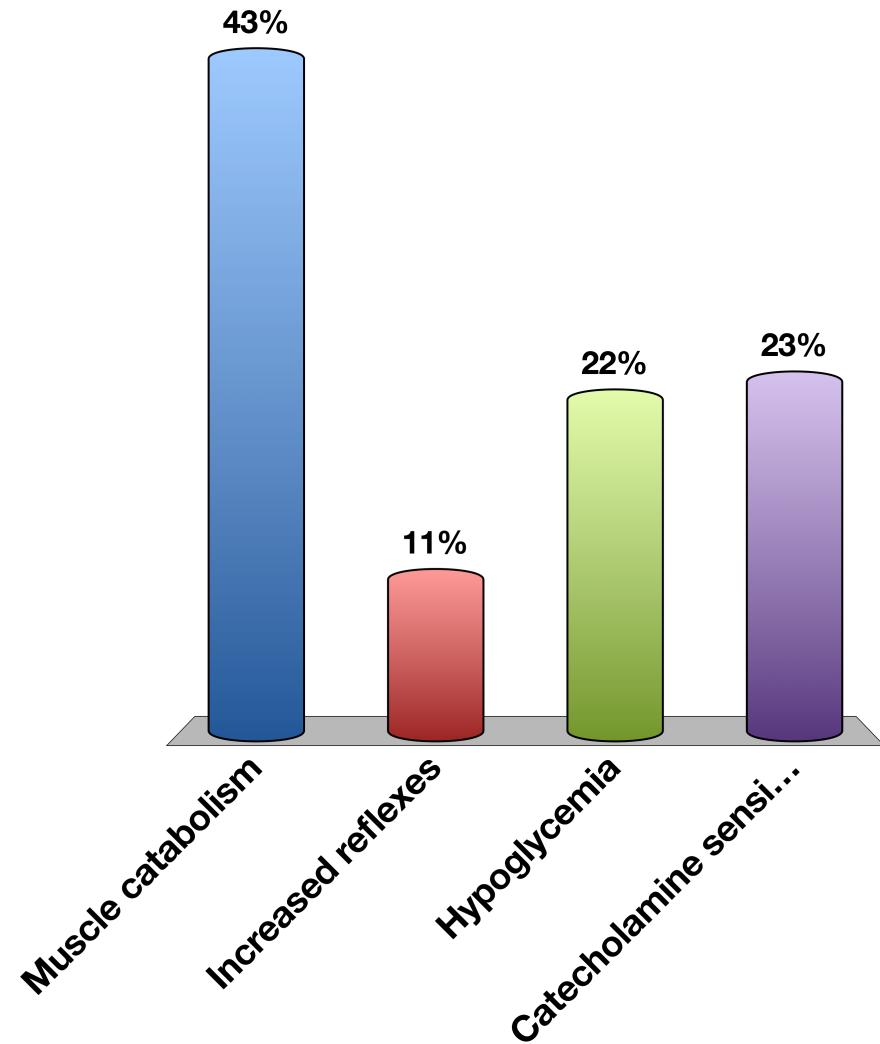
Based on hyperthyroidism we expect...

- A. Increased metabolic rate
- B. Increased heat production/heat intolerance
- C. Weight loss
- D. Catecholamine sensitivity
- E. All of the above



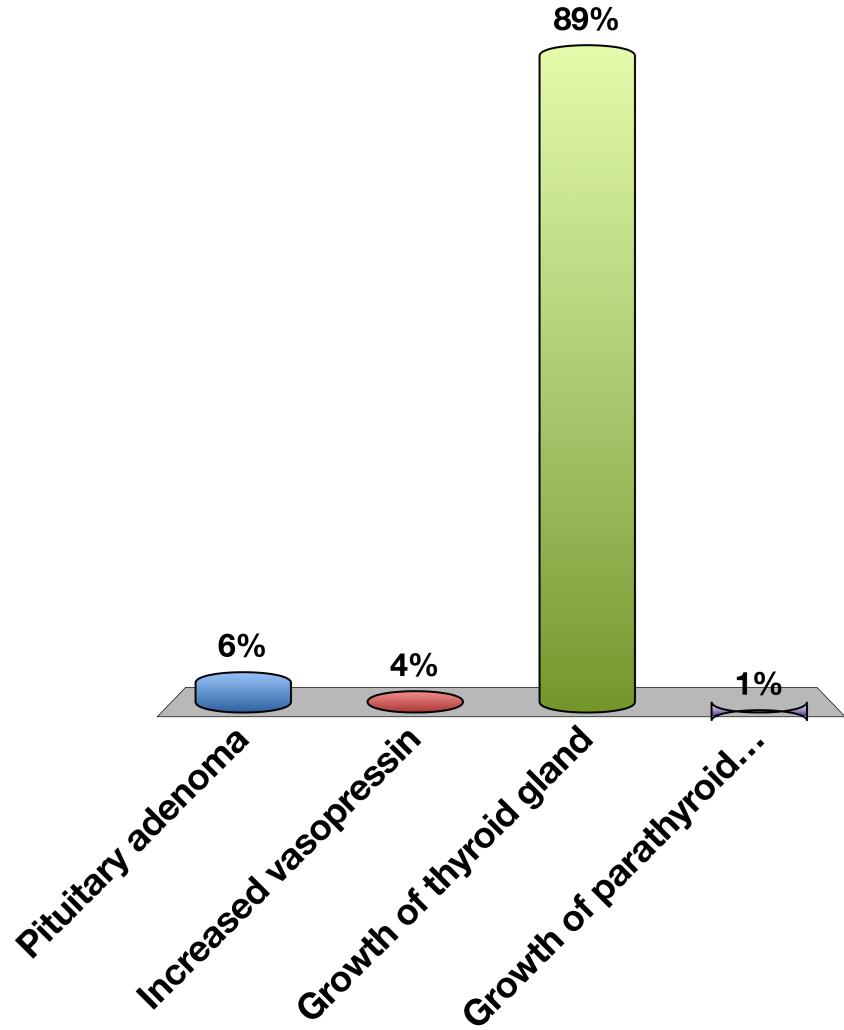
What is the most likely reason for muscle weakness?

- A. Muscle catabolism
- B. Increased reflexes
- C. Hypoglycemia
- D. Catecholamine sensitivity



What caused the bruit (swishing sound in the throat)?

- A. Pituitary adenoma
- B. Increased vasopressin
- C. Growth of thyroid gland
- D. Growth of parathyroid gland



Why was there less menstruation

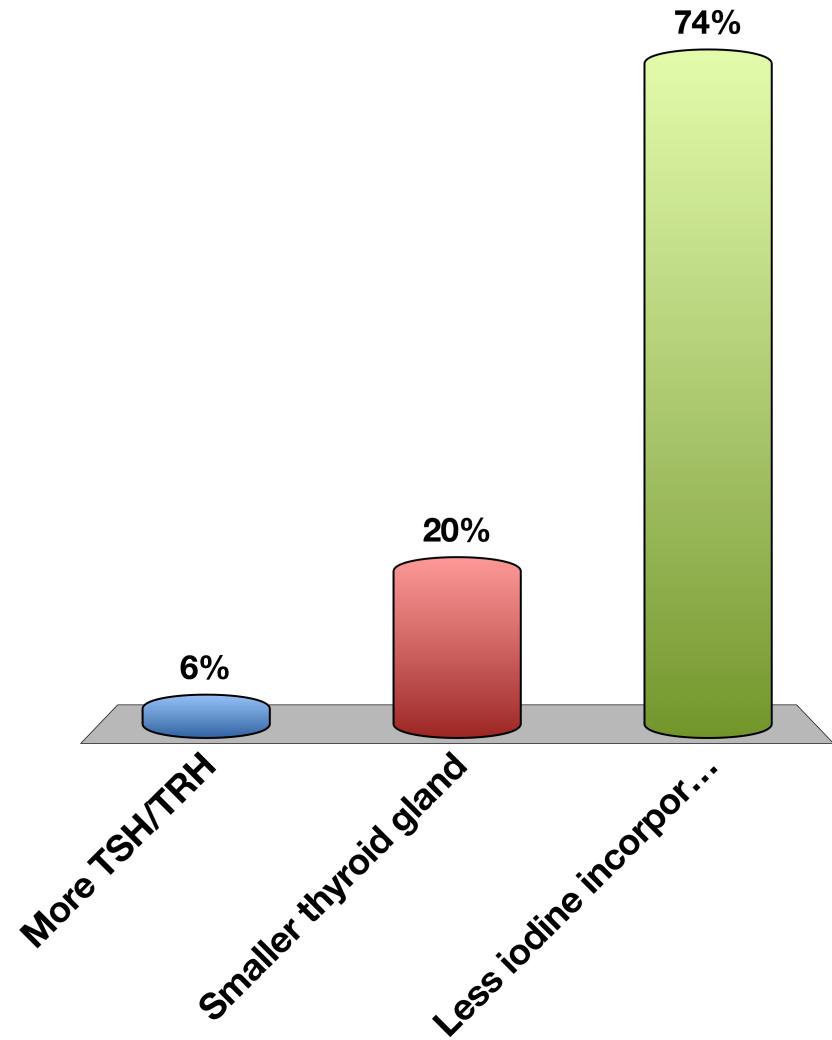
- A. Thyroid hormones inhibit FSH/LH release
- B. TRH activates prolactin release
- C. TSH induces estrogen release

How could you reduce thyroid hormone levels?

- Surgically reduce thyroid gland
- Block organification of iodine into thyroid hormone (methimazole or propylthiouracil)
- Treatment with radioactive iodine

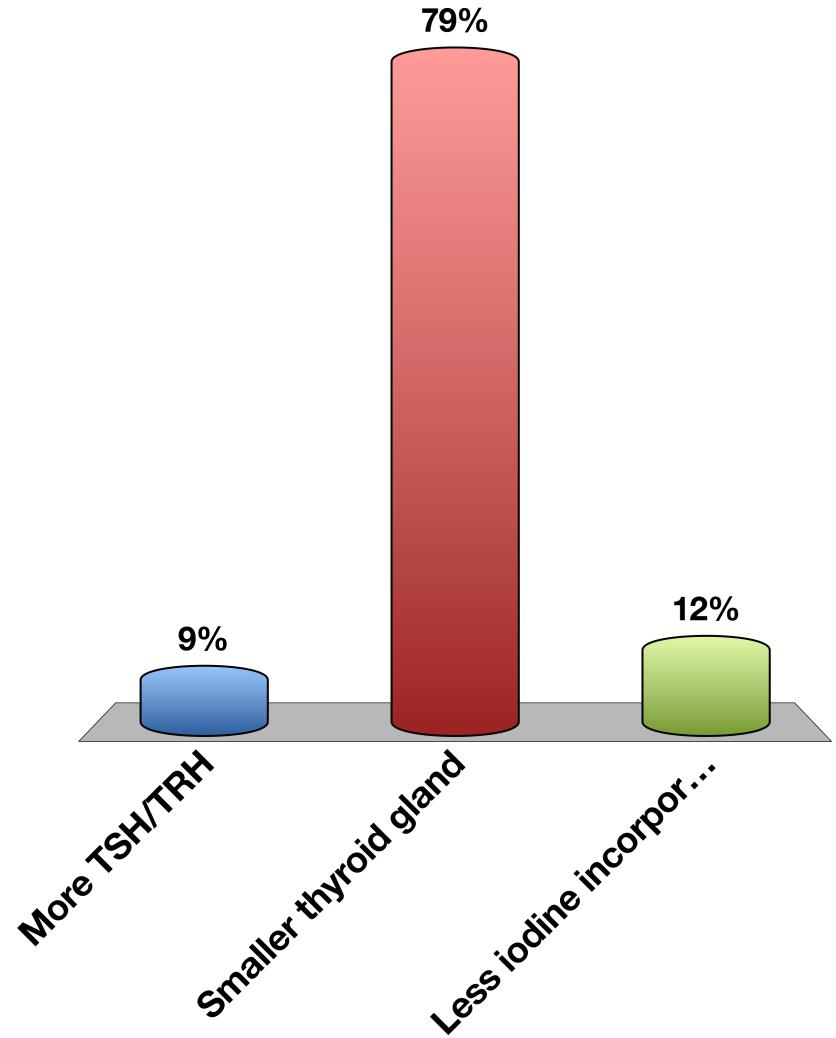
PTU would work via

- A. More TSH/TRH
- B. Smaller thyroid gland
- C. Less iodine incorporation



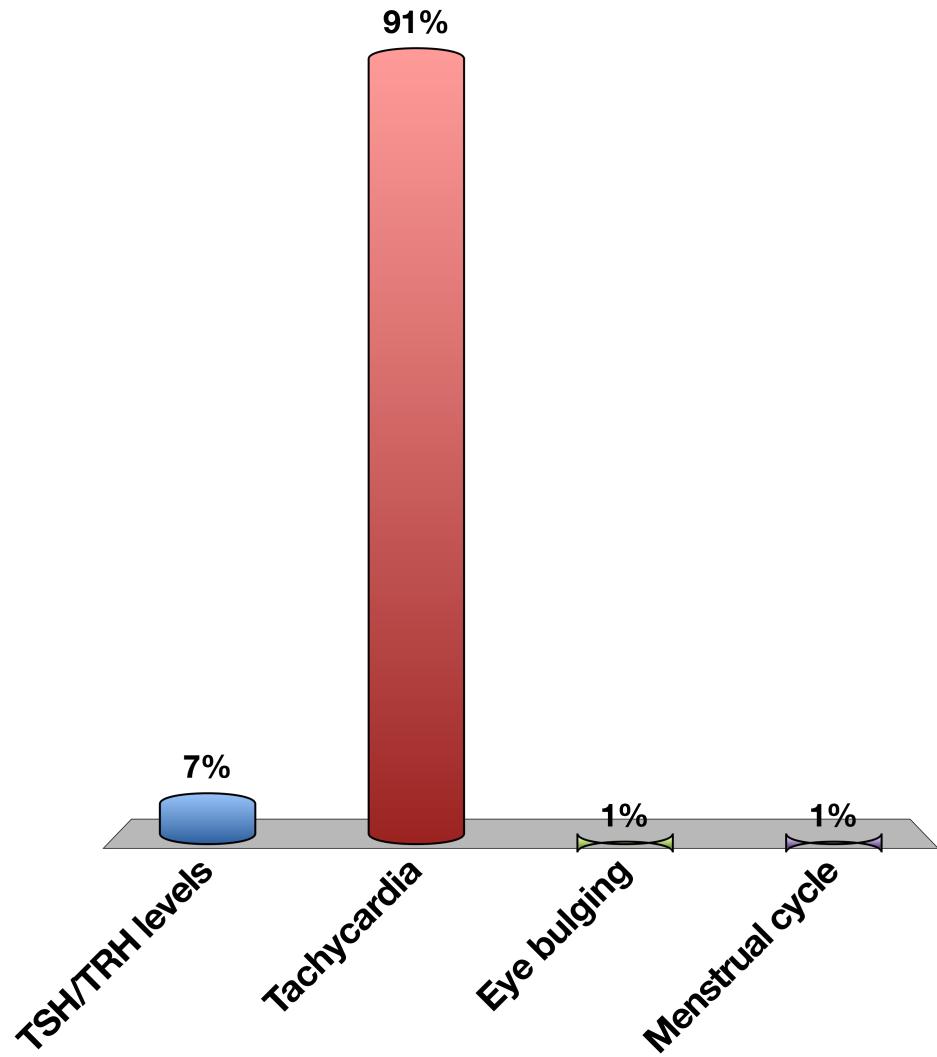
Radioactive iodine would work by

- A. More TSH/TRH
- B. Smaller thyroid gland
- C. Less iodine incorporation



Beta blockers would probably ameliorate which of these?

- A. TSH/TRH levels
- B. Tachycardia
- C. Eye bulging
- D. Menstrual cycle



Good luck on the midterm!