LAB 12

ENDOCRINE II

Assignments:

Quiz: Endocrine Chart – pages 112-114

Due next lab:
Lab Exam 3 – covers labs 11 and 12, endocrine chart and endocrine case studies (1-4 and 7).

Objectives:
Review the Case Studies (You will be tested on Case Studies 1-4 and 7)

Review Endocrine Chart

Complete any additional lab material not covered in the previous week

Review for Lab exam
<table>
<thead>
<tr>
<th>Hormone</th>
<th>Gland produced</th>
<th>Target organ(s)</th>
<th>Stimulus for release</th>
<th>Function</th>
<th>Disorders Hypo/Hypersecretion</th>
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</thead>
<tbody>
<tr>
<td>ADH</td>
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<td>Oxytocin (OT)</td>
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<td>Growth Hormone (GH)</td>
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<td>TSH</td>
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<td>Thyroid Stimulating Hormone</td>
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<td>ACTH</td>
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<td>LH</td>
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<td>FSH</td>
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<td>Function</td>
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<td>Prolactin (PRL)</td>
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<td>Thyroid Hormone T₃ and T₄</td>
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<td>Calcitonin (CT)</td>
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<td>Parathyroid Hormone (PTH)</td>
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<td>Epinephrine (Epi)</td>
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<td>Cortisol</td>
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<td>Aldosterone</td>
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<td>Gland produced</td>
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<td>Sex Hormones from adrenal cortex T &amp; E</td>
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<td>Insulin</td>
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<td>Glucagon</td>
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Case Studies – Critical Thinking

1. A 19-year old BCTC student was admitted to the UK Medical Center because of extreme fatigue and weight loss. For the previous year he had tired easily and was no longer able to study anatomy and physiology as he should to get a decent grade. He had lost 64 pounds in the last 2 years in spite of an increased food intake. His present height is 71 inches and his weight 140 pounds.

About 4 years previously, he began to urinate frequently at night, and since then had increasing thirst and high urine output. He came to the hospital because during the last 24 hours he felt “awful”, was extremely thirsty and irritable, and drank about twelve 360 ml glasses of water. He was urinating hourly during the last 24 hour period and seemed unable to get enough to drink. His gums were sore and he had recent difficulty eating because of the gum tenderness.

Results of physical exam:

Plasma glucose: 435 mg/dl (normal: 60-100)

Urine: specific gravity: 1.035 (normal: 1.015 – 1.022); 4+ reaction for glucose- moderate reaction for acetone

Plasma:
\[ \text{pH} = 7.25 \quad (\text{normal: } 7.35-7.45) \]
\[ P_{CO_2} = 30 \text{ mmHg} \quad (\text{normal: } 35-45) \]
\[ HCO_3^- = 14 \text{ mEq/L} \quad (\text{normal: } 22-26) \]

Hematocrit: 55% (normal: 40-50)

Blood pressure: 105/50 standing; 130/68 lying down
Standing pulse 104/min (normal: < 80)

Respiration: 20 breaths/min (normal: 12)

A. What condition does our BCTC student have?

B. Why might he lose weight when his plasma glucose is up?

C. What is his acid-base disturbance?

D. Explain his respiratory rate, how does it relate to question “C”? 

E. Explain what causes his high urine output.

F. Explain his hematocrit.

G. Explain why his pulse rate is high upon standing.

H. Discuss his ADH levels. Explain why they are high or low.
I. What would be a possible treatment for his condition?
2. A 45-year old male from the Midwest presented with the following symptoms during February: weakness, fatigue, orthostatic hypotension, weight loss, dehydration, and decreased cold tolerance. His blood chemistry values follow:

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum sodium</td>
<td>128 mEq/L</td>
<td>136-139</td>
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<tr>
<td>Serum potassium</td>
<td>6.3 mEq/L</td>
<td>3.5-5.0</td>
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<tr>
<td>Fasting blood glucose</td>
<td>65 mg/dL</td>
<td>70-110</td>
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</tbody>
</table>

Hematocrit: 50%

Leukocytes: 5,000 mm$^3$

He also noticed increased pigmentation (tanning) of both exposed and nonexposed portions of this body and back. A plasma cortisol determination indicated a low cortisol level. Following administration of ACTH, plasma cortisol did not rise significantly after sixty to ninety minutes. Endogenous circulating levels of ACTH were later determined to significantly elevated.

A. What endocrine organ is the site of the malfunction?

B. Is this a primary or secondary disturbance? How do you know?

C. What is the name of this disorder?

D. Discuss the electrolyte disturbances resulting from this disorder (normal vs. diseased).

E. Discuss the glucose disturbances resulting from this disorder (normal vs. diseased).

F. What is the cause of the tanning?

G. What type of replacement therapy would be required for this individual?

H. Describe the feedback loop for this endocrine disorder. Where is the loop broken?
3. A 38-year old female visits her doctor complaining of chronic fatigue and weakness, especially in her legs. Upon greeting the patient, the doctor notes that although she is mildly obese, there is an unusually round contour to her face. During questioning, he learns that at her recent 20-year high school reunion, nobody recognized her because her face looked so different. Physical examination yields an unusual fat distribution consisting of a hump on the upper back and marked centripedal obesity. Blood pressure is also abnormally high.

   A. What is your diagnosis?

   B. Explain how you reached this diagnosis.

4. Mr. Jessup, a 55-year old man, is operated on for a cerebral tumor. About a month later, he appears in his physician’s office complaining of excessive thirst. He claims to have been drinking about 20 liters of water daily for the past week and voiding nearly continuously. A urine sample is collected, its specific gravity is reported at 1.001.

   A. What is your diagnosis?

   B. Explain both types of diabetes and how they are different. Use your text- both renal and endocrine chapters.

   C. Explain both types of diabetes insipidus.

5. A 36-year old mother of four is considering tubal ligation as a means of ensuring that her family gets no larger. She asks the physician if she will become “menopausal” after the surgery. How would you answer her question and explain away her concerns.

6. A woman who is taking birth-control pills that consist of only progesterone experiences the hot flash symptoms of menopause. Explain why.
7. Sharon went to her doctor with the following symptoms: dull facial expressions; droopy eyelids; puffiness of the face; sparse, dry hair; scaly skin; evidence of intellectual impairment; lethargy; a change of personality; bradycardia (60 b/min); a blood pressure of 90/70; anemia (Hct 27); constipation and hypothermia. Plasma concentrations of T₃ and T₄ were low and TSH levels were elevated. Following administration of exogenous TSH, plasma T₃ and T₄ did not rise after 2 hours.

A. What is the disorder?

B. Is this a primary or secondary disorder?

C. Would you expect to find a palpable goiter? Explain

D. Describe the feedback loop involved. Where is the loop broken?

E. Describe a suitable treatment for Sharon.

8. Mary Francis had a total thyroidectomy followed by thyroid hormone replacement therapy. A few days later she developed laryngeal spasms, a mild tetany, and cramps in the muscles of the hands and arms. The following tests were performed:

- Urinary calcium 20 mg/dL
- Urine phosphorus 0.1 g/day
- Plasma calcium 7.0 mg/dL
- Plasma phosphorus 5.0 mg/dL

Calcium and vitamin D were given orally each day and the tetany and laryngeal spasms were alleviated.

a. What endocrine disorder does Mary Francis have?

b. What caused the tetany and laryngeal spasms?

c. What is the purpose of the vitamin D administration with the calcium?