Endocrine System Pathophysiology
Activity #1

Diabetes Movie Questions

1. Type I diabetes, found in children, is also called ____________, ______________, or ______________.

2. Insulin is needed for ____________ to penetrate ____________.

3. List 2 differences between Type I and Type II diabetes.

4. Type I diabetes is treated with ______________________.

5. Diabetics have a ____________ predisposition which is triggered by ____________, ____________, or ____________factors.


7. Diabetes is managed by maintaining _________________.

8. Long term complications of diabetes may include:

9. Hypoglycemia can be defined as:

10. Symptoms of hypoglycemia include:

11. Severe hypoglycemia can lead to ________________ and can be reversed with a ________________ injection.

12. Hyperglycemia can be defined as:
13. Symptoms of hyperglycemia include:

14. Severe hyperglycemia can lead to ________________.

15. Diabetes is the leading cause of ________________ and ________________.

16. Individuals developing antibodies to pancreatic cells can be treated with small doses of ________________ as a preventative measure.

17. Other treatment methods being researched are:

**Activity #2**

Complete the matching and short-answer activity.

1. In the following columns, match the hormone on the left with its source on the right.

   _____ thyroxine  
   ______ estrogen  
   ______ thyroid-stimulating hormone  
   ______ insulin  
   ______ antidiuretic hormone  
   ______ aldosterone  
   ______ catecholamines (epi. and norepi.)

   a. hypothalamus  
   b. adrenals  
   c. adrenal medulla  
   d. pituitary gland  
   e. ovary  
   f. thyroid gland  
   g. pancreas

2. List the target tissue and specific action of each hormone listed.

Thyroxine:

Aldosterone:
Human Growth Hormone:

Prolactin:

Thyroid Stimulating Hormone (TSH):

Insulin:

Parathyroid Hormone (PTH):

Catecholamines (epinephrine, norepinephrine):

Cortisol:

**Activity #3**

Complete the following case-studies.

**Case #1** (This case study is modified from a Tulane University Case Study)

**History**

A 50 year-old man presents with enlargement of left anterior neck. He has noted increased appetite over past month with no weight gain, and more frequent bowel movements over the same period.

**Physical Exam**

He is 5'8" tall and weighs 150 lb. Heart rate is 82 and blood pressure is 110/76. There is an ocular stare with a slight lid lag. The thyroid gland is asymmetric to palpation, weighing an estimated 40g (normal = 15-20 g). There is a 3 x 2.5 cm firm nodule in left lobe of the thyroid.

**Laboratory Results**
Lab results show an increase in free thyroxine (T4), elevated calcium, and low TSH.

What disease or diseases do you suspect?

Case #2

**History**

A 28 year-old woman with recent tiredness and difficulty concentrating had experienced a decline in memory over the last several months. She also noted decreased frequency of bowel movements and an increased tendency to gain weight. She felt chilled without a light sweater, even in warm weather. There was a history of hypothyroidism in her mother and older sister.

**Physical Exam**

She was 5'5" tall and weighed 125 lb. Her pulse rate was 58 beats per minute and her blood pressure was 138/88. She had a slightly puffy face and her eyebrows were sparse, especially at the lateral margins. The thyroid was firm and bosselated to palpation with an estimated weight of 25 g (normal 15-20 g). The deep tendon reflexes were normally contractive, but showed delayed relaxation.

**Laboratory Results**

Laboratory testing showed a decreased thyroxin level with a markedly increased TSH. An anti-thyroglobulin test was positive.

Your diagnosis is?????

Case #3

**History**

A 30 year-old woman presented with complaints of periodic headaches, palpitations, nervousness, and perspiration. She also reported having lost 15 pounds without dieting or a change in appetite. Physical examination revealed a pulse of 100/min and a blood pressure of 160/110 mm Hg.

**Laboratory Results**
Her serum T4 was 7.0 micrograms/dl with normal T3 uptake and normal T3 (94 ng/dl with normal range of 74-166).
A test for urine catecholamines (epinephrine, norepinephrine) was elevated.
A CT scan of the abdomen revealed a 4 to 5 cm mass involving the right adrenal.
The mass was surgically excised.

What is your diagnosis?

Case #4

History

Virginia, 47 years old, is a well-developed obese woman with a rounded face.
She complains of back pain, fatigue, and muscle weakness.
She has several bruises on her arms and legs that she reports "happens all the time when I just barely hit something."
She reports that she has had a gradual 20 pound weight gain over the past 2 years - mostly evident in her stomach and face.
Her face is rounded with rosy cheeks.
There is an abundance of facial hair present on the chin, upper lip, and side of her face.

Laboratory results

Lab results showed a normal T3 and T4, normal TSH, elevated ACTH

What endocrine disorder do you suspect?

What is the cause of the elevated ACTH?

Case #5

6 year-old Ali is brought to the ER by her mother. She is hyperventilating and vomiting.
Ali’s mother states that her daughter has not seemed like herself lately.
She has been nauseated several times during the past week.
Ali is very thin although her mother indicates she has been eating and drinking continuously.
Her urinary frequency has increased dramatically. She has even been having trouble with bed-wetting although this previously had not been a problem.
What disease do you suspect?

What laboratory tests would confirm your suspicions?

Can you explain the child’s nausea and hyperventilation?

What treatment would you recommend?

Case #6

Cassie, age 23, has recently recovered from a serious bout with bacterial meningitis. On a follow-up visit with her physician she complains that she is continually urinating, and even has to get up several times during the night. She is also continually thirsty. The physician asks her to bring a first-morning urine sample to the lab the following morning.

The urine shows a specific gravity of 1.003.

What disease do you suspect?

In Cassie’s case, what do you expect the cause of the disease is?

Activity #5: PhysioEx

• Complete the PhysioEx exercises for endocrine system physiology
  Hormones and Metabolism
  Hormone Replacement Therapy
  Insulin and Diabetes
ANSWERS TO MATCHING AND SHORT-ANSWER WORKSHEET

1. Type I diabetes, found in children, is also called ____________, ______________, or ______________. JUVENILE, EARLY-ONSET, INSULIN DEPENDENT

2. Insulin is needed for ________ to penetrate _________. GLUCOSE, CELLS

3. List 2 differences between Type I and Type II diabetes. TYPE I: 90% CHILDREN, SUDDEN ONSET, CANNOT MAKE INSULIN. TYPE II: ADULTS, GRADUAL ONSET, PRODUCE INSULIN BUT CANNOT USE IT EFFECTIVELY

4. Type I diabetes is treated with _______________. INSULIN INJECTIONS

5. Diabetics have a ___________ predisposition which is triggered by ____________, ____________, or ___________ factors. GENETIC, VIRAL, ENVIRONMENTAL, DIETARY.

6. List symptoms of undiagnosed diabetes. INCREASED THIRST, INCREASED URINATION, WEIGHT LOSS, INCREASE BLOOD GLUCOSE, DEHYDRATION.

7. Diabetes is managed by maintaining _______________. CONSISTENT BLOOD GLUCOSE LEVELS

8. Long term complications of diabetes may include: HEART ATTACK, STROKE, KIDNEY FAILURE, BLINDNESS.

9. Hypoglycemia can be defined as: LOW BLOOD GLUCOSE LEVELS

10. Symptoms of hypoglycemia include: SWEATING, FATIGUE, HEADACHE, DIZZINESS, PERSONALITY CHANGE, INCREASED HUNGER, VISION PROBLEMS

11. Severe hypoglycemia can lead to _______________ and can be reversed with a______________ injection. CONVULSIONS, GLUCAGON

12. Hyperglycemia can be defined as: ELEVATED BLOOD GLUCOSE LEVEL

13. Symptoms of hyperglycemia include: THIRST, HUNGER, DRY MOUTH, FREQUENT URINATION

14. Severe hyperglycemia can lead to _______________. COMA

15. Diabetes is the leading cause of _______________ and _______________. BLINDNESS, KIDNEY FAILURE
16. Individuals developing antibodies to pancreatic cells can be treated with small doses of ____________ as a preventative measure. **INSULIN**

17. Other treatment methods being researched are: **MICROTHERAPY, VACCINE AGAINST AUTOANTIBODIES, INSULIN PILL.**

**ANSWERS TO ENDOCRINE WORKSHEET**

1. In the following columns, match the hormone on the left with its source on the right.

   __ F __ thyroxine a. hypothalamus
   __ E __ estrogen b. adrenals
   __ D __ thyroid-stimulating hormone c. adrenal medulla
   __ G __ insulin d. pituitary gland
   __ D __ antidiuretic hormone e. ovary
   __ B __ aldosterone f. thyroid gland
   __ C __ catecholamines (epi. and norepi.) g. pancreas

2. List the target tissue and specific action of each hormone listed.

   **Thyroxine:**
   **TARGETS CELLS TO INCREASE RATE OF CELLULAR METABOLISM** __

   **Aldosterone:**
   **TARGETS RENAL TUBULES TO PROMOTE RETENTION OF NA+.**

   **Human Growth Hormone:**
   **TARGETS CELLS TO PROMOTE GROWTH OF BODY TISSUES.**

   **Prolactin:**
   **STIMULATES SECRETION OF BREAST MILK**

   **Thyroid Stimulating Hormone (TSH):**
   **TARGETS THYROID GLAND TO PRODUCE AND RELEASE THYROID HORMONES.**
Insulin:
**TARGETS CELLS. PROMOTES UPTAKE OF GLUCOSE BY CELLS.**

Parathyroid Hormone (PTH):
**CA ABSORPTION FROM GI TRACT. STIMULATES OSTEOCLASTIC ACTIVITY.**

Catecholamines (epinephrine, norepinephrine):
**REGULATE BLOOD PRESSURE BY EFFECTS ON VASCULAR SMOOTH MUSCLE AND HEART**

Cortisol:
**TARGETS BODY CELLS. ACTIONS: PROTEIN CATABOLISM, FAT CATABOLISM, GLUCONEOGENESIS**

Case Studies

Case #1 (This case study modified from a Tulane University Case Study).

**History**
A 50 year-old man presents with enlargement of left anterior neck. He has noted increased appetite over past month with no weight gain, and more frequent bowel movements over the same period.

What disease or diseases do you suspect?
**GRAVES DISEASE BASED ON SYMPTOMS, ENLARGED THYROID, ELEVATED THYROXINE AND DECREASED TSH. THERE ALSO MAY BE AN ADENOMA OF THE PARATHYROID GLAND. PHYSICAL EXAMINATION REVEALED A NODULE ON THE LEFT SIDE OF THE THYROID. THE ELEVATED CA++ ALSO SUPPORTS HYPERPARATHYROIDISM**

Final Diagnosis:
**GRAVES DISEASE WITH ADENOMA OR CARCINOMA OF THE PARATHYROID.**

Case #2

**History**
A 28 year-old woman with recent tiredness and difficulty concentrating had experienced a decline in memory over the last several months. She also noted decreased frequency of bowel movements and an increased tendency to gain weight. She felt chilled without a light sweater, even in warm weather. There was a history of hypothyroidism in her mother and older sister.

Your diagnosis is??????
HYPOTHYROIDISM FROM HASHIMOTO DISEASE (DESTRUCTION OF THYROID DUE TO CIRCULATING AUTOANTIBODIES.

Case #3

History
A 30 year-old woman presented with complaints of periodic headaches, palpitations, nervousness, and perspiration. She also reported having lost 15 pounds without dieting or a change in appetite.

What is your diagnosis?
PHENOCHROMOCYTOMA OF ADRENAL MEDULLA.

Case #4.

Virginia, 47 years old, is a well developed obese woman with a rounded face. She complains of back pain, fatigue, and muscle weakness. She has several bruises on her arms and legs that she reports "happens all the time when I just barely hit something." She reports that she has had a gradual 20 pound weight gain over the past 2 years - mostly evident in her stomach and face. Her face is rounded with rosey cheeks. There is an abundance of facial hair present on the chin, upper lip, and side of her face.

What endocrine disorder do you suspect?
CUSHING’S DISEASE

What is the cause of the elevated ACTH?
NON-PITUITARY ACTH-SECRETING TUMOR

Case #5.

6 year-old Ali is brought to the ER by her mother. She is hyperventilating and vomiting. Ali’s mother states that her daughter has not seemed like herself lately. She has been nauseated several times during the past week. Ali is very thin although her mother indicates she has been eating and drinking continuously. Her urinary frequency has increased dramatically. She has even been having trouble with bed-wetting although this previously had not been a problem.

What disease do you suspect?
TYPE I DIABETES WITH DIABETES KETOACIDOSIS

What laboratory tests would confirm your suspicions?
BLOOD GLUCOSE, ARTERIAL BLOOD GASSES, URINE KETONES

Can you explain the child’s nausea and hyperventilation?
NAUSEA AND HYPERVENTILATION ARE FROM THE ACIDOSIS.
Case #6

Cassie, age 23, has recently recovered from a serious bout with bacterial meningitis. On a follow-up visit with her physician she complains that she is continually urinating, and even has to get up several times during the night. She is also continually thirsty. The physician asks her to bring a first-morning urine sample to the lab the following morning.

What disease do you suspect?
DIABETES INSIPIDUS

In Cassie’s case, what do you expect the cause of the disease is?
CASSIE PROBABLY HAS A PITUITARY LESION FROM HER BOUT WITH MENINGITIS. THE LESION IS CAUSING DECREASED SECRETION OF ADH.