

## Investigation 13.B: Analyzing Endocrine Disorders Answer Key

### Answers to Analysis Questions

1. Patient A acted as the control.
2. Real human body fluids (blood and urine) may contain pathogenic bacteria and viruses. Simulated human body fluids are used to prevent the spread of diseases such as hepatitis.

### Answer to Conclusion Question

3.

Patient	Blood glucose concentration	Glucose present or absent in urine	Sodium present or absent in urine	Additional symptoms	Name of disorder
A	5.0	absent	absent	no additional symptoms	normal (healthy)
B	30	present	absent	very thirsty and urinates frequently	diabetes mellitus
C	4.5	absent	absent	large volume of dilute, pale urine	diabetes insipidus
D	4.0	absent	present	urine output is high; sodium in the urine	Addison's disease
E	3.5	absent	absent	older person whose glucagon-producing cells have deteriorated	pituitary gland and adrenal gland disorder (low blood glucose levels)

### Answers to Application Questions

4. Patient A—all hormones appear to be normal.

Patient B—has diabetes mellitus. The hormonal imbalance could be a result of type 1 diabetes (inability to produce insulin) or type 2 diabetes (insulin levels are normal but the insulin receptors on the body's cells stop responding to insulin). The result is high blood glucose levels.

Patient C—has diabetes insipidus. The hormonal imbalance is the result of low levels of antidiuretic hormone (ADH). Deficient production of ADH or lack of effective action of ADH causes a large amount of urine output, increased thirst, dehydration, and low blood pressure in advanced cases. ADH does not affect blood glucose levels.

## Investigation 13.B: Analyzing Endocrine Disorders (cont'd)

Patient D—has Addison’s disease. The hormonal imbalance is the result of low levels of aldosterone. The symptoms of Addison’s disease include low blood levels of glucose and large quantities of sodium in the urine.

Patient E—has a pituitary gland and an adrenal gland disorder which manifests itself through lower than normal blood glucose levels. The hormonal imbalance that causes the lower blood glucose levels is the result of a decrease in hGH, epinephrine, and cortisol secretions. These 3 hormones all increase blood glucose levels. Another clue provided on the chart is the statement, “this is an older person whose glucagon-producing cells have deteriorated.” To compensate for the lower than normal blood sugar levels, the glucagon-producing alpha cells of the pancreas would be overworked and therefore slowly deteriorate while trying to maintain homeostasis.

- The lack of hGH, epinephrine, and cortisol could be the result of an underactive pituitary gland (hypopituitarism) and a disorder of the adrenal cortex. The anterior pituitary gland produces human growth hormone and adrenocorticotrophic hormone (ACTH). The low level of ACTH would result in low levels of cortisol. hGH also stimulates other hormones that cause the release of glycogen from the liver. Epinephrine released by the adrenal cortex also stimulates the conversion of glycogen to glucose in the liver. Lower levels of these hormones would result in lower than normal blood glucose levels.

The pancreas would secrete glucagon to help compensate for the low blood sugar levels. Glucagon stimulates the liver to convert glycogen back into glucose, which is released into the blood.

- Patient A—normal; no treatment required

Patient B—diabetes mellitus; insulin injections and islet cell transplants are two possible treatments

Patient C—diabetes insipidus; ADH tablets

Patient D—Addison’s disease; aldosterone replacement therapy

Patient E—pituitary gland and adrenal gland disorders; hormone supplements