



Case #107

NAME Educational Activities Committee

Case provided by:

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TOXICOLOGY TEST RESULTS

MATRIX	RESULTS
Femoral Blood	ethanol: none detected acetone: 5.0 mg/dL
Vitreous Fluid	ethanol: 188 mg/dL acetone: 5.3 mg/dL
Urine	not tested
Gastric content	not tested

1. A 32-year-old female is found deceased at home by her spouse when he returns from work. She did not have a regular primary care physician, and per family, consumed alcohol on a daily basis. Several open containers of wine were found in the recycling bin.

Femoral blood in a grey top tube and vitreous fluid in a red top tube were collected at autopsy and submitted for toxicology testing.

Based on the results above, which of the following would be the best next step in testing and why?

- Ethanol test in urine - The ethanol vitreous and blood results should be consistent but are not. Testing the urine for ethanol will show which ethanol result is correct.
- Ethanol test in gastric fluid - An ethanol result consistent with at least one drink will prove ethanol was not absorbed prior to death, explain the negative blood result, and show the vitreous result is from ethanol ingested about 2 hours before death.
- Glucose test in urine - An elevated glucose result will show the decedent was in a state of diabetic ketoacidosis and the ethanol result in vitreous fluid is due to postmortem formation.
- β -hydroxybutyric acid (BHB) test in blood, vitreous, or urine - An elevated BHB result will show the decedent was in a state of diabetic ketoacidosis and the ethanol result in vitreous fluid is due to postmortem formation.

Answer...

B. β -hydroxybutyric acid (BHB) test in blood, vitreous, or urine - An elevated BHB result will show the decedent was in a state of diabetic ketoacidosis and the ethanol result in vitreous fluid is due to postmortem formation. (CORRECT ANSWER, 60.17% of responses)

In diabetic ketoacidosis, the deficiency of insulin leads to increased glucose production, poor glucose utilization, and increase in lipogenesis (releasing abundant fatty acids into the circulation). These free fatty acids are then converted to ketone bodies (β -hydroxybutyrate, acetoacetate, and acetone), which lead to a state of ketoacidosis.

A gray top tube contains sodium fluoride to inhibit microbial growth and potassium oxalate as an anticoagulant. A red top tube does not contain any additives. Samples collected in collection containers without preservative are subject to microbial growth that, in the presence of glucose, can generate ethanol via fermentation.

In a state of hyperglycemia, as seen with DKA, elevated glucose concentrations in the vitreous fluid (collected in tube with no additives) can be used by microbes after death as a substrate to produce the ethanol. Because the blood sample for this decedent was collected in a gray top tube, it was protected from the in vitro formation of ethanol.

Acetone can be present as a marker of diabetic ketoacidosis (DKA) or from acetone consumption. In this setting, testing for BHB can be used to differentiate these two scenarios and confirm or negate a DKA diagnosis.

Other responses

A. Ethanol test in urine - The ethanol vitreous and blood results should be consistent but are not. Testing the urine for ethanol will show which ethanol result is correct. (16.45% of responses)

An ethanol test in urine would most likely show a positive result for the same reason ethanol is positive in the vitreous fluid but would still not identify the reason for the “none detected” blood ethanol result. Relying on the positive ethanol results because of the finding in two matrices without an explanation for the none detected blood result could lead to an interpretation error about the decedent’s ethanol consumption prior to death.

B. Ethanol test in gastric fluid - An ethanol result consistent with at least one drink will prove ethanol was not absorbed prior to death, explain the negative blood result, and show the vitreous result is from ethanol ingested about 2 hours before death. (10.82% of responses)

This test would offer little interpretive insight. A positive ethanol result does not account for the acetone results and the discrepant findings between blood and vitreous. A “none detected” ethanol result may mean either alcohol absorption was complete, or it was not acutely ingested prior to death but offers no insight into why the vitreous fluid is positive and the blood is “none detected”.

C. Glucose test in urine - An elevated glucose result will show the decedent was in a state of diabetic ketoacidosis and the ethanol result in vitreous fluid is due to postmortem formation. (12.55% of responses)

This test can be performed to support a DKA diagnosis if the glucose concentration is elevated. However, glucose concentrations decrease over time. If the result is normal, a BHB test would be the next step. It is more timely to use a more definitive test to substantiate a DKA diagnosis as the reason for the ethanol production in the vitreous fluid.

REFERENCES

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