Case #140

NAME Educational Activities Committee

Case provided by:

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A 90-year-old man with a history of hypertensive atherosclerotic cardiovascular disease and diabetes mellitus was found unresponsive on the floor of his closed garage approximately three hours after arguing with his wife. He had worked as a car mechanic for 50 years. Multiple sealed and opened mechanic supplies used for automotive work were found in the garage, and opened bottles of amlodipine and glimepiride were found in his pockets. The environmental temperature was approximately 41°F (5°C). He was transported to the hospital, where he coded and died shortly after arrival despite resuscitation efforts. Postmortem examination revealed florid lividity, no trauma, diffuse atherosclerosis, an abundant amount of dense, black, odorless, thick material coating the mucosa, and diffuse organ congestion. A STAT carbon monoxide test was negative and toxicology is pending. The autopsy finding shown in the photo is most consistent with which cause of death?

a. Upper gastrointestinal hemorrhage
b. Engine oil toxicity
c. Hypothermia due to environmental cold exposure
d. Drug toxicity

Answer...

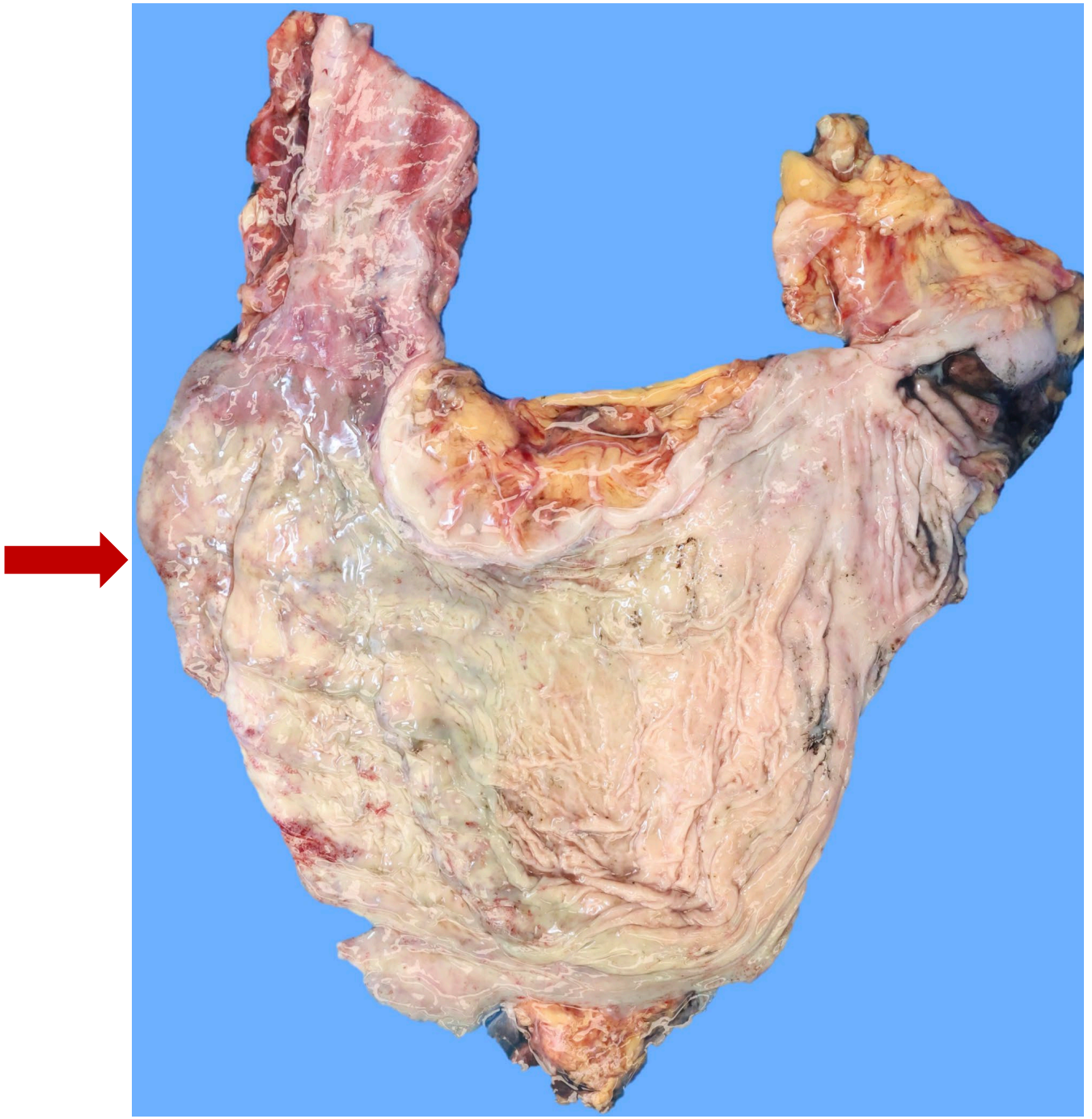
D. Drug toxicity (CORRECT ANSWER, _____ of responses)

The autopsy photo shows activated charcoal that was administered in the hospital by staff who suspected potential drug toxicity/poisoning. Activated charcoal in the stomach appears as dense, **odorless,** jet-black material with a thick, paint-like or granular consistency that uniformly coats the gastric mucosa, often creating a coal-black slurry when mixed with gastric contents.

Activated charcoal works by adsorbing toxic substances, including medications, plant toxins, and some chemicals, onto its surface, preventing gastrointestinal absorption and interrupting enterohepatic or enteroenteric circulation as a secondary decontamination mechanism. Its binding capacity depends on the toxic substance's particle size, solubility, ionization state, pH, and interaction with stomach contents. Certain substances with specific physical properties are poorly adsorbed or not adsorbed at all by activated charcoal.

The black material is typically adherent but can be wiped away to reveal underlying mucosa that may appear relatively intact or pink, contrasting with true corrosive injuries where the mucosa itself is hemorrhagic and necrotic, as shown in the photo of the gastric mucosa after cleaning.

In this case, the deceased deliberately ingested a large amount of amlodipine, resulting in acute toxicity.



D. Drug toxicity (CORRECT ANSWER, _____ of responses)

Activated charcoal can many conditions producing black gastric contents and dark staining of the gastrointestinal mucosa, potentially leading to misinterpretation. In the differential diagnosis, GI bleeding, acute iron tablet overdose, ingestion of bismuth subsalicylate, black licorice, may also result in dark gastric contents and discoloration of the gastrointestinal tract.

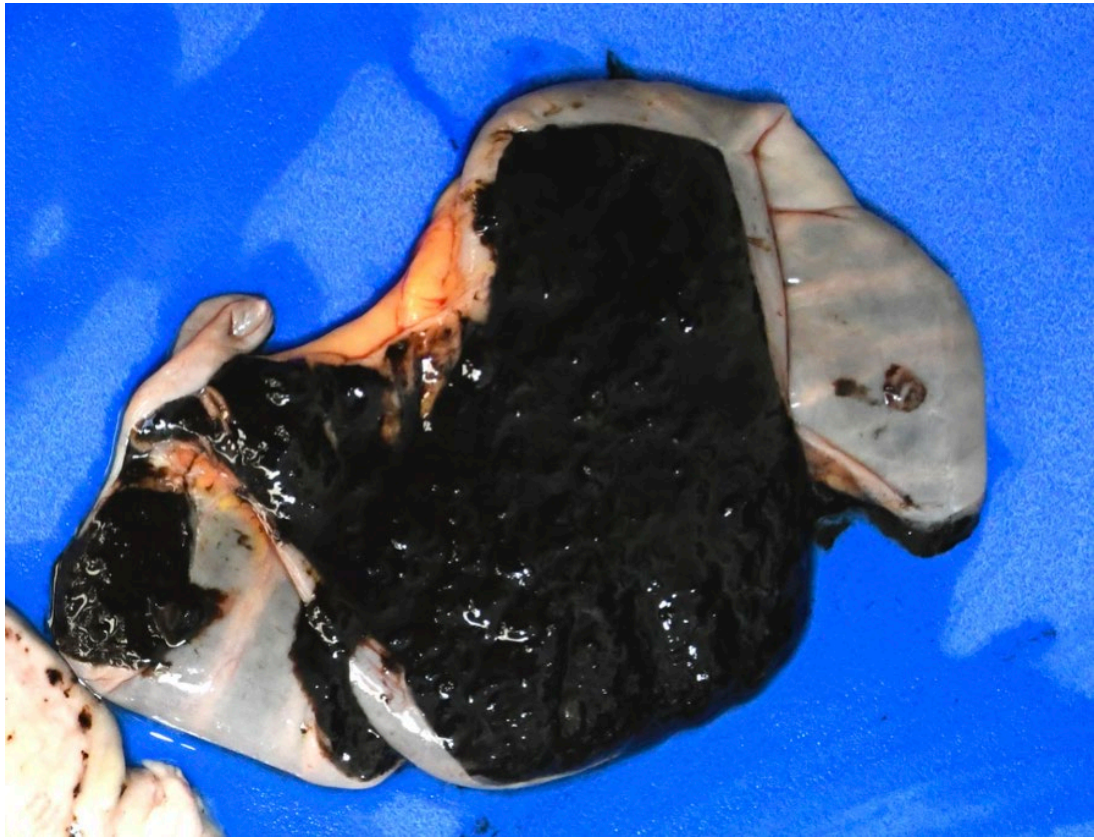
Over-the-counter and home charcoal formulations are widely available and may be ingested prior to medical evaluation, resulting in the finding described above.

However, activated charcoal is most directly linked to medical and emergency department interventions and represents a well recognized forensic and clinical pitfall, emphasizing the importance of careful correlation between gross autopsy findings, medical records review, and toxicologic results to avoid diagnostic error.

Other responses…

A. Upper gastrointestinal hemorrhage (Incorrect – _____ of responses)

While the black appearance of the gastric contents could initially suggest upper gastrointestinal hemorrhage with hematin formation, commonly described as coffee ground material, several findings argue against this interpretation.



In cases of clinically significant upper gastrointestinal bleeding, the autopsy would typically demonstrate corroborating features such as generalized pallor, diminished lividity, evidence of hypovolemia, and identifiable gastrointestinal pathology, including erosions, ulcers, varices, or mucosal hemorrhage. In this case, none of these associated findings are described.

Instead, in this case, the gastric contents show a uniform, dense black coating pattern rather than the granular or clotted appearance expected with digested blood.

B. Engine oil (hydrocarbon) toxicity (Incorrect – _____% of responses)

Engine oils are formulated using base oils composed of petroleum derived hydrocarbons, polyalphaolefins PAO, or synthetic blends combined with various additives. New engine oil is light amber to honey colored, translucent, and clean, often with an odor that varies depending on the brand and formulation.

Intentional ingestion of engine oil is uncommon and, when it occurs, typically results in nonspecific gastrointestinal findings at autopsy. In contrast to activated charcoal, which is characteristically odorless and coats the gastric mucosa, engine oil more typically appears as yellow to light brown, oily or greasy gastric contents. Associated gastric findings may include variable mucosal hyperemia or mild local irritation.

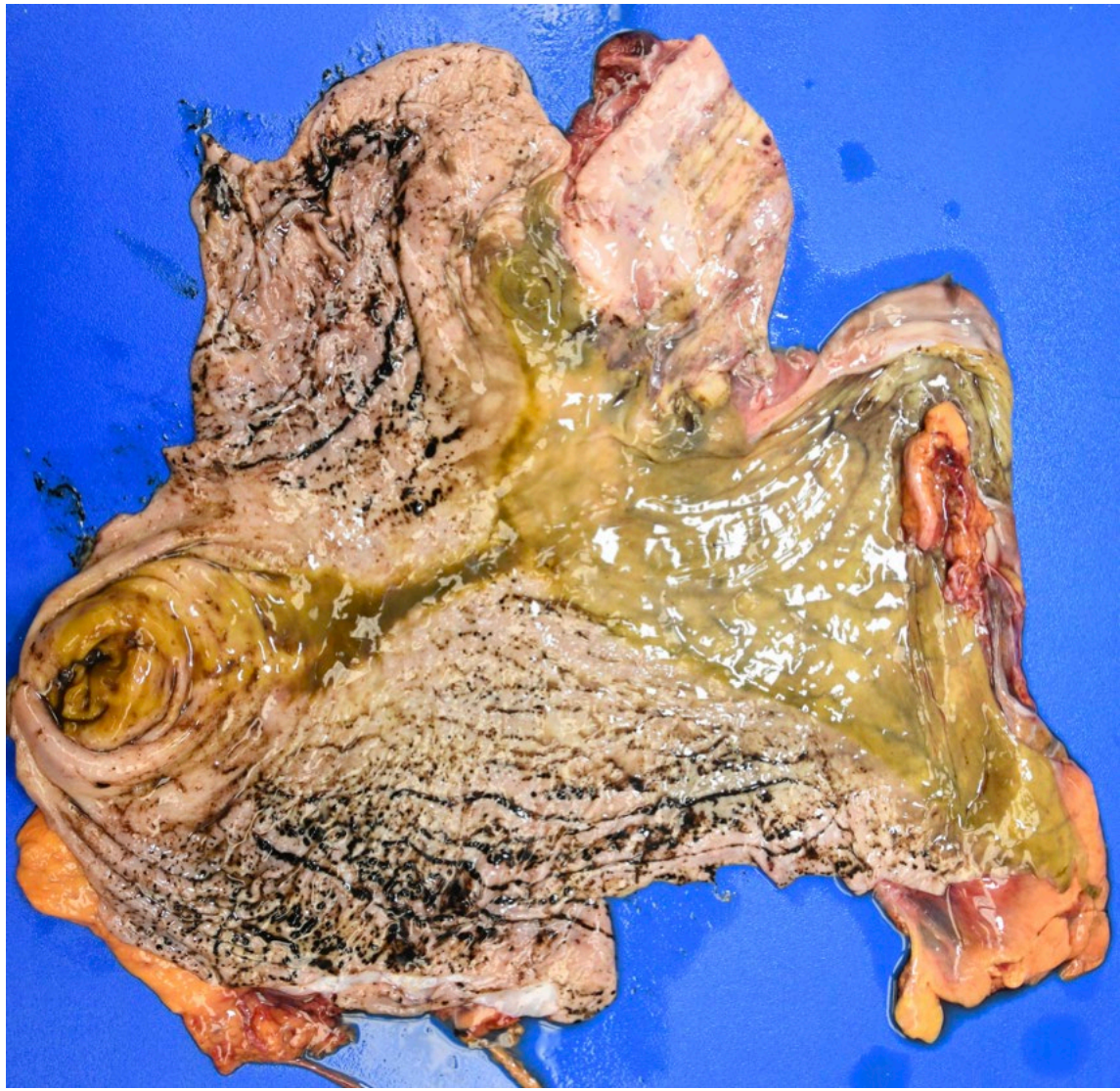
Hydrocarbons are lipophilic liquids with limited gastrointestinal toxicity. Following ingestion, they generally pass through the gastrointestinal tract without significant absorption or systemic effects. Clinically significant toxicity most often results from aspiration into the respiratory tract, which can lead to chemical pneumonitis, irreversible lung injury, and potentially death. Activated charcoal is specifically contraindicated in hydrocarbon poisoning, as it does not effectively bind hydrocarbons and increases the risk of aspiration.

In this case, no autopsy findings consistent with aspiration pneumonitis or other abnormalities of the airways or lungs were identified or disclosed in the question, making this choice less likely.

C. Hypothermia due to environmental cold exposure (Incorrect – 5.33% of responses)

While the recorded environmental temperature of 35°F may initially suggest a cold-related death, the deceased adequately dressed for the conditions, and the gastric findings are inconsistent with Wischnewski spots.

Wischnewski spots are dark hemorrhagic lesions on the gastric mucosa that are strongly suggestive of, though not specific for, fatal hypothermia. These lesions appear as small, dark-brown to blackish, oval hemorrhages typically located along the gastric folds. They result from mucosal hemorrhage and exposure to gastric acid, becoming visible during postmortem examination. The uniform black coating observed in this case represents activated charcoal rather than the discrete hemorrhagic spots (Wischnewski lesions) characteristic of hypothermia. Wischnewski spots can also be observed in cases of diabetic ketoacidosis (DKA).



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