

Note: Reference texts are listed at the bottom if the literature reference is not in the answer.

1. a. This is an example of serotonin syndrome. Signs and symptoms associated with serotonin syndrome are cognitive, autonomic, and neuromuscular which include confusion, agitation, disorientation, tremor, vomiting, shivers, myoclonus, ataxia, hyperreflexia, mydriasis, and hyperthermia. Thioridazine is not linked to serotonin syndrome. SSRIs (for example, fluoxetine) inhibit serotonin reuptake. MDMA (ecstasy) can be associated with the serotonin syndrome because it promotes serotonin release. This patient does not have a history of illicit drug use, and with a recent history of her SSRI being adjusted it is the most likely cause. Of course, a careful history is always needed. Patient has no history of psychosis or exaggerated behavior reported.
2. c. Parents are now advised not to keep syrup of ipecac in the home. They are advised to contact the regional poison control center for any type of ingestion. The committee felt it was premature to recommend activated charcoal administration in the home at this time. See the following reference: American Academy of Pediatrics, Committee on Injury, Violence, and Poison Prevention. Poison treatment in the home. *Pediatrics*. 2003; 112: 1182-1185.
3. c. When ingestion of a toxic amount of acetaminophen is suspected to have occurred within eight hours, NAC (*N*-acetylcysteine) needs to be administered immediately. Elevation of the transaminases indicates the amount ingested was toxic. Gastric lavage only removes about 40% of an ingested poison if done within an hour after ingestion and would not be expected to alter the clinical course here, especially since the patient has been vomiting. Activated charcoal works for many poisons, but the specific antidote for acetaminophen overdose is NAC, and it has a higher priority when a toxic ingestion of acetaminophen is suspected. A psychiatry consultation is necessary, but not until medically cleared.
4. a. and c. are both correct. This is an example of organophosphate poisoning. Organophosphates affect both the muscarinic and the nicotinic receptors. Stimulation of the muscarinic receptors causes the following symptoms: diarrhea, urinary incontinence, miosis, bradycardia, bronchospasm, emesis, lacrimation, and salivation. (Mnemonic is DUMBBELS). Organophosphates also target nicotinic receptors, which may be associated with muscle weakness, paralysis, and CNS effects. The antidotes are atropine and pralidoxime. Atropine is a competitive antagonist of acetylcholine at muscarinic receptors, but not the nicotinic receptors. Pralidoxime works by attaching onto the phosphorylated moiety of the organophosphate-enzyme complex and removes the organophosphate to regenerate AChE (acetylcholinesterase). Pralidoxime needs to be administered immediately before the organophosphate and the enzyme age.

5. d. The patient's presentation was consistent with methemoglobinemia, which is treated with methylene blue. Many drugs including local anesthetics, sulfonamide antibiotics, phenazopyridine, dapsone, and chloroquine can cause methemoglobinemia. Methemoglobinemia usually responds to methylene blue. Since it did not in this case, other causes of the cyanosis must be excluded or treated. Phenazopyridine can cause sulfhemoglobinemia, which is similar to methemoglobinemia, but does not respond to methylene blue. Other explanations for a failure of methylene blue to reduce the methemoglobin might include the presence of Glucose 6 Phosphate Dehydrogenase deficiency or a deficiency of NADPH reductase.
6. e. Tricyclic Antidepressant overdoses as suicide attempts represent a major cause of poisoning hospitalizations and deaths. Cardiovascular effects include abnormal cardiac conduction and arrhythmias and hypotension. Common EKG findings include sinus tachycardia with QRS prolongation and atrioventricular block. Ventricular tachycardia (monomorphic and polymorphic) and ventricular fibrillation may occur, but polymorphic ventricular tachycardia (torsades de pointes) is less common.
7. b. When a patient is found unresponsive, the first priority is to obtain /maintain the airway. Since this patient is not breathing adequately, bag-valve mask ventilation and/or intubation with ventilation is mandatory. Once the airway is secured, then the "coma cocktail" can be administered which is naloxone, thiamine and dextrose. If a bedside glucose check can be done immediately, dextrose can be skipped if the blood glucose level is adequate. Gastric lavage should not be done as the first step in a comatose patient.
8. Regarding toxic inhalations:
 1. True – Sudden stress, hypercapnia, hypokalemia, and hypoxia all predispose a sniffer to greater cardiac toxicity
 2. False – The toxic metabolic product of methylene chloride is carbon monoxide.
 3. False – "Sudden sniffing death" can occur after volatile inhalant abuse. The cause of the sudden death is a dysrhythmia, due to cardiac sensitization to endogenous catecholamines.
 4. True – Benzene is known to cause aplastic anemia.
9. c. Oxalate is the metabolite in ethylene glycol that causes tissue injury by combining with calcium to form calcium oxalate. Calcium oxalate can cause widespread tissue damage. Glycoaldehyde is the first metabolite of ethylene glycol, but does not cause acidosis. Glycolic acid is a metabolite of ethylene glycol and causes acidosis, but is not osmotically active. Glyceraldehyde is a metabolite of ethanol.
10. a. and b. Since the patient worked in a veterinarian's office, he had access to various veterinary pharmaceuticals. Telazol, which is an anesthetic used by veterinarians is combination of tiletamine (structurally similar to PCP and ketamine) has similar effects to ketamine and PCP. (See Redmond A, Herman MI: Ingestion of Telazol, a veterinary anaesthetic, by a 16 year-old male. Clinical Intensive Care 13:139-142). PCP and ketamine can cause a wide range of symptoms including adrenergic hyperactivity (hypertension, tachycardia), diaphoresis, hallucinations, hypersalivation (drooling), and vertical nystagmus. Crystal methamphetamine is a sympathomimetic and would not cause ataxia or drooling. Diazepam is a benzodiazepine and therefore would cause sedation.
11. f. Gastric lavage is contraindicated with the ingestion of hydrocarbons, acids and bases because they can cause further damage. Gastric lavage is often performed within an hour of a TCA ingestion due to the potential for life-threatening effects of TCAs. Clonidine patches would not be likely to be removed by gastric lavage.

12. **All** of the statements concerning arsenic exposure are **correct**.
13. c. The eyes and respiratory tract are targets of local irritative and inflammatory effects. Other symptoms are unconsciousness, cyanosis, dilated pupils, decreased respirations or apnea, generalized tremors, and agitation. The blackened jewelry as well as blackened coins is a helpful bedside clue.

References:

American Academy of Pediatrics, Committee on Injury, Violence, and Poison Prevention. Poison treatment in the home. *Pediatrics*. 2003; 112: 1182-1185.

Ling L, Clark R, Erickson T, Trestrail J: *Toxicology Secrets*. Philadelphia, Hanley & Belfus, 2001.

Olson K (ed): *Poisoning & Drug Overdose* (4th ed). McGraw-Hill Companies, 2004.