

TOXICOLOGY

Table 97. Agents with Limited or Uncertain Binding to Activated Charcoal

Iron	Gasoline
Lithium	Mineral seal oil
Heavy metals	Caustics ^a
Arsenic	NaOH
Mercury	KOH
Lead	HCL
Thallium	H ₂ SO ₄
Alcohols	Low-molecular-weight compounds
Methanol	Cyanide
Ethanol	Pesticides
Isopropanol	Organophosphates
Ethylene glycol	Carbamates
Hydrocarbons	
Kerosene	

^a Administration of activated charcoal may also impede further management.

Table 98. Agents Causing Hypoglycemia in Overdosed Children

Ethanol
Salicylates
Oral hypoglycemic agents
Propranolol
Insulin

Table 99. Poisons Not Detected on the Comprehensive Drug Screen^a

β -Adrenergic antagonists
Calcium channel blockers
Carbon monoxide
Clonidine
Cyanide
Iron
LSD
Many benzodiazepines (alprazolam, midazolam, lorazepam)
Most plants and mushrooms

^a Partial listing of some of the most common poisons.

Table 100. Poisons Causing Respiratory Depression or Apnea^a

Antipsychotic agents	Exotic snake envenomation
Carbamate pesticides	Cobras
Chlorinated hydrocarbons	Sea snakes
Trichloroethylene	Mambas
1,1,1-trichloroethane	Mojave rattlesnake envenomation
Clonidine	Narcotics
Coral snake envenomation	Nicotine
Cyclic antidepressants	Organophosphate pesticides
Ethanol (especially when combined with sedative/hypnotics)	Sedative/Hypnotics

^a Partial list of representative poisons.

Table 101. Poisons Causing an Abnormal Anion Gap^a

<i>Increased anion gap with metabolic acidosis</i>	Methanol ^b
Carbon monoxide ^b	Salicylates ^b
Cyanide	Theophylline ^b
Ethanol ^b	<i>Decreased anion gap</i>
Ethylene glycol ^b	Bromide
Iron ^b	Lithium ^b
Isoniazid	Hypermagnesemia ^b
	Hypercalcemia ^b

^a Partial list of representative poisons; anion gap = $\text{Na}^+ - (\text{Cl}^- + \text{CO}_2^-)$.

^b Specific levels rapidly available.

Table 102. Common Poisons and Antidotes

Poison	Antidote	Administration
Acetaminophen	N-Acetylcysteine	Loading dose 140 mg/kg, then 17 doses at 70 mg/kg/dose. Dilute 20% solution to 5%–10% with juice or soda to improve palatability.
Anticholinergics	Physostigmine	
Benzodiazepines	Flumazenil	
β-Adrenergic antagonists	Glucagon	
Calcium channel blockers	Glucagon	0.3–0.6 mL/kg (8–16 mEq calcium/kg)
	Calcium gluconate 10%	
Carbon monoxide	Hyperbaric oxygen	
	Sodium thiosulfate 25% ^a	
Cyanide	Sodium nitrate 3%	Dose depends on hemoglobin (see cyanide antidote kit package insert). Do not exceed recommended dosage. Do not give to patients suffering from concomitant carbon monoxide exposure.
	Sodium thiosulfate 25%	Dose depends on hemoglobin (see cyanide antidote kit package insert).
Digitalis	Digitalis Fab fragments	Calculate dose based on level or dose ingested or 10 vials if acute overdose, 5 vials if chronic overdose.
Ethylene glycol	Ethanol	0.6 g/kg load over 1 hour followed by 100 mg/kg/hr infusion
	Pyridoxine	2 mg/kg and thiamine 0.5 mg/kg
Iron	Deferoxamine	5–15 mg/kg/hr IV infusion
Isoniazid	Pyridoxine	
Lead	Lead level 45–69 mcg/dL	
	Dimercaptosuccinic acid	10 mg/kg PO three times daily for 5 days, then twice daily for 14 days (may be useful at lower levels)
	or	50–75 mg/kg/day divided, every 6 hours either IM or by slow IV infusion (IV use not FDA-approved)
	Calcium NaEDTA	
	Lead level ≥70 mcg/dL	
	Calcium NaEDTA and	Administer as described above
	British anti-lewisite (BAL)	3–5 mg/kg IM every 4 hours for 5 days
Methanol	Folate	50–100 mg over 6 hours
	4-Methylpyrazole (investigational)	
Methemoglobinemia	Methylene blue 1%	1–2 mg/kg (0.1–0.2 mL/kg)
Narcotics	Naloxone	
Organophosphates	Atropine	0.1–0.5 mg/kg initial dose with additional doses as needed to counteract bronchorrhea
	Pralidoxime	25–50 mg/kg (up to 1 g); for severe cases, consider 10–15 mg/kg/hr infusion
Phenothiazines (dystonia)	Diphenhydramine	1–2 mg/kg IM or IV
	Benzotropine	1–2 mg/kg IM or IV

IM, intramuscularly; IV, intravenously; FDA, Food and Drug Administration; NaEDTA, sodium ethylenediaminetetraacetic acid; PO, orally.

^a Consider for possible cyanide inhalation if the patient suffers from smoke inhalation.

Table 103. Epidemiologic Aspects of Food Poisoning

Organism	Pathogenesis	Source	Prevention
<i>Salmonella</i>	Infection	Meats, poultry, eggs, dairy products	Proper cooking and food handling, pasteurization
<i>Staphylococcus</i>	Preformed enterotoxin	Meats, poultry, potato salad, cream-filled pastry, cheese, sausage	Careful food handling, rapid refrigeration
<i>Clostridium perfringens</i>	Enterotoxin	Meats, poultry	Avoid delay in serving foods, avoid cooling and rewarming foods
<i>Clostridium botulinum</i>	Preformed neurotoxin	Honey, home-canned foods, uncooked foods	Proper refrigeration (see text)
<i>Vibrio parahaemolyticus</i>	Infection enterotoxin	Sea fish, seawater, shellfish	Proper refrigeration
<i>Bacillus cereus</i>			
Diarrheal type	Sporulation enterotoxin	Many prepared foods	Proper refrigeration
Vomiting type	Preformed toxin	Cooked or fried rice, vegetables, meats, cereal, puddings	Proper refrigeration of cooked rice and other foods
Enterohemorrhagic <i>E. coli</i> 0157-H7	Cytotoxins	Milk, beef	Thorough cooking of beef, consumption of pasteurized milk products
Enterotoxigenic <i>E. coli</i> (traveler's diarrhea)	Enterotoxin	Food or water	Prognosis is not recommended for infants and young children

Table 104. Clinical Aspects of Food Poisoning

Organism	Incubation	Symptoms	Duration	Treatment
<i>Bacillus cereus</i>	Vomiting toxin 1–6 hr Diarrhea toxin 6–24 hr	Vomiting ± diarrhea; fever uncommon	8–24 hr	None
<i>Brucella</i>	Several days to months; usually >30 days	Weakness, fever, headache, chills, arthralgia, weight loss; splenomegaly		Bactrim, tetracycline
<i>Campylobacter</i>	2–10 days; usually 2–5 days	Diarrhea (often bloody), abdominal pain, fever		Severe infection or immunocompromised; erythromycin, Cipro, or Norfloxacin
<i>Clostridia botulinum</i>	2 hr–8 days; usually 12–48 hr	Poor feeding, weak cry, constipation, diplopia, blurred vision, resp weakness; symmetric descending paralysis		Supportive, trivalent equine antitoxin to prevent further paralysis
<i>Clostridia perfringens</i>	6–24 hr	Diarrhea, abdominal cramps, vomiting and fever uncommon	<24 hr	None
<i>Escherichia coli</i>	→	→		Antibiotics in systemic infections
<i>E. coli</i> O157:H7	1–10 days; usually 3–4 days	Diarrhea (often bloody), abdominal cramps, little or no fever. Can cause HUS.	5–10 days	Supportive
ETEC	6–48 hr	Diarrhea, abdominal cramps, nausea, fever, and vomiting; uncommon	5–10 days	Supportive
<i>Listeria monocytogenes</i>	2–6 wk	Meningitis, neonatal sepsis, fever	Variable	Ampicillin and gentamicin
Nontyphoidal <i>Salmonella</i>	6–48 hr	Diarrhea often with fever and abdominal cramps	<7 days	None unless <3 months or immunocompromised
<i>Salmonella typhi</i>	3–60 days; usually 7–14 days	Fever, anorexia, malaise, headache, myalgias, ± diarrhea or constipation	3–4 wk	Chloramphenicol, ampicillin, amoxicillin, Bactrim, Cefotaxime, Ceftriaxone
<i>Shigella</i>	12 hr–6 days; usually 2–4 days	Diarrhea (often bloody), frequently fever, abdominal cramps	1 day–1 month	Bactrim, Cipro
<i>Staphylococcus aureus</i>	30 min–8 hr; usually 2–4 hr	Vomiting, diarrhea	<24 hr	None
<i>Vibrios</i>	4–30 hr	Diarrhea, cramps, nausea, vomiting	Self limited	Usually none. Treatment for patients with liver disease or immunocompromised: Cefotaxime, gentamicin, Chloramphenicol, Tetracycline
<i>Yersinia enterocolitica</i>	1–10 days; usually 4–6 days	Diarrhea, abdominal pain (often severe), mesenteric adenitis, pseudo-appendicular syndrome	1–3 wks	Septicemia or enterocolitis in immunocompromised: Cefotaxime, aminoglycosides, tetracycline, Bactrim, chloramphenicol

Table 105. Nomogram for Estimating Severity of Acute Poisoning

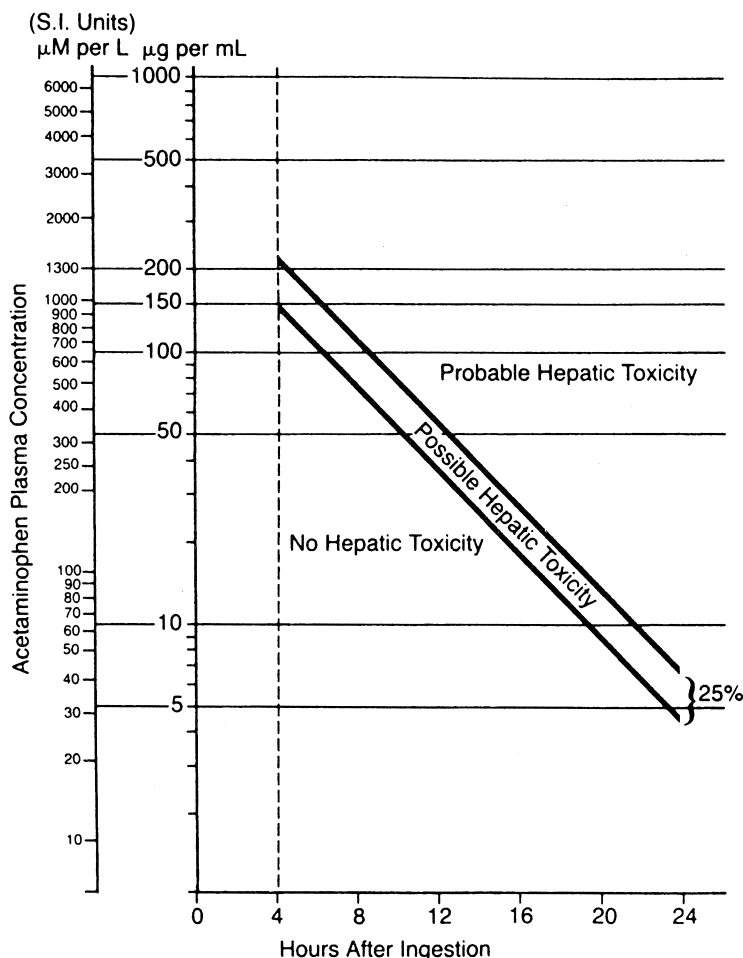


Table 106. Poisonous Plants

The following are a few common plants that are toxic:

Azalea	Laurel
Buttercup	Lily-of-the-valley
Calla lily	Mistletoe
Creeping Charlie— ground ivy	Morning glory
Daffodil	Nightshade
Delphinium	Periwinkle
Elderberry	Philodendron
Holly berries	Poison ivy
Hyacinth bulbs	Poison oak
Hydrangea	Rhododendron
Iris	Sweet pea
Ivy (Boston and English)	Tomato vines
Jimson weed	Tulip
Larkspur	Wisteria
	Yew

Table 107. Helpful Specific Drug Levels

Drug	Time to Peak Blood Level (Hours Postingestion)	Potential Intervention
Acetaminophen	4	<i>N</i> -Acetylcysteine administration
Carbamazepine	2–4 ^{a, b}	...
Carboxyhemoglobin	Immediate	Hyperbaric oxygen therapy
Digoxin	2–4	Fab (digoxin antibody) fragment
Ethanol	1/2–1 ^b	...
Ethylene glycol	1/2–1	Ethanol infusion and hemodialysis
Iron	2–4	Deferoxamine administration
Isopropanol	1/2–1 ^b	...
Lead	5 weeks ^a	Chelation and environmental abatement
Lithium	2–4	Hemodialysis
Methanol	1/2–1	Ethanol infusion and hemodialysis
Methemoglobinemia	Immediate	Methylene blue administration
Phenobarbital	2–4	Alkaline diuresis, multiple-dose activated charcoal
Phenytoin	1–2 ^a	Multiple-dose activated charcoal
Salicylates	6–12 ^a	Alkaline diuresis, multiple-dose activated charcoal, hemodialysis
Theophylline	1–36 ^a	Multiple-dose activated charcoal, whole-bowel irrigation, charcoal hemoperfusion, hemodialysis

^a Repeated measurement of levels is necessary because of significant variation in time to reach to peak level.

^b The peak level is predictive of toxicity and clinical course. Adapted from Weisman RS, Howland MA, Verebey K. The toxicology laboratory. In: Goldfrank LR, Flomenbaum NE, Lewin NA, et al., eds. *Goldfrank's toxicologic emergencies*, 5th ed. East Norwalk, CT: Appleton & Lange, 1994:105.