

Poisonings: An Update for the Pharmacist

by H. David Bergman, Ph.D.
Dean, College of Pharmacy, Southwestern Oklahoma State University

Goals and Objectives

Goals:

To provide the pharmacist with information regarding the various methods used to treat poisonings.

Objectives

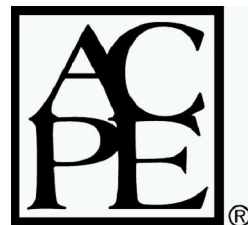
After completing this article, the pharmacist could be able to:

1. Describe the various treatment methods used in poisonings.
2. Discuss the indications & contraindications involved with each treatment method.
3. Discuss each therapeutic agent used in treating the poisoned patient.
4. List the major sources of poison information.
5. Explain the use of poison treatment methods to patients and/or health professionals.

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Chemical or drug ingestion is a serious problem in the United States. It is estimated that more than two million cases of poisoning occur in the United States each year. These can range from accidental poisonings in the home to intentional overdoses or suicide. Approximately 20,000 deaths each year are the result of poisonings with a significant amount of these as a result of intentional adult self-poisonings.

The peak age for childhood poisoning is between 1.5 and 3 years of age. These children have acquired fine motor skills and are in the oral stage of development, but do not have adequate judgment to protect themselves. Therefore, they can easily ingest anything within reach. These poisonings occur most frequently when the parents are occupied or at the home of grandparents who often do not childproof their surroundings.

Poisoning calls are frequently received by poison centers, community pharmacies, and hospital pharmacies. Although appropriately equipped and maintained poison centers are usually very effective in dealing with poisonings, many community and hospital pharmacies do not have the general information or procedures to react to these situations.

The purpose of this article is to provide the pharmacist with the basic knowledge required to deal with poisonings as well as describe the various general methods used to treat the poisoned patient.

Evaluation of the Poisoning

In many instances, the caller does not volunteer sufficient information to the pharmacist to appropriately answer the pertinent questions. In addition, the pharmacist must also be calm and ask the correct questions in order to direct the caller to the correct source for treatment. This can best be achieved by using a form and following the steps on the form. This will also provide for written documentation. The types of questions are listed in Table 1. Although this may appear to be a significant amount of information, it can be obtained quickly and usually provides important information for determining the appropriate treatment.

In many cases, the logical step for the community or hospital pharmacist is to refer the patient to the poison center in the area. Pharmacists should have the phone number of this center in an accessible

location. In some situations, the pharmacist may be the initial source of information. In those cases, it is essential that pharmacists develop a format as previously described as well as maintain a series of reference sources. In addition, a list of experts in the region (i.e., botanist) should be developed for use as consultants.

General Therapy

The treatment of poisoning is very complex and requires an understanding of the situation as well as an ability to evaluate the process and apply and modify the basic principles to each individual case. All ramifications of each case must be considered. For example, if the intent was suicidal, then psychiatric counseling is warranted. Conversely, if it was accidental, then care must be taken to avoid a recurrence.

Treatment of many intoxications is largely symptomatic and supportive. If the patient's vital functions are supported and symptoms that develop are treated, most patients will detoxify themselves and recover. Therefore, it is essential that the patient rather than the poison is treated.

Local Exposure

Many chemicals are quite toxic when they come in direct contact with the skin, eyes, or mucous membranes. In most situations, damage is caused by a direct effect of the chemical on the exposed tissue. Some compounds, such as organophosphate insecticides and the halogenated hydrocarbons, can produce systemic toxicity via percutaneous absorption.

All body areas exposed to the chemical agent must be treated. Materials spilled on the skin are best removed with large amounts of water delivered as rapidly as possible. Neutralizing agents (i.e., baking soda to neutralize acids) should not be used and may even cause further damage by a chemical reaction.

If the eye is exposed to caustic chemicals, a similar process must be used. If an eye bath is not available (many industrial areas have these), then the patient's head should be placed directly underneath a faucet and cool or lukewarm water is run directly into the eye(s) with the lids held open. This process should be continued for 5 to 10 minutes.

These exposures must be considered serious and an ophthalmologist should be seen within 2 hours after

the exposure. If the agent causes systemic toxicity, then both topical and systemic therapy is warranted.

Emesis

Emesis or vomiting may be beneficial, but the type and amount of poison ingested, the time elapsed since ingestion and contraindications to the procedure must be evaluated before an emetic is administered.

Emetics should not be used in patients who have ingested petroleum distillates, acids, strong bases, or strychnine, do not have the gag reflex, have seizures, are unconscious, and/or are pregnant. When the emetic is administered, it is recommended that the patient be administered fluid which often decreases the time of vomiting when used appropriately (i.e., 240-360 ml. of water in adults).

The emetics used most often are apomorphine and syrup of ipecac. Apomorphine has a short onset of action. Vomiting usually occurs within 3 minutes after the drug is given. The usual subcutaneous dose is 6 milligrams in adults and 0.03 milligrams/pound for infants, although it must be used in children very cautiously. Since apomorphine may produce respiratory and central nervous system depression, it must not be used in patients with significant central nervous system or respiratory depression. Apomorphine may also produce protracted vomiting.

Ipecac syrup is the emetic of first choice. Unlike apomorphine, it may be administered safely at home, but only when instructed by a physician or poison center personnel. Care must be taken to use syrup of ipecac rather than the much stronger (14 times) fluid extract. The Food and Drug Administration approves the OTC sale of appropriately labeled one ounce quantities of ipecac syrup.

When administered properly, syrup of ipecac is an effective and safe emetic. It acts as a gastric irritant as well as a central stimulant in the medulla on the chemoreceptor trigger zone. The usual dosage is 15 milliliters in persons over one year of age. This should be followed by several glassfuls of water. The major disadvantage of ipecac syrup is its onset of action, which is 20 to 30 minutes after administration. Major toxic reactions (i.e., cardiovascular) are rare in normal doses, but patients may be somewhat lethargic after normal doses.

Other methods or compounds used for inducing emesis are not recommended. Salt water, mustard water, and stimulation of the gag reflex are not as reliable and/or effective.

Gastric Lavage

Gastric lavage is a process in which toxicants are removed from the stomach by inserting a tube into the stomach via the esophagus. The contents of the stomach are aspirated through the tube, fluid is instilled into the tube and allowed to mix with the gastric contents, and then removed via the same tube. It may be used in comatose patients or those without a gag reflex. It should not be used in the presence of convulsions, ingestion of petroleum distillates, corrosive acids, or alkalis. Fluid for gastric lavage is somewhat dependent on the poison, but isotonic saline is usually appropriate. Gastric lavage may be useful several hours after some ingestions, which is an advantage for drugs with increased gastric emptying time.

Cathartics

Cathartics are useful in poisoning cases to further decrease the absorption of the ingested material from the gastrointestinal tract. Saline cathartics are the agents of choice. Those used are sodium sulfate (Glauber's salt) or magnesium sulfate (Epsom salt). Oil based evacuants, such as mineral oil or castor oil, are usually avoided because of aspiration and the chance of increasing the absorption of lipid soluble poisons.

Saline cathartics can be administered by mouth or via lavage tube. The dose of sodium or magnesium sulfate is 250 mg/kilogram of body weight, diluted in water.

Activated Charcoal

Activated charcoal is used to absorb toxicants within the gastrointestinal tract. It is inert and does not exert any effects of its own, but when mixed with water to form a slurry it is a very good absorbant when administered either orally or by lavage tube.

The usual dose of activated charcoal is 40 to 60 grams for adults and 20 to 30 grams for patients 14 years of age or younger. Activated charcoal effectively absorbs ipecac; therefore, activated charcoal must not be administered after successful vomiting has occurred.

Activated charcoal must be removed from the body. This is accomplished through the administration of saline cathartics or aspiration through a gastric tube. This should be done under medical supervision and the charcoal and poison complex must be removed or it may undergo separation in the gastrointestinal tract.

Enhancement of Excretion

One mechanism to minimize the toxic effects of potentially dangerous quantities of poisons is to hasten elimination of the substance. This can be accomplished for those toxicants that are normally excreted in large amounts in urine by forced diuresis and/or alteration of urinary pH.

Forced diuresis is employed by using large amounts of intravenous fluids and diuretics. The diuretics employed are the loop diuretics, such as urea or mannitol. The goal is to maintain a urinary flow at 3 to 6 ml/kg of body weight per hour.

The purpose of urinary pH adjustment is to convert an intoxicant from the unionized or reabsorbable form to the ionized or excretable form. This is accomplished by acidifying the urine for weak bases, such as amphetamine, and alkalinizing the urine for weak acids, such as phenobarbital. Ideally, the urinary pH for alkalinization should be 7 to 8, while 4.5 to 5.5 is ideal for acidification.

Dialysis

Dialysis refers to the therapeutic procedure whereby unwanted solutes in the blood plasma are allowed to diffuse across a dialysis membrane into a solution. The dialysis solution is formulated so that the undesirable substances diffuse across the semipermeable membrane.

Two types of dialysis, hemodialysis and peritoneal dialysis, are used. Hemodialysis averages five times

the clearance rates of peritoneal dialysis, but is much more complicated and requires highly trained personnel and expensive and sophisticated equipment.

Not all compounds can be removed by dialysis. Compounds that are considered should be both dialyzable and removed at a rate significantly higher than by normal metabolic processes.

The Universal Antidote

The universal antidote consists of two parts burned toast to provide nonactivated charcoal, one part milk of magnesia, and one part strong tea solution to provide tannic acid. The preparation is still commercially available as activated charcoal, tannic acid, and an antacid. The universal antidote is ineffective and should not be used.

Specific Antidotes

An antidote is a remedy used to counteract a poison. Although many agents are referred to as antidotes, there are only a limited number of specific antidotes available today. These are listed in Table 2.

Role of the Pharmacist

Pharmacists can provide a variety of valuable services within the entire area of clinical toxicology. The unique background enables the pharmacist to be a significant resource in poison centers. Pharmacists are frequently asked to identify products that are ingested. In addition, the pharmacist can serve as the coordinator in the scheme that encompasses the reporting and referral of poisonings.

The pharmacist can also plan an important role in poison prevention. (Table 3) This includes not only appropriate distribution of medications, such as ipecac syrup, but also community involvement.

Table 1
Format for Poisoning Evaluation

I. Poisoning Information

- A. Name of Product Ingested _____
- B. Amount Ingested _____
- C. Time Since Ingestion _____
- D. Who Witnessed the Poisoning? _____

II. Patient Information

- A. Name _____
- B. Location _____
- C. Phone Number, Age & Weight _____
- D. Patient History _____
- E. Current Therapy _____

Table 2
Major Specific Antidotes

Antidote	Toxicant
Atropine	Carbamate Insecticides Organophosphate Insecticides
Bal (Dimercaprol)	Arsenic, Gold, Mercury, Lead
Cyanide Antidote Package	Cyanide
Physostigmine	Anticholinergics
N-Acetylcysteine	Acetaminophen
Naloxone	Narcotics
Methylene Blue	Agents that produce Methemoglobinemia
Pralidoxime	Organophosphate pesticides
D-Penicillamine	Copper, Gold, Mercury, Lead, Arsenic
Hexamethylenetetramine	Phosgene
Vitamin K	Anticoagulants
Ethanol	Methyl Alcohol
Calcium Disodium Edetate	Lead
Deferoxamine Mesylate	Iron
Digoxin immune Fab	Digoxin
Diphenhydramine	Phenothiazine induced extrapyramidal symptoms
Flumazenil	Benzodiazepines

Table 3
General Prevention Rules

- Keep drugs and chemicals out of reach
- Drain cleaners, furniture polish, and insecticides should be in overhead cupboards
- Beware of dangers of alcoholic beverages and mouthwash
- Keep safety caps on new medicines
- Do not leave medications on countertops (e.g., aspirin, vitamins)
- Remove poisonous plants from the house. Learn the names of your plants. Teach children not to put plant parts into the mouth
- Do not put chemicals (e.g., kerosene) in soft drink bottles.
- Check older homes for lead paint
- Keep syrup of ipecac and the poison control center telephone number available