HANDBOOK OF POISONS

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by

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PREFACE

The purpose of this handbook is to provide a concise summary of the diagnosis and treatment of clinically important poisons. Many other potentially poisonous agents that have not been important clinically are included in tabular form. The necessity for such a book has grown out of the rapidly expanding importance of chemical products in industrial, agricultural, and domestic processes. These substances have been introduced commercially in a bewildering variety of new preparations whose nature is often disguised by a coined name.

Poisons have been organized into industrial, agricultural, household, medicinal, and natural hazards, since this method allows considerable correlation of poisons with types of exposure. In some cases, chemically similar agents with varied uses appear in more than one section. Insofar as is possible or feasible, chemically and, in some cases, pharmacologically related agents have been grouped together. In order to enable the physician to identify the toxic principle in a given proprietary preparation, brand names have been freely used and are included in the general index. Only those likely to be important clinically or those whose composition is not obvious are included. This group comprises many insecticides and medicinal agents. Others will undoubtedly be added in future editions.

The author hopes that in striving for brevity and clarity he has not oversimplified or been unduly dogmatic. References have been almost entirely omitted; anyone interested in references on any subject discussed in this book can find them in Chemical Abstracts or the Current List of Medical Literature.

Since this book is new and nothing similar of comparable scope is available, any suggestions for increasing its usefulness will be appreciated. Information about toxic agents not included which have been found to have clinical significance will be especially helpful.

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Robert H. Dreisbach
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TABLE OF CONTENTS

Section I

General Considerations of Poisons and Poisoning

Chapter 1

EMERGENCY MANAGEMENT OF POISONING

The emergency management of poisoning is aimed at preventing absorption of the poison beyond that amount which the body can safely detoxify or which can be effectively antagonized by antidotes. This can be accomplished by delaying absorption of the poison and removing the poison from the body. These measures can be initiated as first-aid treatment before the physician arrives. (See inside back cover.)

EMERGENCY MEDICAL MEASURES

The emergency measures in the treatment of poisoning vary with the type of exposure. The physician receiving a telephone report of a case of poisoning must be prepared to instruct the caller in the necessary first-aid steps. He should ask which type of exposure to poison has occurred (e.g., inhaled, skin, eye, ingested, injected) and instruct the caller accordingly. After the necessary first-aid steps have been taken, the physician must himself see the patient or the patient must be directed to a hospital or emergency station where definitive medical treatment can be given.

Ingested Poison:

1. Give universal antidote, 5 to 30 Gm. (1 to 6 tsp.) suspended in a glass of water, if available (see p. 12). However, do not waste time searching for universal antidote.
2. Give one to two glasses of water or milk to drink.
3. Do gastric lavage (cautiously or not at all after corrosives)(see p. 11).
4. Catharsis (see p. 13).

Injected Poisons (e.g., snake bites):

1. Apply tourniquet and ice packs to slow absorption (see p. 14).
2. Give specific antidote (e.g., snake venom antiserum).

Skin Contamination:

1. Drench skin to completely remove the poison.
2. Use the appropriate antidote when available.

Eye Contamination:

Irrigate eye thoroughly with running water for at least 15 minutes. Instill a few drops of 1% fluorescein solution in the eye. If the fluorescein leaves a yellow stain, continue irrigating the eye for another 15 minutes (see p. 14). Avoid use of chemical antidotes.

Inhaled Poisons:

1. Remove from exposure, establish adequate airway, and give oxygen and artificial respiration as indicated.
2. Determine blood pressure frequently during use of positive pressure resuscitation equipment. A prolonged inspiratory cycle will impair venous return and lower blood pressure.
3. Maintain body temperature.
4. Use specific antidote when available (e.g., amyl nitrite for cyanide).

EMERGENCY DIAGNOSIS AND EVALUATION OF POISONING

When the physician is called upon to treat a case of poisoning, his first responsibility is to limit the effect or absorption of the poison. He must then decide whether the poisoning is sufficiently serious to require further treatment. Cases of poisoning generally fall into three categories: (1) exposure to a known poison, (2) exposure to an unknown substance which may be a poison, and (3) disease of undetermined etiology in which poisoning must be considered as part of the differential diagnosis.

EXPOSURE TO KNOWN POISONS

In most cases of poisoning, the agent responsible is known and the physician's only problem is to determine whether the degree of exposure is sufficient to require more than emergency treatment. The exact quantity of poison absorbed by the patient will probably be unknown, but the physician may be able to estimate the greatest amount which the patient could have absorbed by examining the container from which the poison was obtained and by questioning relatives or co-workers as to the amount present in the container

previously. The missing quantity can then be compared with the known fatal dose. Reported minimum lethal doses are useful indications of the relative hazards of poisonous substances, but the fatal dose may vary greatly. If the poison is known to have caused serious or fatal poisoning, treatment for exposure to any quantity must be vigorous.

EXPOSURE TO SUBSTANCES WHICH MAY BE POISONOUS

If a patient has been exposed to a substance whose ingredients are not known, the physician must determine the contents without delay. This problem is complicated by the multiplicity of trade-named mixtures and the rapidity with which the formulas for such mixtures change. Since most trade-named chemical mixtures do not list the ingredients on the label, it is ordinarily impossible to evaluate the significance of contact with such materials without further information. The following methods are suggested for evaluating trade-named mixtures.

Call Manufacturer or His Local Representative:

One of the quickest and most reliable ways to find out the contents of a questionably poisonous substance is to telephone the manufacturer or his representative. He may also have information concerning the type of toxic hazard to be expected from the material in question, and may know methods of treatment.

Index of Handbook of Poisons:

The index of this book lists the main toxic ingredient of some of the most poisonous proprietary mixtures or indicates the poison which most closely simulates the over-all effects of the mixture.

References Useful in Determining the Contents of Proprietary Mixtures:

Since available proprietary mixtures number in the tens of thousands, it is impractical to include all of these names in a reference work. However, a number of books are useful in determining the contents of mixtures and should be available to every physician.

1. Pesticide Handbook (annual publication), by D. E. H. Frear, College Science Publishers, Box 798, State College, Pa. (Lists 6000 pesticide mixtures.)
2. Handbook of Material Trade Names, by O. T. Zimmerman and I. Levine, Waverly Press, Baltimore, 1952.
3. Toxicology of Trade-marked Products, by H. C. Hodge, Williams and Wilkins, Baltimore, 1956. (Lists 15,000 household products.)

4. Modern Drug Encyclopedia, edited by Marion E. Howard, Drug Publications, Inc., New York, 6th ed., 1955. (Lists 4000 proprietary medicinal agents.)
5. Modern Chemical Specialties, by M. A. Lester, MacNair-Dorland Publishing Co., New York, 1950.
6. Physicians' Desk Reference (annual publication), published by Medical Economics, Inc., Rutherford, New Jersey. (Lists 6500 proprietary medicinal agents.)

DIFFERENTIAL DIAGNOSIS OF DISEASE WHICH MAY BE THE RESULT OF POISONING

In any disease state of questionable etiology, poisoning must be considered as part of the differential diagnosis. For example, the high incidence of cases of lead poisoning which have been discovered in a few medical centers indicate that many cases must go unrecognized. Some of these patients had symptoms for more than a year and had been seen by several different physicians. Admittedly, the diagnosis of lead poisoning is difficult, but its possibility must be considered before the necessary steps to confirm the diagnosis can be made.

The diagnostic work-up of a patient who may possibly be poisoned consists of (1) a complete history, (2) complete physical examination, and (3) appropriate laboratory tests.

History:

The history may be obtained from parents, friends, or neighbors. For example, in cases of poisoning in children, the parents may not be helpful whereas a neighbor will have seen the child eating a plant or other poisonous substance. The various individuals should be questioned separately to avoid overlooking important items.

The history should be taken systematically. The following are especially important if poisoning is being considered in the differential diagnosis:

A. Occupational Exposure: Occupational hazards include the following types of poisoning:
   1. Heavy metal poisoning - Welders, steamfitters, plumbers, painters, ceramic workers, Babbitt metal workers, battery makers, brass polishers, burners, cable workers, miners, pottery makers, electroplaters, printers, enamel workers, filling-station workers, galvanizers, garage workers, refinery workers, junk-metal refiners.
   2. Chlorinated hydrocarbons - Rubber cement and plastic cement workers or users, cobblers, leather workers, dry cleaners, painters (including varnish and lacquer painters), furniture finishers, cloth finishers, paint removers, and rubber workers.

3. Nitro and amino aromatic compounds - Dye makers, explosives workers, colored pencil manufacturers, rubber workers, tannery workers, vulcanizers.
4. Benzene - Rubber and plastic cement workers and users, dye makers, gasoline blenders, electroplaters, paint and paint remover manufacturers and users, painters, printers, varnishers, and dry cleaners.
5. Carbon monoxide - Blacksmiths, furnace workers, founders, brick makers, cement makers, chimney cleaners, filling-station workers, garage workers, miners, refinery workers, plumbers, policemen, sewer workers.
6. Chromium - Garage workers, dye makers, electroplaters, painters, pottery workers, printers, and paper makers.
7. Mercury - Amalgam makers, dentists and dental workers, detonator workers, felt hat makers, laboratory workers, jewelers, thermometer manufacturers, radio equipment workers, electroplaters, and printers.
8. Methyl alcohol - Book binders, bronzers, rubber and plastic cement users, dry cleaners, leather workers, printers, painters (including lacquer and shellac painters), and wood workers.
9. Hydrogen sulfide - Furnace workers, sewer workers, refinery workers, tannery workers, glass workers, and miners.

B. Availability of Poisons in the Home:
1. Ingestion of food, drink, and medicines.
2. Contact with insecticides or other agricultural chemicals.
3. Exposure to fumes, smoke, or gases.
4. Skin contact with liquids such as insecticides or cleaning solvents.
5. Search the patient, home, and other environment for poison containers.

C. System History:
1. General health -
   a. Weight loss - Any chronic poisoning, but especially lead, arsenic, dinitrophenol, and chlorinated hydrocarbons.
   b. Asthenia - Lead, other heavy metals, chlorinated organic compounds.
2. Head and central nervous system -
   a. Delirium, hallucinations - Alcohol, antihistamines, atropine and related drugs, camphorated oil, lead, cannabis (marijuana), cocaine, amphetamine, bromides, quinacrine, ergot.
   b. Depression, drowsiness, coma - Barbiturates or other hypnotics, alcohol, solvents, antihistamines, insecticides or rodenticides, atropine or related

drugs, lead, opium and opium derivatives, paraldehyde, cyanides, carbon monoxide, alcohols, phenol, chenopodium, santonin, aspidium.

c. Muscular twitchings and convulsions - Insecticides, strychnine and brucine, camphor, atropine, aspidium, cyanides, santonin.

d. Headache - Nitroglycerin, nitrates, nitrites.

3. Eyes -
   a. Blurred vision - Atropine, physostigmine, phosphate ester insecticides, cocaine, solvents, dinitrophenol, nicotine.
   b. Colored vision - Santonin, aspidium, quinacrine.
   c. Double vision - Alcohol, barbiturates, nicotine, phosphate ester insecticides.
4. Ears -
   a. Tinnitus - Quinine, salicylates, quinidine.
   b. Deafness or disturbances of equilibrium - Streptomycin, dihydrostreptomycin, quinine.
5. Nose -
   a. Anosmia - Phenol nose-drops, chromium.
   b. Fetor nasalis - Chromium.
6. Mouth -
   a. Loosening of teeth - Mercury, lead, phosphorus, fluoride, bismuth.
   b. Painful teeth - Phosphorus, mercury, bismuth.
   c. Dry mouth - Atropine and related drugs.
   d. Salivation - Lead, mercury, bismuth, thallium, phosphate ester insecticides, other heavy metals.
7. Cardiorespiratory system -
   a. Respiratory difficulty, including dyspnea on exertion and chest pain - Phosphate ester insecticides, physostigmine, silicosis, other pneumoconioses, cyanide, carbon monoxide, atropine, strychnine.
   b. Palpitation - Nitrites, nitroglycerin, organic nitrates.
   c. Cough - Smoke, dust, silica, beryllium.
8. Gastrointestinal system -
   a. Vomiting, diarrhea, abdominal pain - Caused by almost all poisons, particularly corrosive acids or alkalis, metals, phenols, medicinal irritants, and solvents.
   b. Jaundice - Chlorinated compounds, arsenic and other heavy metals, chromates, cinchophen, neocinchophen, mushrooms, phenothiazine, and sulfonamides.
9. Genitourinary -
   a. Anuria - Mercurials, bismuth, sulfonamides, carbon tetrachloride, benzene.
   b. Polyuria - Lead.
   c. Menstrual irregularities - Lead, bismuth, estrogens, other heavy metals, mercurials.

10. Neuromuscular system -
    a. Muscular weakness or paralysis - Lead, arsenic, botulism, poison hemlock (Conium maculatum), organic mercurials, thallium.
    b. Muscle fasciculations - Phosphate ester insecticides, nicotine.
11. Endocrine system -
    a. Libido decreased - Lead, mercury, other heavy metals.
    b. Breast enlargement - Estrogens.
12. Blood - Anemia - Lead, benzene.

Physical Examination*:

A. General:
    1. Blood pressure fall - Nitrates, nitrites, nitroglycerin, veratrum.
    2. Blood pressure rise - Epinephrine or substitutes, veratrum.
    3. Hyperthermia - Dinitrophenol or other nitrophenols.

B. System Examination:
    1. Skin -
        a. Cyanosis in the absence of respiratory depression or shock - Methemoglobinemia from aniline, nitrobenzene, acetanilid, phenacetin, nitrate from well water or food, bismuth subnitrate.
        b. Dryness - Atropine and related compounds.
        c. Corrosion or destruction - Acids or alkalis.
        d. Jaundice from liver injury - Chlorinated compounds, arsenic, chromates, cinchophen, neocinchophen, mushrooms, phenothiazine, and sulfonamides.
        e. Jaundice from hemolysis - Aniline, nitrobenzene, pamaquine, pentaquine, primaquine, benzene, castor beans, jequirity beans, fava beans, phosphine, arsine, nickel carbonyl.
        f. Lividity - Carbon monoxide, cyanide.
        g. Rash - Bromides, sulfonamides, antibiotics, poison oak.
        h. Loss of hair - Thallium.
    2. Eyes -
        a. Dilated pupils - Atropine and related drugs, cocaine, nicotine, solvents, depressants.
        b. Contracted pupils - Morphine and related drugs, physostigmine and related drugs, phosphate ester insecticides.
        c. Pigmented sclerae - Quinacrine, santonin, jaundice from hemolysis or liver damage.

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*A useful outline is readily available in Krupp, et al., Physician's Handbook, 8th edition, page 3 (Lange Medical Publications, Los Altos, Calif.), 1954.

d. Funduscopic - Pallor of disc from quinine, nicotine.

3. Nose - Perforated septum - Chromium.
4. Mouth -
   a. Black line on the gums - Lead, mercury, arsenic, bismuth.
   b. Inflammation of gums - Lead, mercury, arsenic, bismuth, other heavy metals.
5. Lungs -
   a. Wheezing - Phosphate ester insecticides, physostigmine, neostigmine, mushrooms (Amanita muscaria).
   b. Decreased vital capacity - Silica, beryllium dusts, other dusts.
   c. Rapid respirations - Cyanide, atropine, cocaine, carbon monoxide, carbon dioxide.
   d. Slow respirations - Cyanide, carbon monoxide, barbiturates, morphine.

C. Neurological Examination:

1. Central nervous system -
   a. Convulsions - Insecticides, strychnine, camphor, atropine.
   b. Depression, drowsiness, coma - Barbiturates or other hypnotics, alcohol, solvents, antihistamines, insecticides or rodenticides, atropine or related drugs, lead, opium and derivatives, paraldehyde, cyanides, carbon monoxide, alcohols, phenol.
   c. Deafness or disturbances of equilibrium - Streptomycin, dihydrostreptomycin, neomycin, quinine.
2. Muscle strength -
   a. Muscle weakness or paralysis (may be limited to a single muscle or muscle group) - Lead, arsenic, botulism, poison hemlock (Conium maculatum), organic mercurials.
   b. Muscle twitching - Insecticides, nicotine.

Laboratory Examination:

A. Simplified Laboratory Tests Useful in Aiding the Diagnosis of Poisoning:

1. Urinary phenolic compounds (salicylates, diacetic acid) - To 5 ml. of urine add 10% tincture ferric chloride drop-by-drop until precipitation ceases. A purple color indicates a positive test. Acetylsalicylic acid gives a positive test only after urine has been boiled for a few minutes with a few drops of dilute hydrochloric acid. (Boiling the urine eliminates diacetic acid, if present.)
2. Sulfonamides in urine - Place several drops of urine on newsprint or a paper towel. Add one drop of Hydrochloric Acid, U.S.P. (concentrated hydrochloric acid diluted 1:4 in distilled water). An orange color

indicates sulfonamides. A comparison should be made with control urine free of sulfonamides.

3. Blood bromide - The La Motte Chemical Company, Towson, Baltimore 4, Maryland, has available a simplified procedure for determining blood bromide levels. The test is carried out by adding gold chloride reagent to 2 ml. of deproteinized blood serum. The resulting color reaction is compared with a known bromide standard until a color match is obtained. The blood bromide concentration is then derived by reading directly from the standard color tube. An instruction book gives each step in detail. Blood levels above 150 mg. of bromide per 100 ml. of serum produce symptoms of intoxication; levels above 200 mg. per 100 ml. of serum are associated with serious toxicity.
4. Urine bromide and iodide - To 10 ml. of urine add a few drops of fuming nitric acid and 5 ml. of chloroform; mix gently and let stand three minutes. The chloroform settles to the bottom and takes on a pink to violet color in the presence of iodides or a yellow color in the presence of bromides. A positive test is not an indication of poisoning but only of absorption of bromide. The blood bromide test will indicate the possibility of poisoning.

B. Special Chemical Examinations Useful in the Diagnosis of Poisoning: Special chemical examinations for lead or other heavy metals, insecticides, cholinesterase, barbiturates, alkaloids, etc. may be necessary in the differential diagnosis of poisoning. The following laboratories are suggested for the performance of such analyses. It is wise to make prior arrangements with the laboratory to make certain that they will accept samples for analyses.

1. County coroner's laboratory - Heavy metals, blood alcohol, barbiturates, alkaloids.
2. City, county or state police laboratory - Blood alcohol, barbiturates, other poisons.
3. State toxicologists's office - As under 1. Analyses in connection with criminal poisonings.
4. Federal Bureau of Investigation Laboratory, Washington, D.C. (only through local police).
5. State departments of public health (see p. 59) will usually perform analyses relating only to cases of occupational poisoning: insecticides, heavy metals.
6. County hospital laboratory - Lead, barbiturates, alkaloids, blood alcohol.
7. Private laboratories - Heavy metals, barbiturates.
8. Technical Development Laboratory, United States Public Health Service, P.O. Box 769, Savannah, Georgia - Insecticides in body fat, blood cholinesterase. (They will send sample bottles on request by physicians.)
9. Field Station, P. O. Box 73, Wenatchee, Washington - Blood cholinesterase, insecticides in body fat.

Chapter 2

GENERAL PRINCIPLES IN THE TREATMENT OF ACUTE POISONING

The treatment of acute poisoning consists of the application of the following general procedures as rapidly as possible: (1) delay of absorption and removal of poison, and (2) treatment of immediate symptoms.

DELAY OF ABSORPTION AND REMOVAL OF POISON

INGESTED POISONS

Dilution, Adsorption, and Delay of Gastric Emptying:

Diluting the poison by giving water, milk, flour or starch suspension, mashed potatoes in water, beaten eggs, salt solution (one teaspoon to the pint), or universal antidote (see p. 12) is most effective if done within the first few minutes after ingestion. Dilution reduces the local effect of corrosives and slows absorption of other poisons. The administration of milk or beaten eggs has the advantage of effectively delaying gastric emptying time and therefore reducing absorption in the intestine; little absorption takes place in the stomach. Flour or starch suspension or mashed potatoes in water adsorbs the poisons and so prevents absorption. The quantity of liquid given should not exceed the capacity of the stomach; otherwise, gastric contents will be forced past the pylorus and absorption speeded. If nothing but water is available, it should be used because it increases the amount of fluid which must be absorbed for a given amount of poison. Thus, no time should be lost in searching for an antidote if water is available.

Emesis:

A. Indications: Emesis is used as a means of emptying the stomach if gastric lavage cannot be instituted immediately.

B. Contraindications: Do not produce emesis if the patient has ingested any of the following:
   1. Acids or alkalies - Emesis increases the likelihood of gastric perforation.
   2. Kerosene - During vomiting, patient may aspirate gastric contents.
   3. Convulsants - Stimulating vomiting may induce convulsions.

C. Materials:
   1. Table salt or powdered mustard (as emetics).
   2. Milk, canned or fresh (to slow absorption and to neutralize acids).
   3. Water.
   4. Canned fruit juice (for use in alkali ingestion).

D. Technic:
   1. Give water, milk, or fruit juice by glassfuls. After each administration, stimulate vomiting by touching the pharynx or back of the tongue with a finger or tongue depressor unless the patient is already vomiting.
   2. One heaping teaspoon of table salt or one-fourth teaspoon of powdered mustard may be added to each glass of water to assist in producing emesis.

Gastric Lavage:

A. Indications:
   1. Gastric lavage is the treatment of choice when ingestion is discovered within two to four hours. Little is usually gained by gastric lavage after this time unless the patient has been in shock, with resulting delay in gastric emptying and slowing of absorption.
   2. Lavage is indicated for removal of poisons in hysterical, comatose, or otherwise uncooperative patients.

B. Contraindications and Precautions:
   1. Do not do gastric lavage with a large gastric tube more than 30 minutes after the ingestion of corrosive acids or alkalies. By this time tissue destruction may have progressed to the point where perforation may occur if a large tube is passed. A small, flexible Levine tube may be passed cautiously and left in place without increasing the danger of perforation.
   2. Kerosene poisoning - Since passing a gastric tube is likely to induce severe retching and vomiting in children, great care must be used to prevent aspiration of gastric contents containing kerosene. Kerosene apparently passes readily into the trachea because it is oily and does not stimulate the cough reflex. Aspiration can be prevented by intubating the trachea with a tube having an inflatable cuff (see p. 17).
   3. Convulsions - Attempting to pass a stomach tube will increase the frequency and severity of convulsions. If

there is reason to believe that unabsorbed poison remains in the gastrointestinal tract after convulsions are controlled, a stomach tube can then be passed.

C. Equipment: The following equipment should be available in hospital emergency rooms, in other emergency treatment centers, and in doctors' offices.

*1. Stomach tubes, No. 20 and No. 30, rubber, with at least two through-and-through perforations at the end.
*2. Asepto® irrigating syringe, 4 oz., to fit above stomach tubes.
3. Metal urethral irrigating syringe, 100 ml.
4. Levine tube, No. 12.
5. Endotracheal tubes with inflatable cuffs, sizes for child and adult (see p. 17).
6. Mouth gag.
7. Suction machine, syringe, or aspirating bulb, with tubing and soft rubber catheters, for removing mucus from the pharynx and trachea.
8. Canned milk, six cans (for treatment of poisoning with corrosives and to delay absorption).
9. Canned fruit juice, one 46 oz. can, or small can of concentrated lemon juice (as antidote in alkali poisoning).
10. Universal antidote - Two parts powdered charcoal, one part tannic acid, and one part magnesium oxide.

D. Technic: Speed is essential. Various lavage solutions cannot be recommended because valuable time must be wasted in their preparation.

1. Give the patient a glass of water to drink prior to passing the stomach tube.
2. Lay the patient on his side with his head lower than his waist to prevent fluid from entering the trachea. If the patient struggles, immobilize him in a sheet or blanket.
3. Measure the distance on the tube from the mouth to the epigastrium and mark the tube with an indelible marking pencil or with a piece of adhesive tape.
4. Remove dentures and other foreign objects from the mouth.
5. Open the patient's mouth, using a gag if necessary.
6. Pass the tube over the tongue and toward the back of the throat without extending the head on the neck. The tube will curve down the back wall of the pharynx and enter the esophagus. If the tube meets an obstruction when introduced about half way to the mark, the tube has probably entered the trachea. Sudden aphonia also indicates tracheal intubation. When an obstruction is met before the mark on the tube reaches the

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*These should be carried by all physicians.

level of the teeth, do not use force but simply remove the tube and repeat the procedure until the tube passes readily to the mark indicated.

7. After the tube has entered the stomach, remove the stomach contents by the use of an irrigating syringe with or without siphoning.
8. After the stomach contents have been removed, repeat the introduction and withdrawal of 120 ml. (4 oz.) of water, milk, saline solution, sodium bicarbonate solution, universal antidote suspension, fruit juice, vinegar, milk of magnesia, or other available antidotes at least 20 times. Avoid giving large quantities of water; this might force the stomach contents through the pylorus.

Catharsis:

A. Indications: After gastric lavage or emesis for the removal of ingested poisons from the stomach, rapid catharsis is important for removing not only unabsorbed material from the intestines but also material which has been excreted by the liver or intestines and not yet reabsorbed. Thus, in some types of poisoning, repeated catharsis may be of use.

B. Contraindications:
   1. Corrosives - Administration of cathartic may increase the extent of the intestinal injury.
   2. Irritant cathartics such as the vegetable cathartics (aloes, cascara) should not be used in any type of poisoning.

C. Materials:
   1. Sodium sulfate - The cathartic of choice, since absorption causes no deleterious effects.
   2. Castor oil - Bland until hydrolyzed to an irritant in the intestine. It is useful in phenol poisoning, since phenols are highly soluble in castor oil. Removing the castor oil by saline cathartic may be advisable. Castor oil may be contraindicated in poisoning by some types of fat-soluble substances since it may increase intestinal absorption.

D. Technic:
   1. Following gastric lavage or emesis, give 30 Gm. (1 oz.) of sodium sulfate dissolved in 250 ml. (1 cup) of water. Cathartic effect should follow within 30 minutes to one hour.
   2. In phenol poisoning, give castor oil, 30 to 120 ml. (1 to 4 oz.). Increasing the amount does not increase intestinal irritation since intestinal action begins after hydrolysis of only a small amount.