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Accidental Poisoning in Young Children: Its Causes and Its Prevention

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ABSTRACT—Accidents, burns, drownings, and poisonings are the four most frequent causes of death among children. They far exceed the frequency of death from any of childhood's infectious diseases. With reasonable care, death from poisoning is probably the most amenable to prevention. Accidental poisoning, mainly in preschool children, is discussed from the standpoints of the major toxic hazards found around the usual home, their nature, incidence, location, and prevention.

The accidental swallowing or ingestion of outright toxic or potentially toxic substances by children constitutes one of the major hazards of modern civilization. The existence is a result, in part, of the great complexity and vast array of chemical agents available to the modern family, in part, of the natural inquisitiveness of young children, and, in major part, of the unintentional carelessness of adults in leaving harmful or potentially harmful products within easy and inviting reach of children.

Who

We shall be talking mainly about that segment of our population under 5 years of age—the preschool group. They make up only 8 to 9 per cent of most urban populations, yet they account for 80 to 90 per cent of all cases of accidental ingestion of potentially harmful or toxic substances. At least 500 children under the age of 5 die in the United States each year from various forms of “poisoning.” This places “poisoning” fourth in order of frequency, being exceeded only by accidents, burns, and drownings as a cause of death among children. All four are much more frequent causes of death than any of the infectious diseases.

Accurate figures for the incidence of nonfatal poisoning are not readily available, since many cases are not reported, but the best available information indicates that for each fatal case of poisoning there are somewhere between 500 and 1000 instances, for a grand total approximating a quarter million cases a year, of a child's swal-

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lowing something at least potentially hazardous and causing the parents no small concern. There are few procedures more terrifying to a young child than to be held immobile while a rubber tube is inserted into his stomach for the purpose of gastric lavage or “stomach pumping.”

We will not attempt to describe here the behavior patterns of these age groups that render them so susceptible to “accidental poisoning.” However, it has been found that the children involved are not significantly different either physically or mentally from those children who never swallow substances they shouldn't. Males are involved, however, slightly more often than females.

Incidence of Accidental Poisoning According to Age

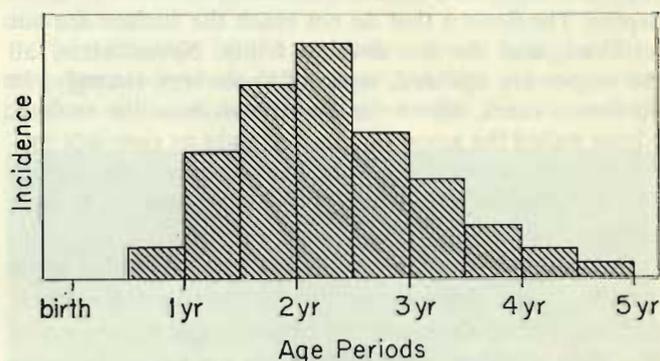


FIGURE 1. Incidence of Accidental Poisoning in Young Children by six-month Periods (Compiled from several sources).

It may be seen readily from Figure 1 that the 2-year old has the highest incidence of ingestion of “poisons,” followed by the 1-year old. The latter is the age group that has learned to pull everything out of the kitchen cupboards and not only play with the contents but put everything in his mouth and “down the hatch.” For this reason, this age group has the highest incidence of cases involving the swallowing of detergents, bleaches, and similar household products. The group having the highest incidence—the 2-year old—gets more involved with medicines, especially aspirin.

Agents Involved

It should be emphasized at the outset that by the word “poison” we mean any substance (drug or chemical,

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alone or in combination) that, when taken in excess, produces manifest toxic or potentially deleterious effects.

For some agents, a few milligrams is an excess while for others many grams are needed before any toxic manifestations are noted. Pesticides, as a group, are a good example of the former while drugs may fit into either category. Table 1 gives the ranges found in the litera-

Table 1. Percentages of Cases and Deaths Attributable to the Major Groups of Toxic or Potentially Toxic Agents (Data from many sources)

Type of Agent	Cases	Deaths
	%	%
Medicines:	48-55	31-44
Internal	(40-45)	
External	(5-10)	
Household products	15-20	10-25
Pesticides	10-12	7-10
Petroleum Products	8-10	20-25
Miscellaneous	5-10	5-10

ture of reported cases (incidents) and of deaths attributable to each of the major types of agents involved in poisoning in young children in and around the home. Figure 2 illustrates the actual per cent of cases by agent type from a study by Dr. Harold Jacobziner (1957) of the New York City Department of Health.

In the category of medicines, the drugs most frequently involved are aspirin, barbiturates and other sleep producing drugs, tranquilizers and antihistaminics, and topical antiseptics such as iodine tincture.

Overdosage with aspirin accounts for almost one fifth of all cases of poisoning from drugs among preschool children. Part of this arises from the all too prevalent misconception that aspirin is "harmless." Although by no means one of the most toxic of drugs, aspirin is far from harmless and has been used successfully for suicidal purposes by adults. For a 1-to-3-year-old child, the swallowing of 10 to 15 adult-size aspirin tablets is almost certain to be fatal if not treated promptly, and even 5 or 6 such tablets could cause alarming symptoms of poisoning.

The introduction of fruit and candy-flavored "children's aspirin" has been another potent factor in the high incidence of poisoning from this drug. They provide the "spoonful of sugar that makes the medicine go down" but also serve to blunt the parent's awareness of the potential danger involved, as well as increasing the child's desire to procure more.

Barbiturates and other sleep-producing drugs such as Glutethimide (Doriden[®]) and Methyprylon (Noludar[®]) are often left carelessly by adults in handbags and dresser drawers where they are within easy reach of the inquisitive 2-year old, and constitute the next most frequent group of hazardous drugs for the young child. Tranquilizers and antihistaminics, although not so potent, produce similar symptoms in overdosage. They all produce progressive depression of the consciousness and in sufficient dosage, produce complete unconsciousness, severe depression of respiration and circulation, and death by respiratory failure. Chocolate flavored laxative tablets con-

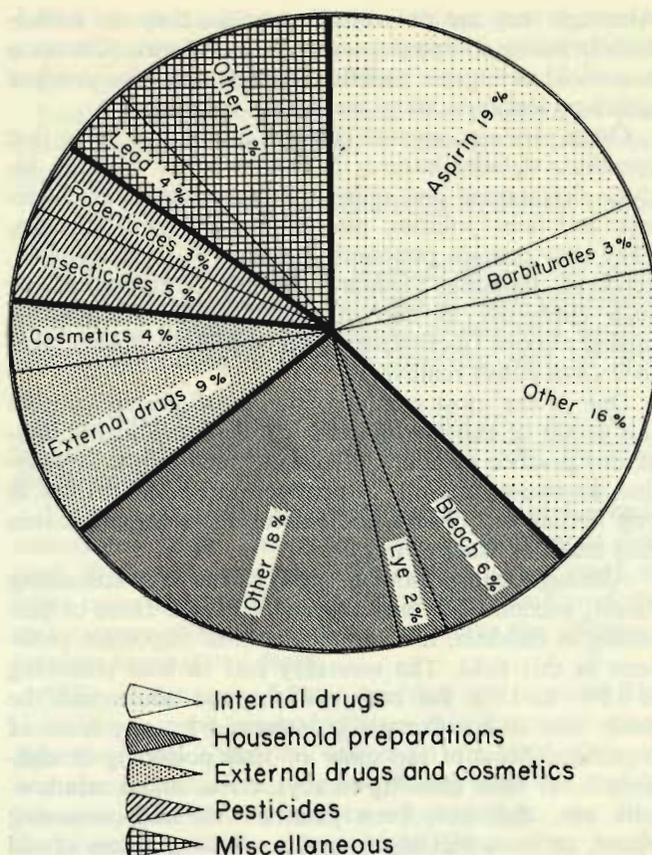


FIGURE 2. Frequency of Poisoning in Children by major Categories of Agents (Modified from Jacobziner, 1957).

taining phenolphthalein are also involved, more than occasionally, in hurried trips to the hospital.

All topical antiseptic preparations, since they are used specifically to prevent bacterial infections by "killing" bacteria, are likely to be hazardous if swallowed by children. In this regard, iodine tincture, which is still one of the most commonly used household antiseptics, is a frequent cause of poisoning. All such substances if swallowed are likely to cause severe irritation of the mouth, throat, stomach, and intestines, with abdominal pain, nausea, vomiting, and diarrhea.

A wide variety of household products used in the kitchen, bathroom, and laundry present varying degrees of hazard and are a common cause of a wild ride to the nearest hospital emergency room and a session of "stomach pumping."

Among the most hazardous products are the strong acids and alkalis such as hydrochloric (muriatic) acid, sulfuric acid (oil of vitriol), oxalic acid, lye, strong ammonia, and drain, sink, and toilet-opening compounds; they are corrosive and produce a violent gastroenteritis with destruction of tissue that may be followed by extensive scar formation and may lead to stricture of the esophagus or pylorus, necessitating subsequent operations.

Hypochlorite-containing bleaches such as Hi-lex[®] and Chlorox[®] are among the household products most frequently encountered in reports of poisonings of children.

Although they are not actually caustic, they are sufficiently irritating to cause a severe gastroenteritis. Common household detergents and liquid soaps may also produce sufficient irritation to cause severe diarrhea.

Other products commonly found around the home that constitute definite hazards if swallowed by children include drycleaning and spot-removing compounds, furniture and floor polishes, and waxes and paint solvents. They may contain petroleum products such as gasoline, kerosene, naphtha, Stoddard solvent, or turpentine, or such chemicals as carbon tetrachloride (Carbona[®]), methyl alcohol (methylated spirit, wood alcohol) or acetone (nail polish remover).

One of the most common sources of poisoning from this group of substances is the careless and highly dangerous practice of adults of placing such things as gasoline, kerosene, fuel oil, turpentine, and paint thinner in pop bottles and glasses and leaving them around within easy reach of "sticky" fingers.

Although lead poisoning, mostly from lead-containing paints, accounts for only about 4% of the cases of poisoning in children, it is one of the most important problems in this field. The mortality rate in lead poisoning is 12% to 15% for both children and adults and the death rate is not materially improved by any form of treatment. Most of the cases of lead poisoning in children occur from chewing on toys, cribs, chairs, windowsills, etc., that have been painted with lead-containing paints, or from picking up and swallowing flakes of old paint that fall off painted plaster walls and ceilings.

In general, paints for interior use do not nowadays contain lead, but many of the cases are associated with old buildings that have been painted and repainted over many years and the offending lead paint may be one of the many undercoats applied many years previously.

Approximately 10% of both poisonings and fatalities are the result of the ingestion of pesticides (Table 1). These include insecticides, rodenticides, herbicides, and fungicides. More than 300 different chemical substances are involved, and since they are used specifically because they are toxic to animal or vegetable life or both, they are among the most toxic substances found around the home.

Among the most toxic chemicals in this group may be mentioned strychnine, nicotine (Black-Leaf 40[®]), cyanide (Cyanogas[®]) and arsenicals such as arsenic trioxide (grasshopper bait), sodium arsenite (brush and weed killer), and sodium arsenate (ant poison).

Many cases of poisoning have been caused by the swallowing of various chlorinated hydrocarbon insecticides such as those containing benzene hexachloride (BHC) and its purified gamma isomer Lindane[®], DDT, chlordane[®], toxaphene[®], and others.

The common moth preventatives, mothballs and mothflakes (naphthalene), and dichloricide (p-dichlorobenzene) have also caused cases of poisoning from being eaten by children.

Among the miscellaneous products commonly found around the home that constitute a hazard if swallowed by the young child are such things as antifreeze (methyl

alcohol or ethylene glycol), shoe polishes (nitrobenzene and organic solvents), permanent wave solutions (ammonium thioglycollate), skin lotions (methyl salicylate, camphor), and depilatories (thioglycollates or sulfides).

At Christmas time, there are always cases involving the swallowing of the fluid in bubbling Christmas tree lights, which contain methylene chloride.

Source of the Poison

Ninety per cent of accidental poisonings in children occur within the home (your home, a neighbor's, grandmother's, etc.). The reported percentages of cases by room within the house is shown in Table 2 from which the following may be noted:

Table 2. Percentage of Cases of Poisoning According to Location within the Home. (Data from many sources)

Location	Cases
	%
Kitchen	30-40
Bedroom	20-25
Bathroom	10-15
Living Room	8-10
Unknown	10-20

1. No room in the house lacks, at least at some time, the agents causing poisoning.

2. The kitchen is the source of the largest number of cases of poisonings of all types including drugs, pesticides, and petroleum products as well as household preparations.

3. There are a surprising number of cases in which the parents or other responsible individuals do not know from where the child has obtained the "poison." This may be related to the "Sunday morning syndrome," which is the group of stomach pumpings that deluge hospitals mid-Sunday morning because the poisoning occurred while the parents were sleeping late.

4. The bathroom is not the source for most of the instances of poisoning, a result, at least in part, of greater precautions being taken with usual bathroom agents (drugs, toiletries, etc). Many of these agents are kept in a medicine cabinet and are somewhat less readily accessible to children.

The locations about the house from which the agents of cases of poisoning are most frequently obtained are shown in Table 3. It can be seen from this table that the

Table 3. Percentage of Cases of Poisoning According to Location within the Room (Data from many sources)

Location	Percentage of Cases
Table tops	25-28
Low cabinets	18-22
Floor	8-10
Medicine cabinet	5-8
Unknown	10-15

great majority of poisonous agents were obtained from low, easy-to-reach sites, such as the tops of dining room or kitchen tables and lower kitchen cabinets. A significant number of these cases are related to temporarily

placed handbags of relatives or friends who are not cognizant of the potential danger of a purse's contents.

It is of interest, though not apparent from Table 2, that improper (nonoriginal) containers play a very significant role in poisonings with agents other than medicines from all locations.

Prevention

The key to the prevention of accidental poisonings is awareness by parents of the potential and actual poisonous substances in their homes and the exercise of care, based on this awareness, in handling such substances. Knowing that anything swallowable may be poisonous if taken in excess for that particular substance, and that medicine is medicine even when it comes in odd-shaped containers or is disguised as chewing gum, lollipops, or candy tablets, would prevent a considerable number of poisoning cases.

To be more specific and to suggest some positive measures that might be taken or remembered to prevent or reduce the chance of an accidental poisoning occurring in the home, the following suggestions are offered, based upon the information presented:

1. Keep all medicines, both for internal and external use, in a high cupboard that can be and is kept locked. Particularly to be avoided are such practices as leaving drugs (aspirin, barbiturates, etc.) in handbags, in kitchen, dining room, and bedroom drawers, or in the bathroom medicine cabinets.

2. It is safest not to use flavored aspirin at all. Children's dosages in unflavored aspirin are readily available. In any case, aspirin should be locked up and out of the reach of children.

3. Detergents, soaps, bleaches, waxes, and polishes should be kept in a high cupboard rather than under the counter or sink. While less convenient for the housewife, such locations can be lifesaving.

4. Keep all chemicals and other potentially dangerous substances in high and inaccessible places, preferably in closed and locked containers, and always in their original and properly marked containers. This applies particularly to such things as dry cleaning agents, paint solvents, thinners and paint and varnish removers, and pesticides. It is a safe rule that anything one would not drink or swallow should not be left around where young children can possibly get into it.

5. Keep all chemicals, medicines, etc., in their original containers. This is very important from the standpoint of identification to facilitate prompt treatment if an accident should occur.

6. Do not leave young children unattended. This may sound too obvious to mention but all too many cases of poisoning occur in that split second while the back is turned, or the attention directed elsewhere, and a potentially dangerous substance is within reach on a low table or the floor.

7. Be especially careful when visiting in relatives' or friends' homes. A strange house is always a challenge to a curious mind. Also, relatives or friends may not be so

careful about keeping hazardous things out of harm's way. With this in mind, make sure that a visitor's handbag is inaccessible to small children.

8. Do not take medications in the presence of preschool children. They are great imitators of adult behavior.

9. Get rid of outdated or unneeded medicines, household products, and pesticides.

While no attempt will be made to discuss the treatment of cases of poisoning from any of these substances, since this is a matter necessitating professional medical care, a few points of first aid treatment may be indicated.

If a child has swallowed any substance known or thought to be potentially hazardous the following steps should be taken:

1. Call a physician and be prepared to take the child immediately to the emergency room of the nearest hospital. While in many cases the danger is not great, in other instances, involving potent poisons, time is of the very essence and a few minutes may make the difference between survival and death.

2. Try to determine what it was that was ingested. The container may be invaluable from this standpoint since ingredients are commonly stated on the label. Observe any characteristic odor on the breath such as that of kerosene, phenol, wintergreen oil, camphor, etc. If a container is available it should be taken along to the doctor or hospital for identification purposes.

3. In the event that medical aid cannot be secured promptly, a general "class" antidote may be given, followed by the induction of vomiting. Milk of magnesia¹⁴ (magnesium oxide) will neutralize acids and lemon juice (citric acid) or diluted vinegar (acetic acid) will neutralize alkalies. The so-called "universal antidote" is somewhat effective against a wide variety of poisons, heavy metals, alkaloids, and acids. It consists of two parts of activated charcoal and one part each of magnesium oxide and tannic acid (strong tea).

Usually, however, it is more effective to attempt to induce vomiting immediately without bothering with an antidote. This may commonly be accomplished by gagging with the finger.

Vomiting should not be induced if the material swallowed is a petroleum product (gasoline, kerosene, fuel oil, etc.) because of the danger of the material being aspirated into the lungs; nor should vomiting be induced if the poison is strychnine or a caustic poison such as lye. These types of poisoning should be treated only by gastric lavage in a hospital.

The bibliography of accidental poisoning in children is very extensive; only a limited number of representative papers is given in the accompanying list of references.

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