

# Hospital Emergency Cases of Poisonings and Other Injuries Caused by Ingestion

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**M**ODERN TECHNOLOGY and human desire are creating a host of products made of new materials or designs, and an innumerable variety of drugs and other substances are being produced and marketed every year. Many such products, particularly drugs and common household items, are subject to voluntary or accidental abuse among certain age groups in all classes of our society. To help control potentially hazardous products and protect consumers from unreasona-

ble risk of injuries, Congress created the National Commission on Product Safety in 1967. The commission has stated that except for annual accident reports from the Department of Health, Education, and Welfare, the supply of adequate epidemiologic data needed for both consumer education and manufacturer orientation is limited. With the recommendation of the commission, efforts have been made by the U.S. Government to generate some of the much-needed information.

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## Background

The division of research and biostatistics, Pennsylvania Department of Health, received a 3-year research grant in 1969 from the Food and Drug Administration, through the National Institutes of Health, to conduct a special in-depth epidemiologic study of accidental injuries associated with consumer products in a tricounty area of south-central Pennsylvania. The specific objectives of the project are (a) to study who is involved and how and under what circumstance such an accident or injury occurs, (b) to identify the product including its defective feature, (c) to evaluate the relative degree to which the consumer and the product are responsible for the accident, (d) to

assess the nature and extent of the injury, and (e) to estimate the magnitude of medical costs as well as economic and social losses caused by such episodes. Medical societies of the three counties (Dauphin, Cumberland, and York) and the Pennsylvania Osteopathic Association endorsed the project and encouraged support by all physicians practicing in the study area.

During the first year of the project, we investigated product-related injuries treated at the emergency departments of six local hospitals: Harrisburg, Polyclinic, Holy Spirit, and Community General Osteopathic Hospitals in Harrisburg; York and Memorial Osteopathic Hospitals in York. The participating hospitals provided medical services for almost the entire population (351,218 as of April 1, 1970) of the 29 communities composing the Greater Harrisburg metropolitan area, the Greater York metropolitan area, and adjacent townships and boroughs.

### Objectives

This report is limited to cases of patients treated at the hospital emergency departments for an overdose of drugs or other forms of poisoning and injuries caused by ingestion. Specific objectives of the analysis were, first, to determine the incidence or frequency of such poisonings or injuries; second, to identify the substances or the products involved; and third, to evaluate possible differences in such incidences according to the sex and age characteristics of the persons affected. Comprehensive data pertaining to all kinds of accidental injuries from a wide variety of consumer products will be analyzed and reported elsewhere.

### Methods

We briefed the medical and paramedical staffs of the six hospital emergency departments on the purpose and methodology of the study and discussed detailed procedures for ascertaining appropriate cases. Six research interviewers were employed and trained specifically for the study. They

were assigned to the hospitals for daily or weekly collection of study data. From a large pool of emergency case records at the hospital, each interviewer was instructed to screen only those cases that met the predetermined criteria on mode of injury (ingestion) and place of residence of the victim. In our study, ingestion was defined simply as "an object or substance being taken by the mouth."

In addition to a comprehensive questionnaire designed to cover injuries caused by all consumer products, a special form was developed and used to record all cases of drug overdose and other injuries caused by ingestion. For each case we recorded the sex, age, and address of the patient as well as the nature of injury and identity of the drug or other substance ingested. An interviewer visited patients under 15 years old at home and ascertained detailed epidemiologic data from an adult member of the household who was familiar with the injury. These interview data are not included in this report.

### Results

During a period of 12 months from September 15, 1969, through September 14, 1970, a total of 1,003 emergency ingestion cases were ascertained for the entire study population. The total incidence rate for the year was 286 per 100,000 population, or approximately 3 per 1,000 persons. This total included 779 (78 percent) cases of poisoning by an overdose of drugs, with an annual rate of 222 per 100,000 population, and 224 (22 percent) cases of nondrug poisoning or injury caused by other objects or substances, with an annual rate of 64 per 100,000 population (table 1). The pattern of drug predominance was even more marked when females (84 percent) were considered separately. Of the total ingestion cases reported, 587 (59 percent) were females and 416 (41 percent) were males. Nearly twice as many females (63 percent) as males (37 percent) were victims of drug overdose. In contrast, more males

**Table 1. Patients treated for ingestion by hospital emergency services, by sex and drug-nondrug classification of case**

Sex	Number of cases			Proportion by case type			Proportion by sex		
	Drug	Nondrug	Total	Drug	Nondrug	Total	Drug	Nondrug	Total
Total.....	779	224	1,003	0.78	0.22	1.00	1.00	1.00	1.00
Male.....	287	129	416	.69	.31	1.00	.37	.58	.41
Female.....	492	95	587	.84	.16	1.00	.63	.42	.59

(58 percent) than females (42 percent) were involved in other types of poisonings or injuries caused by ingestion.

### Drug Poisoning

All the ingested drugs reported either by trade name or generic name were grouped in 11 broad categories, and the frequency of reporting and the incidence ratio were computed for each category. In 88 instances the name of the drug involved was not identified and thus was not classified. The result of the analysis is presented in table 2. The total number of drugs mentioned exceeds the number of persons poisoned because of multiple ingestions in some instances.

*Tranquilizers and sedatives.* This category was most often involved in incidents. The 10 most frequently reported drugs within this category, in order, were phenobarbital (45 times), chlorthalidone hydrochloride or Librium (30 times), glutethimide or Doriden (23 times), diazepam or Valium (21 times), meprobamate or Equanil (10 times), secobarbital or Seconal (10 times), chlorpromazine or Thorazine (nine times), sodium pentobarbital or Nembutal (eight times), oxazepam or Serax (seven times), and methapyrilene or over-the-counter sleeping preparations such as Nytol (six times). There were 24 other specific drugs identified in this category. In some instances, however, the drugs were recorded only as "barbiturate," "tranquilizer," or "sleeping pill."

*Analgesics.* Analgesics were the next most frequently reported group of drugs. By far the most prevalent was aspirin, representing almost 80 percent of the total frequency of 266. Other analgesics involved were propoxyphene or Darvon (18 times), codeine (four times), formulation with oxycodone, for example, Percodan (three times), and buffered analgesic, for example, Vantol (three times). In addition to aspirin, we were able to identify a total of 12 specific names of analgesics.

*Antihistamines and cold medications.* Most of these drugs were not prescribed. Within this category cough syrup was most frequently mentioned and then cold tablets, decongestants, and antihistamines, in order. Some of these drugs were identified as Congespirin, Romilar, Benadryl, Dristan, and Contac. In addition, 10 other specific drugs of this type were mentioned.

*Hallucinogens and opiates, topical medications and antiseptics.* The hallucinogens and opiates found in our study were actually related to 14

**Table 2. Distribution of ingested drugs, by type**

Type of drug ingested	Frequency	Proportion	Incidence in 1 year <sup>1</sup>
All identified drugs <sup>2</sup> . . . . .	815	1.00	232.0
Tranquilizers and sedatives . . . . .	339	.42	96.5
Stimulants . . . . .	18	.02	5.1
Analgesics . . . . .	266	.33	75.7
Hallucinogens and opiates . . . . .	20	.03	5.7
Antibiotics . . . . .	11	.01	3.1
Vitamins and minerals . . . . .	25	.03	7.1
Antihistamines and cold medications . . . . .	51	.06	14.5
Steroids, hormones, birth control preparations . . . . .	23	.03	6.5
Topical medications and antiseptics . . . . .	20	.03	5.7
Diet pills . . . . .	8	.01	2.3
Other medications . . . . .	34	.04	9.7

<sup>1</sup> Per 100,000 population.

<sup>2</sup> Frequency of unidentified drugs reported, 88; incidence in 1 year, 25.1. Frequency of all drugs reported, 903; incidence in 1 year, 257.1. The total number of drugs exceeds that of patients because of multiple ingestions in certain cases.

ingestions of LSD, five of heroin, and one of marijuana. Of the topical medications and antiseptics ingested accidentally, rubbing alcohol, mercurochrome, hydrogen peroxide, camphorated oil, and tincture of iodine were more frequently involved.

*Vitamins and minerals.* These were misused at a ratio of 7 per 100,000 persons per year. These preparations were reported 25 times as being abused, representing 3 percent of the total frequency of the identified drugs in 1 year.

*Miscellaneous drugs.* Other categories of drugs less frequently overdosed and causing acute poisoning were stimulants (mostly amphetamines), with a ratio of 5 per 100,000 persons per year, and steroids, hormones, and birth control pills, with a ratio of 7 per 100,000 persons per year. Antibiotics had a ratio of 3 per 100,000 per year. Diet pills, without specific identity, had a ratio of 2 per 100,000 per year.

All cases of drug overdose were further grouped into prescribed and nonprescribed categories by sex and age group. The results of this analysis are presented in table 3. There were certain sex differences; slightly more females than males were in the prescribed drug category, whereas more males than females were in the nonprescribed drug category. Certain age differences were also noted by prescription status. The proportion of prescribed drug cases as compared with nonprescribed drug cases consistently increased with age of the person affected. Specifically, the

proportion of prescribed drug cases was only 17 percent for infants under 1 year; this proportion reached 28 percent for small children between 1 and 4 years old, 56 percent for children between 5 and 15 years, and 61 percent for those 16 years or older. This pattern generally remained for both males and females.

Of the 779 cases of drug poisoning analyzed, 492 (63 percent) were in females and 287 (37 percent) were in males; this predilection of females was much more pronounced in the prescribed drug category than in the nonprescribed drug category. When both sexes were considered together, 44 percent of all drug cases were in children under 15 years; of these children, by far the larg-

est proportion was in the 1- to 4-year age group. There were certain differences in the age distribution according to the prescription status. Approximately 71 percent of the prescribed drug cases were in adults 16 years or older as compared with only 42 percent of the nonprescribed drug cases in the same age group. A large proportion (51 percent) of all nonprescribed drug cases were, in fact, in children between 1 and 4 years.

Three groups of drugs most frequently reported or of special interest were further analyzed according to the sex and age characteristics of the patients. The result of this analysis is presented in table 4. Of the 339 listings of tranquilizers and sedatives, 289 or 85 percent were related to adults

**Table 3. Distribution of patients, by sex and age, according to prescription status of drugs ingested**

Sex and age group (years)	All drugs		Prescribed drugs		Nonprescribed drugs	
	Number	Proportion	Number	Proportion	Number	Proportion
Males . . . . .	287	1.00	120	0.99	167	1.00
Under 1 . . . . .	3	.01	0	.....	3	.02
1-4 . . . . .	152	.53	40	.33	112	.67
5-15 . . . . .	18	.06	10	.08	8	.05
16 and over . . . . .	114	.40	70	.58	44	.26
Females . . . . .	492	1.00	258	1.00	234	1.00
Under 1 . . . . .	3	.01	1	.00	2	.01
1-4 . . . . .	132	.27	40	.16	92	.39
5-15 . . . . .	36	.07	20	.08	16	.07
16 and over . . . . .	321	.65	197	.76	124	.53
Both sexes . . . . .	779	1.00	378	1.00	401	1.00
Under 1 . . . . .	6	.01	1	.00	5	.01
1-4 . . . . .	284	.36	80	.21	204	.51
5-15 . . . . .	54	.07	30	.08	24	.06
16 and over . . . . .	435	.56	267	.71	168	.42

NOTE: If both prescription and nonprescription drugs were ingested, the case was assigned prescribed drug status.

**Table 4. Distribution of three selected groups of drugs, by sex and age of patient**

Sex and age group (years)	Baby aspirin and aspirin		Tranquilizer and sedative		Hallucinogen and opiate	
	Number	Proportion	Number	Proportion	Number	Proportion
Males . . . . .	82	1.00	76	1.00	13	1.00
Under 1 . . . . .	1	.01	0	.....	0	.....
1-4 . . . . .	57	.70	15	.20	0	.....
5-15 . . . . .	5	.06	7	.09	1	.08
16 and over . . . . .	19	.23	54	.71	12	.92
Females . . . . .	142	.99	263	1.00	7	1.00
Under 1 . . . . .	1	.01	0	.....	0	.....
1-4 . . . . .	66	.46	18	.07	0	.....
5-15 . . . . .	9	.06	10	.04	5	.71
16 and over . . . . .	66	.46	235	.89	2	.29
Both sexes . . . . .	224	1.00	339	1.00	20	1.00
Under 1 . . . . .	2	.01	0	.....	0	.....
1-4 . . . . .	123	.55	33	.10	0	.....
5-15 . . . . .	14	.06	17	.05	6	.30
16 and over . . . . .	85	.38	289	.85	14	.70

NOTE: These figures represent the frequency of drugs ingested rather than the number of patients involved; some patients ingested more than one drug.

16 years or older, and the remaining 50 or 15 percent involved children 15 years or younger. This difference by age was more marked for females than for males. A large proportion (78 percent) of all cases of overdosing with tranquilizers and sedatives involved females, and the remaining small proportion (22 percent) involved males.

Of the 224 poisonings by aspirin and baby aspirin, 139 or 62 percent involved children 15 years or younger. This proportion was much greater for males (77 percent) than for females (54 percent). While relatively more females than males were involved in poisonings with aspirin, the proportion of small children under 5 years was much greater for boys (71 percent) than for girls (47 percent).

Of the 20 times in which hallucinogen or opiate overdose was mentioned, 14 or 70 percent related to those 16 years or older, and the remaining six involved children between 5 and 15 years old. Interestingly, no children under 5 years ingested drugs in this category. In contrast to aspirin and sedatives, acute poisoning by hallucinogen or opiate

was much more prevalent among males (65 percent) than among females (35 percent).

### Nondrug Ingestion

Poisonings and other forms of injury caused by substances or objects other than drugs were classified into five broad categories, and relative proportions and annual incidence rates by such categories were computed. The number of persons affected in this analysis equaled the number of products involved. Specific identities of substances or objects within each category are also listed (table 5).

Poisonings and other injuries caused by nondrug items were further analyzed for sex and age characteristics of the victims. For this analysis, the cases reported were regrouped into three broad categories: toxic chemicals, indigestible objects, and reactions to alcohol or food. The result of this analysis is presented in table 6.

Of the 224 nondrug ingestion cases, 129 or 58 percent were in males, and 95 or 42 percent were in females. This predilection of males was largely

**Table 5. Specific types of 224 nondrug substances or objects ingested and frequency of occurrence**

Substance or object	Frequency <sup>1</sup>	Substance or object	Frequency <sup>1</sup>
Household chemicals . . . . .	109	Solid objects . . . . .	40
Kerosene or gasoline . . . . .	22	Coin . . . . .	20
Liquid cleaner . . . . .	20	Mothball . . . . .	4
Bleach . . . . .	14	Glass bulb . . . . .	3
Lighter fluid . . . . .	10	Pin . . . . .	3
Glue . . . . .	8	Crayon . . . . .	2
Drain cleaner . . . . .	4	Bottle cap . . . . .	1
Room deodorant . . . . .	3	Glass chip (bottle) . . . . .	1
Ammonia . . . . .	3	Pen . . . . .	1
Detergent . . . . .	3	Cigarette . . . . .	1
Gun bluing . . . . .	2	Ballbearing . . . . .	1
Toilet deodorant . . . . .	2	Plastic ball . . . . .	1
Diaper pail deodorant . . . . .	2	Marble . . . . .	1
Dog medicine . . . . .	2	Modeling clay . . . . .	1
Paint . . . . .	2		
Paint remover . . . . .	2	Cosmetics . . . . .	29
Wax . . . . .	2	Perfume . . . . .	8
Motor oil . . . . .	1	Bath soap . . . . .	7
Graphite . . . . .	1	Nail polish remover . . . . .	4
Furniture polish . . . . .	1	Cosmetic . . . . .	3
Spot remover . . . . .	1	Bath oil . . . . .	3
Chlorine . . . . .	1	Cologne . . . . .	1
Antirust solution . . . . .	1	Personal deodorant . . . . .	1
Fabric softener . . . . .	1	Aftershave lotion . . . . .	1
Ink . . . . .	1	Hair dye . . . . .	1
Food and similar items . . . . .	21	Insecticides and pesticides . . . . .	25
Ethanol . . . . .	9	Mouse or rat poison . . . . .	14
Poison berries . . . . .	5	Ant poison . . . . .	9
Food items . . . . .	3	Insecticide . . . . .	2
Candy . . . . .	2		
Mushrooms . . . . .	2		

<sup>1</sup> Incidence in 1 year per 100,000 population: household chemicals 31.0, food and similar items 6.0, solid objects 11.4, cosmetics 8.3, insecticides and pesticides 7.1; total 63.8.

**Table 6. Distribution of nondrug ingestion cases, by broad classifications of substance and sex and age of patient**

Sex and age group (years)	Toxic chemical		Indigestible object		Reaction to alcohol or food		Total	
	Number	Proportion	Number	Proportion	Number	Proportion	Number	Proportion
Males.....	90	0.99	31	1.00	8	1.01	129	1.00
Under 1.....	4	.04	2	.06	0	.....	6	.05
1-4.....	79	.88	22	.71	1	.13	102	.79
5-15.....	4	.04	7	.23	1	.13	12	.09
16 and over..	3	.03	0	.....	6	.75	9	.07
Females.....	71	1.00	15	1.00	9	1.00	95	1.01
Under 1.....	0	.....	3	.20	0	.....	3	.03
1-4.....	63	.89	8	.53	1	.11	72	.76
5-15.....	6	.08	3	.20	1	.11	10	.11
16 and over..	2	.03	1	.07	7	.78	10	.11
Both sexes.....	161	.99	46	1.00	17	1.00	224	1.00
Under 1.....	4	.02	5	.11	0	.....	9	.04
1-4.....	142	.88	30	.65	2	.12	174	.78
5-15.....	10	.06	10	.22	2	.12	22	.10
16 and over..	5	.03	1	.02	13	.76	19	.08

accounted for by the injuries related to toxic chemicals and indigestible objects. There were no significant sex differences in the reactions to alcohol or food.

With respect to age distribution of the victims, it is noteworthy that as large a proportion as 91 percent of all the patients were children 15 years or younger. It is particularly significant that nearly 78 percent of these injuries occurred among children between 1 and 4 years; this age characteristic was present equally for boys and girls. A further analysis of the data indicated that poisonings by toxic chemicals occurred 2 percent of the time among infants under 1 year, 88 percent of the time among children between 1 and 4 years, and 6 percent of the time among children between 5 and 15 years. This age pattern was similar for both sexes.

In contrast to toxic chemicals, injuries caused by swallowing indigestible objects occurred 11 percent of the time among infants under 1 year, 65 percent of the time among children between 1 and 4 years, and 22 percent of the time among children between 5 and 15 years. In general, the pattern of age difference remained for both sexes.

Unlike toxic chemicals or indigestible objects, poisonings or other injuries caused by alcohol or food items were predominantly more frequent among those 16 years or older in both sexes.

### Discussion

Most childhood poisonings in the United States result from the ingestion of toxic substances, solid or liquid, that are commonly used in and around the home. The most frequently reported sub-

stances are medicines. Other toxic or potentially toxic substances often involved are household products such as cosmetics, petroleum products, and pesticides. These products are usually kept in either original or substitute containers and are readily accessible to young children (1).

In our study, poisonings and other forms of injury caused by ingestion of drugs in excessive amounts or by swallowing harmful or obstructive objects and substances represent those that were treated at the emergency departments of the participating hospitals for a period of 1 year. We considered all such cases regardless of the age of the patient. Most incidents occurred accidentally or unintentionally, but some probably resulted from personal volition or drug addiction. The number of similar ingestion cases that might have been treated elsewhere than in hospitals or by physicians in private practice is not known, but the number, particularly of serious cases, is considered to be relatively small because such incidents usually require some kind of emergency treatment that is usually handled at hospitals.

Based on the 1970 census population of the study area, the incidence of drug poisonings and other ingestion injuries brought to hospital emergency services was 286 per 100,000 population, or approximately 3 per 1,000 persons per year. This annual incidence is expected to prevail in urban and suburban communities similar to those studied.

Of all ingestion cases, drug overdose was by far the most frequent form of poisoning, regardless of sex, but it was particularly noticeable among adult females. Some adult patients ingested two or more

types of drugs in combination, and some patients mixed alcohol and drugs. Within the drug overdose cases, tranquilizers, sedatives, and analgesics, particularly aspirin, were most frequently involved. This seems to indicate that, while these drugs are widely used under varied circumstances and intentions, many consumers are either not properly informed of the serious consequences and adverse effects of their abuse or are not capable of rational judgment when precipitating physical and emotional stresses exist, or both. Tranquilizers are frequently prescribed for patients with emotional problems, who are prone to ingest overdoses of those drugs as gestures or true attempts at suicide.

Sedative drugs are used to reduce tension and anxiety, to treat certain psychosomatic disorders, and in many instances to induce sleep by depressing the central nervous system. The barbiturates are by far the largest group of sedatives now being marketed. These drugs vary in duration of action (2), ranging from the very fast acting thiopental to the moderately fast acting pentobarbital and secobarbital to the slow-acting phenobarbital. In our study the slow-acting and moderately fast-acting compounds appeared to be much more frequently involved; some were identified by brand names. Although all barbiturates can be habit forming, the short-acting ones are known to be particularly conducive to habituation since increasingly larger doses are needed to produce the desired effect; thus physical dependence ensues.

The results of our study show that, besides barbiturates, other sedatives or tranquilizers were also frequently abused, including chlorthalidone, glutethimide, and meprobamate, all of which were reported by brand, rather than generic, names. In large doses these drugs produce drowsiness and sleep, and in extreme cases, coma.

It should be noted that while barbiturates are prescribed as hypnotic, sedative, or tranquilizing agents, they are also used medically for high blood pressure, peptic ulcer, spastic colitis, and other psychophysiological disorders (2). Further, barbiturates, if administered in large doses, can become analgesic. Our data on emergency cases did not permit further analysis as to what proportion of the overdose cases were in fact related to these specific medical or emotional conditions nor did we attempt to investigate cases of suicides, if any, attempted by using barbiturates.

Barbiturates are also known to be used in con-

junction with amphetamines to induce sleep after the amphetamine effect has passed. Alternatively, amphetamines may be taken to counteract the side effects from barbiturates. Barbiturates are also likely to be used along with amphetamines in anorectics or appetite depressants in order to control the jitteriness produced by the amphetamines. A number of these anorectics contain both types of compounds. Heroin addicts may also take barbiturates to supplement or substitute for their preferred drug (2). It has been cautioned that death can occur when alcohol intoxication and barbiturate overdose are combined. We did not study the frequency of multiple drug ingestions of these types, but know that most of these drugs are prescribed for adult patients.

We noted that the proportion of prescribed drugs being abused increased with the age of the victim; this increase seems to reflect the tendency towards emotional instability on the part of the adults for whom those drugs are prescribed. All childhood poisonings and other injuries from ingestion by patients under 5 years obviously were accidental. Cases in patients between 5 and 15 years also were mostly accidental in that the victims did not anticipate or were not fully aware of the consequences. The exact circumstance or personal background of potential cases of volitional ingestion was not investigated.

We made no attempt to identify the cases of chronic or acute alcoholism in conjunction with drug overdoses, nor did we evaluate detailed pharmacological effects or dosages of any of the drugs reported. Such evaluation, if possible and completed, would provide important additional information in the field of drug abuse and poisoning.

The relative frequency with which stimulants were reported as being overdosed was much lower than that of sedatives. Within the category of stimulants, amphetamines were by far most frequently involved; these drugs are usually prescribed for controlling appetite and, in some instances for reducing mild depression. Because amphetamines are an active agent in weight control, some adult women who were poisoned may have abused these drugs—originally intended for the treatment of obesity. Amphetamines for treatment of head colds, sinusitis, or hay fever also may have been used to excess in some instances.

Overuse of amphetamines may be practiced by teenagers and young adults who are seeking “kicks,” by those who exert themselves beyond

their physiological limits, or by "binge" abusers who desire to "feel high." It is believed that heavy abusers of amphetamines usually suffer from some form of psychic instability. Such persons often use stimulants to help them deal with problems of living and emotional inadequacies (3). Amphetamines may be ingested by young children who ingest anorectic preparations prescribed for their mothers or other adult females.

Specific drugs identified as hallucinogen or narcotic were related to LSD, heroin, and marijuana. Although the true incidence or prevalence of narcotic addiction in the study area is not known, at least six such addicts per 100,000 persons were brought to the hospitals in 1 year for emergency treatment. Persons addicted to other drugs, such as barbiturates, amphetamines, or both, are assumed to be much greater in number. Some drug addicts, particularly non-narcotic abusers, in the same population may have been treated at the physician's office or elsewhere; the exact number of such cases is not available, however.

Most emergency cases of nondrug ingestion reported involved detergents, other cleaning agents, insecticides, petroleum products, cosmetics, and many other common household products. All the nondrug poisonings and injuries were caused accidentally. Most incidents involved small children between 1 and 4 years. Infants under 12 months were far less frequently involved in this type of poisoning, probably because of their physiological limitations in reaching. It is particularly significant that childhood injury by swallowing coins occurred frequently—at an annual rate of nearly one in every 1,000 children between 1 and 4 years.

## Conclusions

Accidental poisonings or other forms of injury by ingestion are the consequence of a complex interaction among the host, substance or object, and environment. Evidence from other research (4,5) indicates that the presence of hazard per se is necessary but not a sufficient condition for poisoning of children (6), and that there seems to be no consistent relationship between safety precautions and poisonings (7). Nevertheless, "child-resistant" containers of drugs, which have been experimented with in military installations, Veterans Administration hospitals, and the Public Health Service, have reduced the risk of drug poisonings among small children.

Our study was limited to the frequency of drug poisonings and other injuries caused by ingestion, identification of the products involved, and analysis of the age-sex characteristics of the victims. More detailed epidemiologic investigation of possible causes of these accidents and other related variables will be presented in a separate report when suitable control data become available during the third year of the research project.

Recommended community programs for poison control and prevention of other ingestion injuries will be formulated from the final results of our epidemiologic study. It should be recognized that a very substantial proportion of ingestion incidents involve children under 5 years of age, who are exploring their environment as part of the natural process of growth.

The Poison Prevention Packaging Act of 1970 requires "childproof" containers for poisonous household substances. In addition to this measure, an effective action program must go beyond conventional warnings directed generally toward parents and should be based on valid scientific knowledge concerning all three essential components of injury; namely, the hazardous substance, the prone host, and the conducive environment, and patterns of interaction among them.

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**TOKUHATA, GEORGE K. (Pennsylvania Department of Health), and ANDERSON, ROBERT E.: *Hospital emergency cases of poisonings and other injuries caused by ingestion. HSMHA Health Reports, Vol. 86, November 1971, pp. 1042-1050.***

An epidemiologic study of poisonings and other injuries caused by ingestion was conducted in 29 communities of south-central Pennsylvania, with a total population of 351,218 as of 1970. This report covers patients treated at the emergency departments of six participating hospitals serving the entire study area for a period of 1 year. Most incidents occurred accidentally, but some probably resulted from personal volition or drug addiction.

The overall incidence of injury from ingestion was approximately 3 per 1,000 per year. Drug over-

doses were by far most frequently reported, particularly among female adults. Aspirin poisoning was responsible for 56 percent of the incidents among small children under 5 years of age. Within the category of stimulants, amphetamines, a common ingredient in anorectics, were more often abused. Amphetamines also were overused by teenagers and young adults with problems of living and emotional inadequacies. Specific drugs identified as hallucinogenic or narcotic were LSD, heroin, and marijuana. The propor-

tion of prescribed drugs abused increased with age of the victim.

Most emergency cases of non-drug ingestion involved detergents, insecticides, petroleum products, cosmetics, and other common household products. Most of these incidents affected children between 1 and 4 years of age. Injury from swallowing coins occurred at an annual rate of one in every 1,000 children in this age group. The results of a more comprehensive study of injuries attributed to all consumer products will be reported separately.