

TABLE. One Hundred Consecutive Propoxyphene Deaths by Manner of Death, Sex, and Presence of Significant Levels of Other Drugs, Including Ethanol

	Suicide		Accident		Undetermined	
	Male	Female	Male	Female	Male	Female
Pure*	15	31	4	6	5	4
Mixed†	5	14	11	2	2	1
Subtotal	20	45	15	8	7	5
Total	65		23		12	

*Blood concentration of propoxyphene 0.2 mg/dl or higher, no significant concentrations of other drugs or alcohol.

†Blood concentration of propoxyphene 0.2 mg/dl or higher, plus blood ethanol concentration of over 150 mg/dl or other drug with at least one half the minimum fatal concentration.

were overrepresented, 58 to 42 overall and 45 to 20 among certified suicides. Men dominated in the accidental group, commonly having high blood alcohol concentrations at the time of death and a history of drug and alcohol abuse.

Propoxyphene deaths were relatively evenly distributed among the age groups from the last half of the second decade through the sixth, although the fifth decade did account for 30 of the 100. There was no marked age difference among the suicides, accidents, or undetermined groups or between men and women. A small number (eight) of propoxyphene victims whose deaths were judged accidental and who had no other significant detectable drugs, including alcohol, had a lower average age (26 years) than other groups. The average age for other groups was about 40 years regardless of sex, manner of death, or presence of drugs or alcohol.

Thirteen of the 100 victims were black, the remainder white. There were no marked racial differences in manner of death, age, sex, or presence of other drugs.

Blood propoxyphene concentrations were obtained in 51 of the 65 deaths that involved no significant concentration of other drugs or alcohol. The average concentration was 0.8 mg/dl, the range 0.2 mg/dl to 2.7 mg/dl. In the same 65, the 47 liver propoxyphene concentrations averaged 9.8 mg/dl and ranged from 0.8 mg/dl to 33.0 mg/dl. In 37 of the 65, propoxyphene analyses were done on both liver and blood. Twenty of the 35 "mixed" deaths had ethanol as the only other drug present having a possible significant concentration. The mean blood ethanol concentration was 200 mg/dl among the 20. Blood propoxyphene concentrations were available in 19 of the 20, the mean of these was 0.5 mg/dl; liver concentrations were available in 13 with a mean of 1.4 mg/dl. The remaining 15 of these "mixed" deaths with a fatal level of propoxyphene included as other possible significant drugs, salicylates (3), meprobamate (2), phenobarbital, secobarbital, amobarbital, butabarbital, ethchlorvynol, diazepam, amitriptyline, methadone, a possible hydrocarbon, and a combination of isopropyl alcohol, thioridazine, and secobarbital.

Usually the propoxyphene had been prescribed for the eventual victim. Prescription size, when known, ranged from 20 to 240, with 50 to 100 capsules the usual range. The specific commercial preparation of propoxyphene was known in one third of the cases. All but two of the formulations were Darvon or Darvon based, eg, Darvon Compound-65 and Darvon-N100.

Death occurred rapidly in the majority of the victims. Over 50% had been seen alive two hours or less before being found dead. Frequently, the acute collapse and death were witnessed. Approximately 30% were found dead in bed and close approximation of the time between ingestion and death was not possible. The remaining 20% include primarily those living three hours or more and those with unknown time of ingestion or death.

History of depression, previous suicide attempt, statement of suicidal intent, and suicide notes were common but not sufficient to present significant frequency data in a group of this size. Individual reports offered history of various forms of drug abuse in 26 instances, 14 of these being primarily alcohol abuse. Chronic, partially disabling physical problems such as rheumatoid arthritis, pancreatitis, and persistent back and leg injury were noted in 14 victims.

Autopsy served principally to eliminate other causes of death. The lungs were typically congested and edematous, 80% of them weighing 800 gm or more. The average weight was 1,000 gm. Abundant white froth was commonly observed in the respiratory tract. Pink-stained gastric content or other visually detectable evidence of medicinal material in the stomach was noted in approximately 10%. Fatty vacuolization of hepatic cells beyond a trace or "plus-minus" degree was present in approximately 50% of the victims.

DISCUSSION

Recognition of a large and increasing number of propoxyphene deaths in North Carolina lead us to examine several aspects of the apparent problem. These include: (1) diagnostic criteria; (2) increase in case frequency; (3) experience in other parts of the nation; (4) characteristics of population affected; (5) sources of the drug; and (6) popularity and efficacy.

(1) *Diagnostic Criteria.* The individual diagnoses were made deductively from the case histories, from autopsies that yielded no anatomic explanation for death, and from toxicologic analyses that revealed propoxyphene blood levels at least tenfold greater than the therapeutic levels. Our experience indicates a propoxyphene blood level of 0.2 mg/dl is adequate to cause death. This is consistent with the published work of others.^{6,7} We believe it possible that some of our subjects with that level might have survived without the additive effect of alcohol or other drugs.

(2) *Increase in Case Frequency.* The number of deaths associated with poisoning due to drugs or other chemicals is difficult to measure in large population groups in the United States and in the nation as a whole. The paucity of adequate statewide systems for the investigation of suspicious or unnatural deaths, the unavoidable provincialism of otherwise competent county-city investigative systems, and the relative immaturity of forensic medicine in the United States give little and late data on the hazards of many drugs, poisons, and other chemicals.

We have seen an increase from rare cases from 1969 to 1971 to over a score each year from 1972 to 1974.