

Letters to the Editor

Poisoning from Carbofuran

Sir:

In a recent issue of this journal, a case report of fatal poisoning from oral ingestion of carbofuran (Furadan 4F) gives an informative account of the effects of carbamate insecticide on cholinesterase activity in biological body fluids [1]. Where such a study may not be feasible on a routine basis it serves as useful adjunct to scientific hearsay evidence.

I report a case of self-induced fatal acute poisoning from oral ingestion of bendiocarb (Camco Ficam W), a reversible anticholinesterase carbamate insecticide, in a 27-year-old white man of approximately 70 kg body weight who was found dead at his home. He had a short history of depression following the loss of his job as a pesticide operator.

From the scene of death, three virtually empty sachets of bendiocarb together with a pint size (568 mL) beer glass and a tablespoon with evidence of residual wetted white powder were recovered. The sachets had each contained 15 g of wettable powder of 80% w/w bendiocarb; they were clearly marked as harmful and carried details of precautions, first aid and guide to doctors. Bendiocarb is a moderately toxic carbamate insecticide ($LD_{50} > 50$ mg/kg).

Bendiocarb was detected in the blood (40 mg/L) and urine (13.5 mg/L) together with alcohol levels of 2.3 g/L (blood) and 3.15 g/L (urine); there were no other drugs found. The blood bendiocarb concentrations above 1 mg/L are associated with serious toxicity.

The determination of cholinesterase activity was not feasible and it was presumed that in a case of fatal overdose with large quantity of carbamate, spontaneous hydrolysis would be so overwhelmed that significant carbamylation of cholinesterase persists, unlike a more rapid reversal in sublethal carbamate poisoning.

This is supported by the results showing substantial cholinesterase inhibition in the case reported by Ferslew et al. [1] where a comparable amount of carbamate insecticide (345 mL of Furadan 4F mixture or 155 g of carbofuran) was ingested giving a blood concentration of 29.3 mg/L.

At the autopsy the pathological findings were nonspecific with gross pulmonary edema and multiorgan congestion. The stomach was unremarkable with a small amount of granular creamy semi-fluid content.

The mechanism of death was presumed to be excessive uninhibited cholinergic activity causing respiratory arrest. At the inquest a verdict of suicide was recorded.

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References

- [1] Ferslew, K. E., Hagardorn, A. N., and McCormick, W. F., "Poisoning from Oral Ingestion of Carbofuran (Furadan 4F), a Cholinesterase-Inhibiting Carbamate Insecticide, and Its Effects on Cholinesterase Activity in Various Biological Fluids," *Journal of Forensic Sciences*, JFSCA, Vol. 37, No. 1, Jan. 1992, pp. 337-344.

Author's Response

Sir:

Dr. Patel's letter to the editor concerning "Poisoning from Oral Ingestion of Bendiocarb (Camco Ficam W), a Cholinesterase-Inhibiting Carbamate Insecticide" provides beneficial data on a fatal intoxication of another moderately toxic carbamate insecticide. I agree that the individual ingested a clearly lethal amount of bendiocarb, which may have been sufficient to overcome any spontaneous hydrolysis of carbamylated cholinesterase. Though the extent of this inhibition can be assumed based on the amount of pesticide ingested, the determination of cholinesterase activity, especially in other biological fluids outside the vascular compartment, would provide confirmational data as to the cause of death as well as the toxicokinetics of the carbamate involved. The determination of the degree of cholinesterase inhibition may be more critical in situations where supratoxic yet sublethal amounts of low to moderately toxic carbamates are ingested which manifest minimal central nervous system effects due to their lack of penetration across the blood-brain barrier, yet produce sufficient muscarinic and/or nicotinic effects to result in death. It is important with forensic interests not to be overly influenced either by the amount of the pesticide ingested or by clinical references to the lack of significance of cholinesterase inhibition in carbamate intoxications.

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Discussion of H Substance in Urine

Sir:

In the paper on detection of ABH antigens in urine by Chase in Vol. 31, No. 3, July 1986, pp. 881-885, H antigen was not detected in some urine samples from blood group A and B individuals. Recently, Lee *et al.* devised a Two-Dimensional Absorption-Inhibition (2-D A-I) procedure (Vol. 33, No. 5, Sept. 1988, pp. 1127-1138) whose sensitivity was 28-fold greater than the inhibition-titration procedure, and applied it to the detection of unconcentrated urine samples. However, no data and discussion about undetected H antigen were present.

Using the 2-D A-I procedure, we examined 53 urine samples from 53 individuals (Female: 29, Male: 24, Ages: 23-43). The results (Table 1) showed that 75% (24/32) of the urine samples from blood group ASe, BSe and ABSe donors contained no or little H antigen, while all urine samples from blood group OSe donors contained detectable H antigen. It has been reported that two-thirds of the ABH macromolecules excreted into urine are synthesized by the kidney and the remaining one-third could be filtered off from the circulation [1]. In addition to the significant variation in the A:H, B:H and A:B:H ratios among different individuals [2], the A and/or B blood group gene-specific glycosyltransferases from kidney [1] converting H substance into A and/or B substance contributes greatly to the undetected H substance in the urine.

Incidentally, Lee *et al.* expressed on page 1129 that by the inhibition-titration procedure, specimens containing antigen sufficient to remove *half or less* the antibody present would be interpreted as "inconclusive" or as "no antigen detected." Nevertheless, a more

TABLE 1—ABH antigens detected in urine.

Samples	ABO Group	Secretor Status	Antigens Detected
14(3)*	A	S	A
5(1)*	A	S	A, H
7(1)*	B	S	B
2	B	S	B, H
3	AB	S	A, B
1	AB	S	A, B, H
9(2)*	O	S	H
3	A	N.S	NAD**
5	B	N.S	NAD
4	O	N.S	NAD

*The individuals donating the samples are menstruating females.

**No antigen detected.

exact definition of the removal fraction is better. When specimens contain antigen sufficient to inhibit 7/8 or more the antibody present, it is interpreted as "conclusive."

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References

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- [2] Baechtel, F. S., "Secreted Blood Group Substances: Distribution in Semen and Stabilities in Dried Semen Stains," *Journal of Forensic Sciences*, Vol. 30, No. 4, Oct. 1985, pp. 1119–1129.

The Use of Statistical Methods in the Journal of Forensic Sciences

Sir:

Numerical information is fundamental to all sciences, including the forensic disciplines, and necessitates the employment of statistical methods to allow summary and interpretation of data. Critical review of the literature requires that forensic scientists be familiar with basic statistical methods. A lack of basic understanding can severely limit accessibility to the literature.

In order to estimate the use of statistical methods in the forensic science literature, the *Journal of Forensic Sciences*, Vol. 35, Nos. 1 to 6, 1990, were reviewed and the use of statistical methods identified. A total of 105 Main Articles, 26 Technical Notes, 29 Case Reports, and 41 Letters to the Editor were reviewed. The four publication categories along with the proportion of statistical applications included, Papers (46.7%), Technical Notes (26.9%), Case Reports (17.2%), and Letters to the Editor (12.2%). These categories differed significantly in terms of their application of statistical methods ($\chi^2 = 20.6$, $df = 3$, $P < 0.001$). These differences can probably be explained in several ways. For

TABLE 1—The five most frequently occurring statistical methods used in *The Journal of Forensic Sciences* and the percentage of literature available to those knowledgeable in these methods.

Statistical Procedure	Cumulative Percentage of Literature Partially Accessible
None	67.2%
Descriptive Statistics	86.1%
Correlation/Regression	90.6%
Limit of Detection	92.1%
General Probability	96.1%
Chi-square Analysis	97.6%

example, some areas of forensic work not employing numerical data may frequently be published as Case Reports while some Letters to the Editor may be in response to published papers without numerical treatment.

How much statistical understanding is necessary to access the literature? The present review showed a total of 27 different statistical methods being used. The most frequently used method was identified as "descriptive statistics," which included several different procedures in that category. The more methods the reader is familiar with, the more of the literature that is accessible. Table 1 shows the five most commonly observed methods and the cumulative percentage of the literature ($n = 201$ items) that would be accessible. Several of the items included multiple methods so the cumulative percentages really refer to partial accessibility.

The results indicate that 32.8% of the publications in the *Journal of Forensic Sciences* for 1990 use statistical methods of some sort. This result can be compared to other work showing the proportion of statistical methods employed in familiar medical literature including: *New England Journal of Medicine* (48%), *The Lancet* (39%), *British Medical Journal* (35%), *JAMA* (24%), and the *Canadian Medical Association Journal* (19%) [1]. The three most common methods appearing in the medical literature were descriptive statistics, t-tests, and contingency tables (χ^2 analysis) [1]. A method that is becoming more important and useful is confidence intervals [2] and yet it appeared in only three of the *Journal of Forensic Sciences* articles.

Obviously, not all of the forensic science literature can appropriately apply statistical methods, because much of it includes no numerical data. However, where numerical data is an important part of the analysis and provides the basis for conclusions, statistical methods should be employed. Statistics is a powerful and largely underutilized tool that has many applications in the forensic sciences to assist in drawing valid conclusions. In addition, one should consider the use of confidence intervals wherever possible to provide a numerical range as the basis for important conclusions.

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References

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- [2] Feinstein, A. R., "Clinical Biostatistics: A Survey of the Statistical Procedures in General Medical Journals," *Clinical Pharmacology and Therapeutics*, Vol. 15, No. 1, 1974, pp. 97-107.

Police and Their Side Arms

Sir:

Are American police officers truly undergunned? Some agencies, including the Federal Bureau of Investigation seem to think so.

The United States Army criterion for casualty production in combat was derived from the damage caused by a .49 inch diameter shrapnel ball of 167 grains weight having an impact velocity of 400 feet per second. The current standard is 79 Joules (J) (58 ft-lbs) delivered to the victim. This measure of impact velocity with the resulting hitting energy is based on military experience over many decades buttressed by research during and after World War II [1]. The former U.S.S.R. gave their criterion as 238 J or 175 ft-lbs [2].

Most handguns readily available to police officers for use on the job, deliver casualty-producing impacts out to a distance of 50 yards. Table 1 shows values at range of 50 yards.

In view of the fact that most police-aggressor firefights take place at a range of approximately 7 yards, each of the calibers described in Table 1 should be more than adequate for incapacitation of the assailant [3].

Some recorded observations indicate that in too many firefights the alleged criminal shows superior shot placement as against that of the police officer. All agencies should address this as a critical situation. Shot-placement skill may be the weakest aspect of police firearms performance. But it is correctable. The pay-off is clear: improved bullet placement by police officers would decrease the number of police officers who become victims of felonious killings.

A sobering official statistic is that about one-fifth of the handgun deaths suffered by police officers were caused by the assailants shooting them with the officers' own weapon. Perhaps more attention should also be paid, in police firearms qualification, to quick fire at short ranges of up to 7 yards [4].

If one realizes that the .357 magnum bullet travels from muzzle to a target 10 yards away in 0.021 second, it is imperative that police officers be trained with that fact in mind. Greater precision shooting not increased impact energies seems what is needed for our police forces [5].

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TABLE 1—Values at a range of 50 yards.

Source of Energy Value	Impact Energy, J (Ft-lbs)	Overkill
Soviet Standard	238 (175)	xxx
USA Standard	79 (58)	xxx
.45 ACP	506 (372)	6
.357 Magnum	619 (455)	8
.38 Special	401 (295)	5
9 mm Luger	397 (292)	5
.44 Magnum	1020 (750)	13
.44 Special	374 (275)	5
.41 Magnum	843 (620)	11
10 mm Auto Min. Muzzle	691 (508)	9
10 mm Auto Max. Muzzle	840 (618)	10

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- [3] Schmidt, A. K., *Deaths in the Line of Duty*, National Institute of Justice. Reports/SNI 189, January 1985, pp. 6-8.
- [4] FBI Press Release, the Uniform Crime Reporting Program, Federal Bureau of Investigation, Washington, D.C., May 1989.
- [5] N.I.J., *Police Handguns Ammunition: Incapacitation Effects*, Vol. I, Evaluation. Report 100-83, Vol. II: Experimental Data, Report 101-83, U.S. Government Printing Office, Washington, D.C., 1983.