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The Adversary System: Role of the Forensic Toxicologist

It is most interesting to note that toxicology in general has become a very popular and paramount science in the last decade. Stimulated by man's concern with adverse health effects—specifically, drugs and alcohol, air pollution, water pollution, etc.—toxicology has become a common household word, although it continues to be mispronounced and, occasionally, misspelled. Table 1 contains a listing of the many titles that have been given to the author on letters addressed to him at the University and at the Coroner's Office. The ultimate was the receipt of a letter addressed to the "Chief Taxidermist," Allegheny County Coroner's Office!!!

TABLE 1—*Misspelled titles for TOXICOLOGIST.*

Toxirologist	Toxiologist
Coxicologist	Toxologist
Toxsologist	Toxeologist
Tarxologist	Troxologist
Troxicologist	Taxiologist
Taxologist	Tixicologist

Noteworthy, as heavily publicized items that represent stimuli to the general awareness of toxicology, are:

1. The Thalidomide episode.
2. The concern with DDT problems and pesticides in general.
3. Fluoridation of drinking water.
4. Cyclamates and Saccharin.
5. The Coppolino Case (Succinylcholine).
6. The pill (birth control pills).
7. Hexachlorophene (percutaneous absorption).
8. Methadone and Heroin Addiction.
9. Mercury in water and its inclusion in edible fish.
10. Lead pollution.
11. Carbon Monoxide from certain autos and CO pollution of the air in general.
12. The Drug Abuse Problem and emphasis on urinalysis for drugs.
13. Drug deaths.

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These items have all contributed to the national awareness of toxicity, toxicology, and the toxicologist. The majority of these items are related to chronic toxicity as opposed to acute toxicity.

If we consider the various roles that toxicology plays in the total medical, legal, and health areas, a toxicologist is involved with human life from the time of conception and even before, to the time of death, and even after burial in certain cases where exhumation is required.

A toxicologist is not a limited or inhibited scientist in the same sense that a urologist or gynecologist works exclusively below the waist. A toxicologist has, in general, a knowledge of the specialty and then may elect to limit himself within the specialty because of economic, political, or personal reasons.

A forensic toxicologist is generally considered as a scientist with major interest in chemical analyses of materials (physical and biological) and interpretation of his findings. He is generally located in a coroner's office, medical examiner's office, health department, police laboratory, hospital laboratory, or private service laboratory, depending on the specific state, county, or local laws and finances. He is not just the local expert that the district attorney calls upon to testify when he needs him or wants him. Admittedly, he is generally concerned with acute toxicity, though not always, and is called upon to testify in criminal cases generally by the prosecution. He can and does become involved, if only in a consulting capacity, in criminal cases for the defense and civil cases as well.

The Specific Roles

The forensic toxicologist has several roles in the criminal justice system. These roles would be classified under the following general headings:

1. Investigative—(on scene).
2. Preservation of evidence (chain of evidence).
3. Analyses of materials.
4. Reporting and recording of results.
5. Interpretation of toxicological data.
6. Consultation (pathologist, police, attorney).
7. Expression of opinion (oral and written).
8. Expert testimony.
9. Research (methodology, improvement of analytical techniques and procedures).
10. Education.

The Forensic Toxicologist

Before proceeding to a brief consideration of some of these roles, some discussion of the training and qualifications of a toxicologist is merited. Unlike obtaining a degree in medicine and then following this with internship and residency in a specialized area—with the end result of a man being board certified in forensic pathology—a toxicologist may have a B.S., M.S., or Ph.D. degree in any number of areas ranging from various specialties in chemistry to pharmacy, pharmacology, pharmaceutics, and more recently, even toxicology. The remainder of his training comes from the less formal "on the job" or apprentice type training. This is not to say that the university course work or research work that he did is unrelated to toxicology. In most cases, the university experience and training relates well to the training of a toxicologist. If a degree program existed at a university, many of the courses already offered in the department could be applied toward a degree in toxicology.

It should be pointed out that beginning in the early 1960's, degree programs leading to the Master's and Doctor's Degree in Toxicology were begun, and are in existence today. Prior to that time, most toxicologists were toxicologists by official title only, and not because they were awarded an academic degree in toxicology. This does not mean that they are unqualified; on the contrary, they are more qualified because of the great number of years of experience.

I should like to caution, however, about the individual who presents himself as a toxicologist and in actuality, by training or experience, is neither. Example: A young man who has a State title of Chemist I, testifying in a case involving alcohol. In qualifying this individual, he indicates that he has about 4½ years experience. The defense attorney, on examination, asks about this experience and learns that he went to school for 4 years, has a B.A. in Biology, has never had a chemistry course, and has been working in the laboratory for about 4 months.

It should be stressed that a forensic toxicologist is qualified generally because of his training, research, and experience, all of which take time. A trial attorney has a degree, but it is his experience in court that makes him a good trial attorney. He gains this experience by working in a firm that deals with criminal law. A toxicologist has a degree, but it is his training and experience in a forensic toxicology laboratory that makes him a good forensic toxicologist.

Research

The forensic toxicologist must be concerned with improving methods of analyses for many chemicals and drugs. He must occasionally develop a method of analysis for a new drug or a metabolite of a drug. He must be aware of the differences in accuracy and sensitivity of one method as opposed to another. Newer instrumental methods of analyses such as mass spectrometry can increase the detection limits for drugs and increase the speed of analyses. However, many governmental offices can be held up in improving the methods and procedures because of financial limitations. Lawyers, particularly, should keep in mind that politicians are not about to allocate funds for the dead (they can't vote) when monies are needed elsewhere for programs. Research on post mortem chemical changes and concentrations of drugs and chemicals is limited because of funding. What happens to the carbon monoxide concentration in tissue after a body is embalmed and buried for 4 years? This question and others like it may go unanswered for years because research on the subject is lacking. The answer may be important to a specific legal proceeding, but obtaining funds for research in this area is difficult.

Education

The toxicologist has the obligation to provide education on the general subject of forensic toxicology for his professional colleagues and for the general populace in his area. He serves as the expert for local problems dealing with the environment and will find himself on various committees involving lead poisoning, drug abuse, pesticides, alcohol, sports medicine, poison control, and consumer protection. He, in general, can serve his community with toxicity information; and, in this way he educates others.

The forensic toxicologist can provide continuing education for police, laywers, and physicians, and can also be involved with university graduate programs in toxicology.

On Scene Investigation

There are many cases in which the toxicologist should perform "on scene" investigations for the purpose of discovering the cause or source of a toxicant involved in a death.

Because Pittsburgh is heavily industrialized, we have the occasion to do "on scene" investigations involving deaths that may be related to toxic gases, fumes, solvents, etc. This type of investigation by a toxicologist may lead to discovery of criminal negligence. On-scene investigation of specific cases certainly lends strength to the testimony given by a toxicologist in a legal proceeding, although, admittedly, it is not necessary in every fatal auto accident, suicide, or homicide.

We were investigating an abortion death, and received a call from the police to accompany them to a suspect's house where an abortion was in progress. This proved most useful in the subsequent trial because of my personal findings of drugs, "secret abortion oil," surgical equipment, and the abortionist's statements to me.

Preservation of Evidence

The forensic toxicologist is responsible for the proper handling of all evidence of concern to his area in a given case. Proper chain of evidence should be documented with receipts or records indicating the persons responsible for the transfer of materials to be analyzed by him. For example, many drunken driving cases are won or lost, depending upon your point of view, because no one can produce the person who drew the blood sample or can show that the sample belonged to the person being charged with the violation. The analysis of the blood sample is a complete waste of the toxicologist's time in these cases because of poor chain of evidence. If the toxicologist exerts himself and insists on proper documentation of chain of evidence, from the time of blood withdrawal to delivery to his laboratory, before the analysis is performed, a more productive result is obtained. Forms for use in chain of evidence are shown in Figs. 1 and 2. It is, however, still amazing to me that many defense attorneys stipulate to the toxicologist's report and accept it without question.

Analyses of Materials

A major job of the forensic toxicologist is to identify toxicants (chemicals, drugs, poisons), in biological material. This identification is carried out using accepted analytical methods and modern instrumentation which vary from one laboratory to another, depending upon the available equipment in the laboratory.

In many cases today, simple qualitative analysis is not enough for legal purposes. It may be sufficient for death certificate purposes, but for legal purposes, quantitation of the chemical is necessary. In other words, the tissue concentration or blood level is generally determined.

I think that a major role for the forensic toxicologist enters with the determination of the concentration of chemical found. Here he must render an interpretation of the results; his opinion of the significance of a given concentration of antihistamine in the brain tissue of an airplane pilot following a fatal crash, his opinion of the amount of benzene found in the brain of a deceased industrial worker, his opinion of the concentration of alcohol in the blood of a victim that received 14 pints of blood before death, his opinion of the concentration of lead or carbon monoxide, or acetone, or benzene found in the tissues of deceased workers. This interpretation of toxicological findings, either his own or in reviewing the report of another toxicologist, is a unique and special area for the forensic toxicologist.

Reporting and Recording of Results

Proper documentation of the laboratory findings is essential to a properly operated forensic toxicology laboratory. The laboratory work report should be filed after a typed

HOSPITAL NAME

PATIENT'S NAME _____

PATIENT'S ADDRESS _____

_____

DATE: _____

Area was swabbed with aqueous Zephiran. No alcohol was used to swab the area before the blood sample was withdrawn.

TIME OF WITHDRAWAL _____

BLOOD DRAWN BY _____

WITNESSED BY _____

_____

POLICE DEPT. _____

PHYSICIAN INVOLVED _____

Code number for tube containing blood, (only if used). _____

FIG. 1—*Hospital form for documentation of blood sample.*

copy has been supplied to the proper parties. In many laboratories, a lab record book is also kept. In cases where a report is "lost," there is still available a permanent lab book, as well as the lab work report. Reports should indicate date of analyses, as well as by whom they were done, particularly in larger facilities where there may be a dozen or more toxicologists working in the same lab.

Consultation and Opinion

The forensic toxicologist may consult with the pathologist or police in a specific case currently being investigated. It may consist of a simple answer to a simple question, "How much liver do you need for morphine analysis," or "Is 0.18 percent legally drunk?"

Whether or not a forensic toxicologist is consulted by his colleagues reflects their personal opinion of him. I guess this is called evaluation, or his reputation. If the forensic toxicologist develops a reputation of "being good on anesthetic deaths," he generally receives consultations involving such cases. Consultation with a forensic toxicologist should be considered, even if you only want to know if there is a better way to conduct a

ALLEGHENY COUNTY CORONER'S OFFICE

542 Fourth Avenue

Pittsburgh, Pennsylvania

DR. C. L. WINEK

Chief Toxicologist

RECEIPT FOR TOXICOLOGY DEPT.

NAME OF PATIENT _____

Name of Person delivering specimen (s) _____

Hospital or Police Department Name _____

Time and Date of Delivery _____

COMMENTS: (if any) _____

_____

_____

_____

Received by _____

FIG. 2—*Receipt form for chain of evidence.*

specific test, or if you want to be prepared to cross-examine a forensic toxicologist in a case. I recall a case where I was on the witness stand and another forensic toxicologist was feeding handwritten questions to the defense attorney. He did not call him as a witness, but simply held on-the-spot consultations with him in court.

Consultation with a forensic toxicologist is extremely important in a criminal case involving the report of analyses and opinion of another forensic toxicologist. First of all, you learn whether or not the findings and opinion are generally acceptable, or if they are controversial, or completely or partially unacceptable. A trial attorney learns how to cross-examine the forensic toxicologist using the proper type of questioning.

I testified in a case involving a man charged with abortion death. He was alleged to have supplied ergot to a woman who died from taking ergot in attempting abortion. A chemist had testified that he identified ergot in her stomach contents. His report said that a substance similar to ergot was present in the stomach contents. After reviewing his analytical procedure, I testified that he could not possibly identify ergot by the procedure he used. In the words of a Pittsburgh trial attorney, "A toxicologist is a real professional who should give his honest scientific opinion and doesn't have to worry about who gets there first with the most money."

Office of the Coroner
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