CHEMISTRY

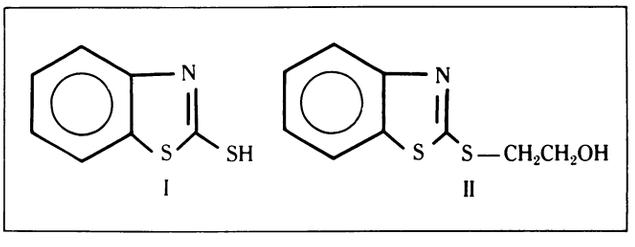
Syringe compound: The great escape

What began as research aimed at developing a routine analytical technique has ended with a startling discovery regarding certain disposable syringes: They can contaminate their contents. "This finding has important implications with respect to the use of these syringes for drug administration and for the collection of blood for drug analysis," report Marisa C. Petersen and Roger L. Nation of The Women's Hospital in Surry Hills, Australia, and John Vine and John J. Ashley of the University of Sydney.

Petersen and colleagues originally had set out to develop a type of blood analysis that uses high-performance liquid chromatography — an assay in which the "unknown" compounds leave a column in specific fractions and activate a detector and recorder to generate a plot with tell-tale peaks. But a large chromatographic peak interfered with their assay when the blood samples were collected with plastic, disposable syringes. Because those peaks were absent when the samples were collected directly into glass containers, the researchers concluded that the "interfering compound ... was not due to endogenous [sample] material or contamination of the reagents used in extraction." Instead, "the compound originated in the disposable syringes used for blood collection."

Petersen therefore set out to identify that mysterious contaminant. The results of the analysis — published in the October JOURNAL OF PHARMACEUTICAL SCIENCES — indicate that the leaching compound is 2-(2-hydroxyethylmercapto) benzothiazole, referred to as "Compound II." Apparently, the source of Compound II was the rubber seal on the plungers of two brands of syringes used in the researchers' experiments: "Monoject," manufactured by Sherwood Medical Industries of Deland, Fla., and "Terumo," manufactured by Terumo Australian Proprietary Limited of Melbourne, Australia. While Compound II is not commonly used in rubber manufacture, it is known to be a reaction product of 2-mercaptobenzothiazole (Compound I), a rubber vulcanization (cross-linking) accelerator, and ethylene oxide, used in this case for sterilization of the syringes.

Although no human toxicity data are reported for Compound II, "the introduction of microgram quantities of even a moderately toxic foreign compound into the body should be recognized and, if possible, avoided," Petersen and co-workers report. The researchers found, for example, that when 10 milliliters of water were allowed to remain in a 20-milliliter syringe for 5 hours, 140 micrograms of Compound II leached into the water. "This may be a cause for concern with obstetric and surgical patients undergoing epidural (located over or upon the outer membrane covering the spinal cord) anesthesia since additional anesthetic solution is often left in a disposable syringe until further pain relief is required several hours later," the Australian researchers report. "When such relief is required, the solution containing accumulated [Compound] II is injected into the epidural space, in close proximity to the cerebrospinal fluid." Compound II also may accumulate in patients such as diabetics who receive chronic medication by injection. Finally, Compound II can interfere with analyses for drug or plasma protein concentrations, for example, in samples of blood.



BIOMEDICINE

CT scan sales snarled by red tape

Federal regulations, not cost, have posed the major obstacle to national distribution of Computed Tomographic Scanners, according to a panel of physicians at the National Institutes of Health. The introduction of CT scanners in the early 1970s was welcomed by a flurry of sales; now, largely due to mandatory "certificate of need" legislation, the number of scanners has plateaued.

CT scanners have been a major factor in decreasing morbidity and mortality, especially in cases of severe head injury and brain abscesses, say the physicians. Legally, CT scanners are viewed as a virtual necessity for large hospitals; D. C. General Hospital in Washington, D. C., with the city's busiest emergency room recently lost a $240,000 malpractice suit for failing to transfer a patient to another hospital with CT scanner capability.

Other major facilities — such as New York's Harlem Hospital, Chicago's Cook County Hospital, and San Juan's Municipal Hospital — are without scanners. Most Veterans Administration hospitals and the majority of the 1,832 short-term hospitals supported by state or local money are also underserved.

The price tag — up to $1 million per machine — is less imposing than the legislation, according to the panel of physicians. In fact, CT scanners actually save money by allowing early diagnosis, providing ambulatory care and replacing many other radiographic procedures. Rather, overzealous health planners and federal regulators are to blame, they say. The "certificate of need" legislation, which requires hospital physicians to gain approval for capital expenditures costs greater than $150,000, discourages many purchases. In Connecticut the legal expenses involved in obtaining the legal certificate represented an estimated 20 percent of the total cost of the scanner. At Yale University Medical Center the hospital had adequate funding — but not federal permission — to purchase a CT scanner.

Increasing number of paternity tests

Allegations of paternity have plagued men from biblical times to modern superstardom. Now, blood tests that achieve 99 percent accuracy are revolutionizing the concept of paternity suits.

Paternity testing, which has doubled in the past three years, will continue to increase as more women seek child support and the federal government becomes more reluctant to subsidize unsupported children, Richard Walker of the American Association of Blood Banks says in the November issue of LAB WORLD.

The first paternity tests, based on red cell ABO grouping, excluded only 15 to 19 percent of alleged fathers; later tests using red blood cell antigens identified 75 percent of "non-fathers."

The newer approach, using Human Leukocyte Antigen (HLA) markers, follows the same basic laws of inheritance as earlier tests: A child must inherit a gene that determines the antigens from each parent, and this child will have only those antigens present in the parents. By identifying these antigens and then determining their frequency in the general population, paternity can be excluded (SN: 11/29/80, p. 348). Red cells have relatively fewer antigens and, hence, a larger number of similar haplotypes among the population; in contrast, white cells have more than 60 HLA antigens, and similar haplotypes in the general population are extremely rare.

The testing is enabling children born out of wedlock to become eligible to claim their fathers' benefits from Social Security, veteran's compensation and insurance. "This type of test will take us closer to the time when there need no longer be disputes concerning paternity, because test results will be so accurate that true fathers will be more likely to settle out of court than fight a losing battle," predicts Walker.