

Arsenic: Poison turned carcinogen

Still reeling from the barrage of criticism they have faced since the news broke of vinyl chloride-related cancers (see p. 154), two large U.S. chemical firms are beating the critics to the petition in a new area. Dow and Allied chemical companies submitted, and the Government last week released, studies on the cancer danger of exposure to inorganic arsenic, a widely used industrial chemical. As many as 1.5 million American workers and countless consumers are exposed to the carcinogen, the Occupational Safety and Health Administration (OSHA) estimates.

Although arsenic compounds have been suspected for decades to be a cause of human skin cancer, routine industrial health measures presumably protected workers from that danger and the highly toxic effects of arsenic ingestion. But monitoring of death certificates turned up a pattern of suspiciously high cancer rates among arsenic workers, so Dow and Allied contracted independent studies.

The Dow study shows that among former workers in a Midland, Mich., arsenic plant (closed since 1956), about a third of the 178 workers exposed during the plants' 32-year operation have died of cancer. The Allied study reports that of 27 workers who died during the last 13 years after exposure in a small Allied arsenic plant in Baltimore, 19 died from cancer. Lung and lymphatic cancer rates were found to be six and seven times higher than expected for male workers.

An Allied spokesman emphasizes that the Baltimore plant recently changed its arsenic manufacturing process to cut down on worker exposure, and that only long-term fairly high-level exposures are implicated.

Arsenic compounds are used in the manufacture of metal alloys, ceramics, dyes, drugs and glass; in garden and farm pesticides; as a defoliant during cotton harvesting; as a growth stimulant for livestock and poultry; as a wood treatment to prevent rot, and for the control of sludge in lubricating oils.

OSHA will conduct hearings later this month on tightening arsenic exposure standards from their present level of 0.5 milligrams per cubic meter to the proposed 0.05 milligrams per cubic meter. Dow and Allied are supporting the change, but several other firms have objected (before this latest evidence).

Setting minimum exposure levels is often difficult without solid scientific data on the health effects from low-level exposures. William Lloyd, director of the occupational health surveillance office of the National Institute of Occupational Safety and Health, says the 0.05 milligram standard would "defi-

nately reduce the incidence of disease." But Lloyd says the institute will reassess the proposed standard in light of the new evidence to decide whether to recommend an even stricter standard.

Allied spokesman Norman Harington told SCIENCE NEWS the company has contracted for additional independent epidemiological studies on threshold levels and dose effects to help set meaningful exposure standards.

One OSHA administrator says he is worried about consumer exposure to arsenic in home and garden pesticides and in commercial poultry and swine. Research is needed on arsenic compounds in the food chain, he says. Food and Drug Administration poultry science division chief Paul D. Lepore says that although inorganic arsenic is used to make feedstock growth-promoting drugs, the drugs themselves are organic arsenicals that have been thoroughly tested on animals and "have been shown not to be carcinogenic."

If the Dow and Allied studies have a bright side, it is that a controversy of many years duration has ended. Until now, there has been no proof that inorganic arsenic is carcinogenic in man. The proof is now strong. □

Animal virus used on cancer patients

It has been close to a century since scientists have been trying to prove that cancer is caused by a virus. The proof is in for some animal cancers, but not yet with human cancers. However, working on the premise that animal cancer viruses share characteristics with putative human cancer viruses, scientists in Texas, Maryland and Tennessee have accomplished something new. They have used an animal cancer virus to immunize cancer patients.

Their results, published in the August JOURNAL OF THE NATIONAL CANCER INSTITUTE, showed what the investigators hoped to show: Immunizing cancer patients with an animal cancer virus definitely makes them respond immunologically to such a virus. They now hope to conduct more experiments to see whether such immunization might also help patients overcome their cancer, presumably by activating immunity against a causative cancer virus.

The investigators are E. M. Hersch, J. U. Gutterman, G. Mavligit, C. R. Gschwind and E. J. Freireich of the University of Texas and M. D. Anderson Hospital and Tumor Institute in Houston; P. H. Levine and E. J. Plata of the National Cancer Institute; and M. G. Hanna Jr. and M. Yurconic Jr.

of the Oak Ridge National Laboratory.

Twenty patients with advanced cancer were immunized with a killed Rauscher leukemia virus. This is a virus that causes leukemia in mice. Antibodies against this virus had already been shown to react with antigens on human leukemia cells, suggesting that human leukemia might be caused by a related virus. The patients were immunized with the virus every two weeks for eight weeks.

As a result of the immunization, two-thirds of the patients developed cellular immunity specifically against the virus. Responses did not differ significantly among patients with different types of tumors or receiving different types of therapy. The data suggest that patients with metastatic (growing) cancer or with acute leukemia can make cellular immune responses against cancer viruses.

Half the patients also developed antibodies specifically against the cancer virus. Antibody responses were most vigorous in patients with melanoma (a malignant tumor containing dark pigment) and in patients receiving chemotherapy plus BCG (bacillus Calmette Guerin). BCG has been found to assist patients in cancer regression, presumably by generally priming their immune systems (SN: 6/23/73, p. 408). Antibodies against the cancer virus were least pronounced in those patients with other kinds of solid tumors than melanoma or with acute leukemia, and in those receiving drugs without BCG.

Although all the patients had advanced cancer, some of them are still experiencing cancer remissions. The investigators believe that the remissions are due to chemotherapy and BCG, rather than to cancer virus immunization. However, they hope that animal cancer virus immunization can eventually be used, along with other therapy, to boost cancer remissions in patients. First they want more assurance that cancer virus immunization counters human tumors. They are now trying to see whether human antibodies to Rauscher virus, or to primate cancer viruses, will kill human tumor cells. If the antibodies will, then animal cancer virus immunization indeed looks promising as a means of successfully counteracting cancer.

As might be expected, the investigators thought long and hard before they gave a known cancer virus to people. But they took precautions, such as killing the virus and performing their experiments only on advanced cancer patients. The patients were also well informed of the possible hazards of such an experiment, and gave their consent to participate. The scientists were happy to find that immunizing the patients with a cancer virus produced no undesirable side effects and so are