

MEDICINE

Cancer and the Environment

Some answers to cancer causes lie in long-term experiments aimed at establishing scientifically the part environment plays, Faye Marley reports.

► IS A CITY TRAFFIC POLICEMAN who breathes automobile exhaust fumes all day running a greater risk of cancer than a farmer overexposed to the sun's rays in a Kansas wheat field? Or does the habitual cigarette smoker run a greater risk of malignant disease than the uranium mine worker?

Experiments aimed at answering these and many other questions related to the sum of environmental causes of cancer and other diseases are going on all over this country and in many parts of the world.

Preliminary studies of possible lung cancer in Philadelphia traffic policemen have shown that the policemen have the highest levels of lead in blood and urine among city and suburban dwellers and workers.

For the first time experiments in California have shown that mice infected by influenza virus and then exposed to ozonized gasoline fumes, by inhalation alone, developed cancer similar to the human type twice as frequently as those which did not inhale the air pollutant. Dr. Paul Kotin of the University of Southern California School of Medicine, who reported this study with his co-workers, said the ozonized gasoline fumes were comparable to certain types of polluted air.

One of the major research projects on air pollution is underway in Los Angeles, Burbank and Azusa, Calif., and work in a fourth nearby location will start in the summer of 1962 on the Hollywood Freeway.

Effects Studied in Animals

Dr. L. Otis Emik of the U.S. Public Health Service's air pollution division told SCIENCE SERVICE that this and a similar large-scale animal study in Detroit will give scientists an opportunity to observe in mice, rats, guinea pigs and rabbits the effects of the same contaminated air that people breathe. Additional studies will involve human subjects exposed to conditions similar to those for the animals.

Automatic electronic instruments are being used to measure continuously carbon monoxide, total hydrocarbons, oxides of nitrogen, total oxidants (substances that readily release oxygen), sulfur dioxide and inorganic particles.

These gases are being monitored in eight major cities in this country, including Los Angeles and Detroit, where a continuous program is sponsored by the Public Health Service. The other cities are Chicago, Cincinnati, New Orleans, Philadelphia, San Francisco and Washington, D.C.

More than 8,000 cases of occupational cancer have definitely been reported since cancer of the scrotum was associated with

the soot of chimney sweeping in London in 1795 by Sir Percival Pott.

As far back as 1879 occupational lung cancer was reported in uranium mines in Czechoslovakia. More than 50% of all deaths in these mines were reported due to the presence of radioactive gas (radon daughters) in the air inhaled by miners.

Uranium mining has grown with the impetus of gold rush days in this country as profit-seeking amateurs with Geiger counters have trekked west in the past few years. They, like many profit-seekers, neglected to take health into account.

Last year the Public Health Service warned that lung cancer, heart disease, accidents and radiation exposure were among serious hazards in the nearly 1,000 underground uranium mines in the western United States.

As recently as 1959, examinations of 1,802 samples of the mine atmosphere showed that more than 66% of the samples had concentrations one to ten times greater than the safe level. These studies involved 371 underground mines with 3,619 miners.

The Federal Government is powerless to

control much of the occupational hazards, but states, cities and communities may obtain national help.

The California State Department of Health is now trying to find out whether living in Los Angeles and other heavily polluted cities carries a special risk of lung cancer. With aid from the National Cancer Institute of the National Institutes of Health and the American Cancer Society, the health department obtained health histories from more than 100,000 persons several years ago. It will probably take another two years before final results are known.

A project for studying the geographic distribution of cancer as related to environmental factors in Washington County, Maryland, is now underway.

Radioactivity Link Studied

Geologists, chemists, physicists and soil scientists are pooling their talents with medical men to find out whether a disproportionate number of cancer fatalities in certain parts of the county is influenced by the radioactivity in the rock or soil.

The study is based on cancer death records that go as far back as 1898.

In a preliminary report, Pope A. Lawrence and Dr. William Y. Chen, working under the National Cancer Institute, praised the work of Dr. Ross Cameron, Maryland deputy state health officer and county health officer for Washington County, in starting the Environmental Cancer Field Research Project in Hagerstown, Md.

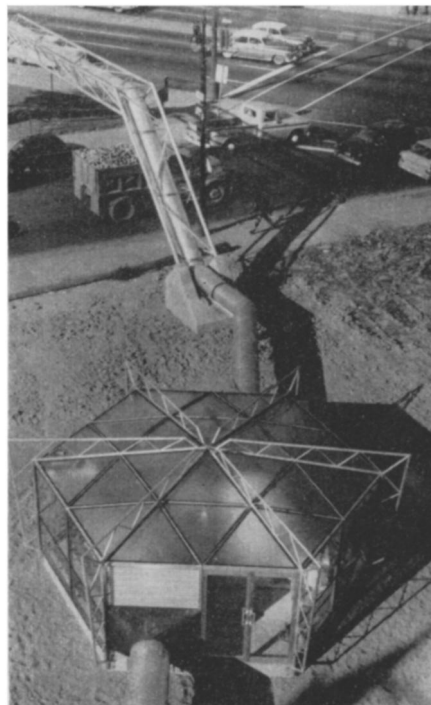
Based on Dr. Cameron's study of the cancer death records, a unique field research laboratory has been staffed and equipped by the National Cancer Institute. The Coffman Research Center was built by a local philanthropist.

Cigarette smoking as a cause of lung cancer has been implicated in research reported under grants by the American Cancer Society and substantiated by the American Medical Association and others. However, scientists connected with the tobacco industry maintain that insufficient research has been done to show cause and effect.

Comparative studies in English cities where the burning of coal causes larger amounts of benzpyrene than occur in New Zealand and South Africa have indicated that the early exposure of males, especially to the benzpyrene, has contributed more than the smoking of cigarettes to lung cancer.

Lung cancer has been shown to be greater in U.S. cities than in rural areas. Coal is burned in the United States less frequently than in the United Kingdom. The culprit may be auto exhaust, in which nine cancer causes have been found.

Occupational skin cancer has come most often from exposure to hydrocarbon materials from three main sources: coal products such as tars and distillates; mineral oils and



STREET AIR—A duct siphons samples of air from a Detroit street to a laboratory in which about 2,500 animals are being tested for the effects of filtered and impure air.

their products; and the products of incomplete combustion of carbonaceous materials.

In all of these the cancer causes presumably belong to the general family of polynuclear hydrocarbons, of which the prototype 3,4-benzopyrene was identified in coal tar.

The ultraviolet light of the sun has caused skin cancer in farmers in certain geographical locations. X-rays in radiologists and arsenic in insecticide manufacture have been responsible for occupational skin cancer. Osteosarcoma is the dominant tumor found in radium dial painters.

Dr. Norton Nelson of the Institute of Industrial Medicine, New York University Medical Center, New York, says the association of lung cancer with chromium chemical manufacture now is well established. Experimentally, bronchogenic lung cancer from inhaled chromium has been reported. Both the refining of nickel and the manufacture of isopropyl alcohol have been linked with increased incidence of cancer of the respiratory tract, especially of

the sinuses.

More than 1,400 bladder cancers of occupational origin have been reported. Aniline was originally blamed and bladder cancers were dubbed aniline cancer, but a fairly narrow group of analogous compounds having similar properties to this poisonous liquid, used in making dyes, now appear to be the cause. Betanaphthylamine, benzidine and 4-aminodiphenyl have been implicated.

Control within industry is making large strides, ranging from rigid protective measures to abandoning the manufacturing process. However, all hazards are not under control.

Nuclear testing in the atmosphere and underground has added a whole new group of environmental causes of cancer for study. This man-made radiation, because of its special scope, has not been included in this discussion of the more common environmental problems.

• Science News Letter, 81:154 March 10, 1962

PHYSICS

Potassium "Whiskers"

See Front Cover

► THE FIRST STUDIES of tiny, single-crystal potassium "whiskers" by the electrons produced from the metal under strong electric fields as seen under powerful microscopes were explained to this year's winners of the Science Talent Search at the National Bureau of Standards.

It was previously thought that this type of metal was unsuitable for field emission studies because of its lack of physical strength.

The group was told by R. L. Parker and S. C. Hardy of NBS that the vapor-grown, single-crystal whiskers of potassium are actually extremely strong because of the lack of imperfections found in larger crystals and masses of the metal.

The whiskers are often less than two millionths of an inch in diameter and eight ten-thousandths of an inch long, the researchers explained. With the field emission microscope, the tips are magnified one million times so their growth can be studied.

Results of this study produced an interesting sensitivity of the process to visible light. Interpretation of the effects of light is not yet clear and the future scientists visiting the laboratory might get a crack at the solution in the future.

In addition to the crystal growth work, the Talent Search winners were shown advanced work in other areas of the physical sciences, including computer development, gas chromatography and radiation physics.

Dr. Bruce Steiner of the atomic physics section is seen on this week's cover, right, with some of the young scientists as he explains a high vacuum system for the determination of the interaction of hydrogen atoms and molecules with various particles.

The visit to the Bureau took place during a week of meetings with top-level scientists in the Nation's capital instead of the students' usual classes.

With the blessings of parents and teachers, the 40 winners left home for a tour of Government research laboratories as part of the program of the Science Talent Institute, Feb. 28 through March 5.

A full schedule was arranged by SCIENCE SERVICE, sponsors of the Institute. From the time of arrival these talented youths were busy with interviews, trips, luncheons and dinners with many of the best scientists in the country.

One of the highlights of the trip was the formal Awards Banquet, with the distribution of \$34,250 in Westinghouse Science Scholarships and Awards, Monday night, March 5.

The student-scientists also toured the Smithsonian Institution, National Gallery of Art, and Capitol Hill, as well as the National Bureau of Standards and the U.S. Armed Forces Institute of Pathology at Walter Reed Army Medical Center.

During their prime time the youths visited noted scientists in their laboratories in many Government research agencies.

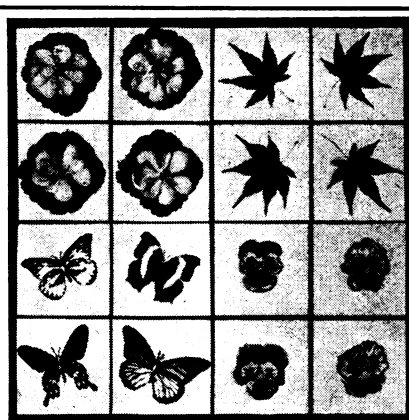
The National Institutes of Health, the U.S. Patent Office, Johns Hopkins laboratories, the Atomic Energy Commission, the National Aeronautics and Space Administration and many other important organizations opened their doors to the future scientists, with small group interviews planned.

The students were chosen during the annual Science Talent Search, conducted by Science Clubs of America, an activity of SCIENCE SERVICE, and supported by the Westinghouse Educational Foundation.

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