1962, at Düsseldorf, Germany. It is scheduled to be published in Staub in October 1962.

One of the best documented facts in the whole complex field of air pollution is that it can, in certain circumstances, result in acute illness and sudden death. Everyone knows about the disasters in Belgium's Meuse Valley, in Donora, Pa., and in London. Continuing research is uncovering other such episodes, long after they have occurred. In the United States we plan to continue our search for further evidence from the past. We hope to develop eventually a warning system that will predict the weather and other conditions which made possible such abnormally high concentrations of air pollutants and thereby mitigate, or even eliminate, future air pollution disasters.

Nevertheless, although more Americans than ever before are doing research today in air pollution, an increasing proportion of this effort is devoted to the long-term effects of exposure to low pollutant levels.

Our approaches to the determination of chronic effects of pollution have been of two major kinds: (*a*) the repeated laboratory exposure of human and animal subjects to specific pollutants or mixtures; and (*b*) the epidemiologic approach, using the community as a field laboratory.

LABORATORY RESEARCH

In pursuing the first kind of research, the Division of Air Pollution, Public Health Service, has encouraged attempts to develop techniques capable of measuring minute changes in physiology to supplement new knowledge of pollutant concentrations at levels which cause marked pathological variations or death. Accordingly, we have recently undertaken studies of physiological and metabolic activities. Unfortunately, because of lack of knowledge about the physiological effects of pollutants, the choice of metabolic activity to be studied must often be based on trial and error. In some cases, a chance observation by other investigators, discovered in a search of the literature or through personal communication, offers a clue which seems worth pursuing. In one such instance, because of the similarity of certain toxiocological effects of ozone to those produced by ionizing radiation, our researchers are following, in rats exposed to ozone, the urinary excretion pattern of creatine and creatinine, known to be affected by radiation. Possible alterations in protein and purine metabolism after exposure to various pollutants are being sought by analyses of the urinary excretion of uric acid and amino acid nitrogen. Measurements of oxygen consumption, also in progress, may yield useful information during long-term inhalation exposures. These approaches are then coupled with studies of pulmonary function for comparison with human disease states.

The following examples illustrate some of the various approaches in the study of the long-term effects of air pollution on animals and man. In a study using classic laboratory techniques, repeated inhalation of ozone at a concentration of 1 ppm (2.6 mg./m.^{3}), only slightly greater than that existing in some urban atmospheres, produced chronic bronchitis and bronchiolitis in small animals (*1*). The smaller bronchioles were partly occluded by hyperplastic or sloughed epithelium mixed with acute inflammatory exludate in guinea pigs which survived the experiments and were sacrified at the end of more than 400 days of exposure. The bronchiolar walls displayed fibrosis extending into the alveolar ducts and alveoli. A mild degree of emphysema was considered to be secondary to the bronchial occlusion. The changes were less marked in rats and hamsters and inconsistent in three mice examined. No evidence of intrapulmonary injury was detected in two dogs whose lungs were examined microscopically, but the trachea and major bronchi showed slight epithelial injury. Rats and guinea pigs which died during the course of exposure exibited massive pneumonia; slight fibrosis was noted as early as the 25th day of exposure.

Groups of 9-month-old rats were exposed continuously up to 2 years to 1, 2, 4, 8, 16, and 32 ppm of sulfur dioxide to determine the long-term effects as manifested by survival, hematological response, and clinical symptoms (*2*).

Exposed rats exhibited changes in skin, fur, and conjunctiva and respiratory distress of increasing severity with increasing concentrations of the gas. A marked difference in the death rate of the group exposed to the 32 ppm concentration (84 mg./m.^{3}) was observed, as compared with controls, and groups exposed to lesser concentrations of sulfur dioxide also began to die before the control group. All control animals survived the first 9 months. By 18 months and until the end of the experiment, the survival rate of rats at all exposures to SO_2 except 32 ppm was similar but distinctly different from that of control