was made on eight infected rats. In one of the rats, seven living larvae were found in this region. All were about 0.2 mm long, or only slightly larger than the size (approximately 0.17 mm) Philpot reported for recently hatched larvae, and within the range of sizes of larvae found on the body surface. In another rat, one small larva and three gravid females, the latter probably moving to the outside, were found in this region. These findings suggest that retrofection does occur in the life cycle of *S. obvelata*. It is possible such infection occurs in many oxyurids. It would explain the massive infections sometimes found, for example, in reptiles.

In summary, gravid females of *S. obvelata* migrate from the anus of the host; eggs are deposited, either by being laid or by rupture of the body of the female worm, on the skin of the anal region; here the eggs become fully embryonated and at least many of them hatch; recently hatched, living larvae have been recovered not only on the body surface of the anal region but also in the posterior portion of the large intestine. These findings indicate that infection with *S. obvelata* can occur by larvae entering the anus, that is by retrofection, as recently described for *Enterobius vermicularis*. Infection by mouth by licking infective eggs or larvae from the skin probably also occurs and must be the method whereby young rats acquire infection from an infected mother.

References

1. DESCHIÈNS, R. *Bull. Soc. path. Exot.*, 1944, **37**, 310.
2. LAWLER, H. J. *J. Parasitol.*, 1939, **25**, 442.
3. PHILPOT, F. *J. Helminth.*, 1924, **2**, 239.
4. RILEY, W. A. *J. Parasitol.*, 1920, **6**, 89.
5. SCHÜFFNER, W. and SWELLENGREBEL, N. H. *J. Parasitol.*, 1949, **35**, 138.

Comments and Communications

The Donora Episode

One year ago 20 persons lost their lives at Donora, Pennsylvania, in America's first mass killing from industrial air pollution. Now the U. S. Public Health Service has released a preliminary report on its year-long study of the Donora tragedy. This represents the Public Health Service's first foray into the field of community air pollution. Two years ago they were not even interested in making a small grant to help studies already well along in opening up this health field. Today they suddenly find the field so important that they quickly request $750,000 from Congress to enlarge upon their studies! Just what did their year's work, with a staff of 25 investigators, show?

They found that 42.7% of the people living in the Donora-Webster area were affected in the poison smog of a year ago. The quick survey made by local Donora workers at our request soon after the tragedy showed 43.2%. They found—as did we—that the percentage affected rose rapidly with age, was greatest at higher levels than down along the river, and was highest across the river in Webster. They found in the valley air the same irritants to the respiratory tract that were pointed out in our December report, but they found no dangerous concentrations and hence were unable to identify the killing agent.

The most valuable part of their year's work—analysis of poison output from the steel and zinc plant stacks—remains unused and unevaluated in their written report. They spent months analyzing the valley air for poisons, but failed to calculate the concentrations probably present during the killing smog a year ago, when an inversion blanket clamped a lid down over the valley's unfortunate people. Had they made such calculation, they would have found that even one day's accumulation of the very irritating red oxides of nitrogen from the acid plant stacks would have caused concentrations almost as high as had been set as the maximum allowable for safety of factory workers exposed only for an 8-hour work day. At the end of 4 days of last year's blanketing smog, concentrations reached were probably more than four times higher than the 10 milligrams per cubic meter of air listed as the upper limit of safety! And the Donora people breathed the poisoned air not 8 hours a day but for 4 whole days. *More than 4 tons* of this poison gas were poured out into the valley air every day during the April test period, even though the brownish-red plumes from the acid plant stacks were then very much less dense than those commonly seen up to the time of the October tragedy.

Stack output of zinc and the sulfur oxides were also found much too high for safety under smog conditions, while the amounts of carbon monoxide emitted were enormous. Because accumulation in the valley air of all carbon monoxide emitted over a 4-day period would probably have been fatal to the whole population, and because no signs of carbon monoxide poisoning were evident in Donora at any time, the Public Health Service investigators concluded that it would be unjustifiable to clamp a hypothetical lid down over the valley. This was a serious error on their part, for their own report (meteorology section) showed a gentle southward drift of the valley air throughout the critical part of the October smog period. Ninety percent of the carbon monoxide arose from blast furnace stacks located at the extreme southern end of the town and was thus carried away from the Donora residents. This gentle southward air movement also accounted for the same high illness rate throughout all parts of Donora as prevailed in its northern edge alongside the zinc plant.

There are now available up-to-date methods of cleansing such stack gases of harmful materials and the burning of the carbon monoxide on to carbon dioxide should be considered as a fuel-saving measure in plant economy. The operators of the Donora zinc smelter and sulfuric acid

plant should have taken warning at the time of the Belgian disaster of 1930, when 60 persons lost their lives and many thousands were made ill under conditions almost identical with those at Donora. Yet, almost two decades later, the outmoded smelter at Donora was still operating as it and its Belgian counterpart were doing in 1930. Let us hope that the Donora tragedy may prove such an object lesson in air pollution dangers that no industrial plant will feel safe in the future in pouring aloft dangerous amounts of poisonous materials. Furthermore, safety standards to be set up should be those that will give safety under the most adverse weather or smog conditions.

The U. S. Public Health Service investigation of animal deaths in the surrounding countryside was merely cursory, and the report fails to consider at all the terrible devastation and erosion that have resulted from the killing of nearly all plant life within more than a mile radius of the zinc smelter. Surely these were important features of the local air pollution problem. The Federal Security Administrator and the Surgeon General (in their forewords to the report) claim that the Service has here opened up a *new* field in the nation's health, blandly ignoring the years of work others had put in.

Let us hope that the Donora disaster will awaken people everywhere to the dangers they face from pollution of the air they must breathe to live. These 20 suffered only briefly, but many of the 6000 made ill that night will face continuing difficulties in breathing for the remainder of their lives. Herein lies the greatest health danger from polluted air—continuing damage to the respiratory system through years of nonkilling exposure.

Millions of Americans and most medical scientists had been aware of this important public health hazard for several years before the Donora episode spotlighted the community dangers of industrial air pollution. But the U. S. Public Health Service focused its interest on the health of workers *within* the plants. Only after the Donora disaster was it drawn into the much more important aspect of the problem—the relation of industrial air pollution to *community* health.

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Correction

In reference to the article "Chromatographic Analysis of a Mixture of Proteins from Egg White" (*Science*, **1949, 110**, 564), the cation exchange resin Dowex 50 employed in the experiment cited was obtained in February, 1949, from the Microchemical Specialties Company, Berkeley 3, California, under the name of Ion-X, and not from the Dow Chemical Company as reported in the footnote. We have thus far not obtained satisfactory results with a sample of Dowex 50, (24427), obtained from the Dow Chemical Company on August 8, 1949.

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Molecular Orientation and Intracellular Photometric Analysis

In two recent articles B. Commoner and D. Lipkin (*Science*, 1949, **110**, 31, 41) have questioned the validity of the microspectrographic techniques of the sort originated by Caspersson, whereby quantitative estimates of chemical constituents of cells are obtained from measurements of absorption with a microscope and suitable photometric apparatus. Although the main emphasis is placed upon the possible influence of molecular orientation upon measurements of ultraviolet light absorption by nucleotides, it is the conclusion of Commoner and Lipkin that "the entire problem of interpreting intracellular extinction measurements needs to be reexamined with the realization that one is dealing not with true solutions but with oriented aggregates of molecules." It is worth noting that the criticism did not arise from the authors' observation of an effect of orientation upon absorption. It is, rather, based upon inferences from certain physical principles, from the meager information as to the structure of nucleic acid molecules, and from a particular interpretation of selected data on ultraviolet absorption published by Caspersson and his students.

In this laboratory we have been making photometric studies of fixed cells, measuring not only the natural ultraviolet absorption but, in addition, the absorption of the following: (a) the Feulgen reaction, in which color is restored to Schiff's decolorized fuchsin reagent by the aldehyde group of desoxyribose; (b) methyl green staining, in which a basic dye of the triphenyl methane group is combined with the phosphoric acid of desoxyribose nucleic acid (Pollister, A. W. and C. Leuchtenberger, 1949, 35, 111); and (c) the Millon reaction for protein, in which new chromophores are produced, apparently as derivatives of the phenolic group of tyrosine and tryptophane. Our measurements would seem to have been made under conditions very favorable for showing any effect of molecular orientation upon absorption, since they are all on fixed preparations in which, as T. Caspersson pointed out in 1940 (*Chromosoma*, 1940, **1**, 605), the dehydration and shrinkage of standard cytological technique tend to increase birefringence. Moreover it may be added that the senior author has noted that dehydration of precipitated nucleohistone fibers enormously increases their negative birefringence. Yet, in spite of these favorable conditions, in thousands of measurements there is no case (with the possible exception of some anomalous data on striated muscle) in which the data can be readily interpreted, by the criteria Commoner has set forth, as evidence for an effect of molecular orientation on absorption. As will be described below: (a) the distribution curves are symmetrical at all extinction values, not tending to cluster near 0.3; (b) Lambert's law, that extinction is proportional to thickness, has been repeatedly shown to hold for measurements of nuclei, cytoplasm, and intracellular substance; (c) there is good evidence that extinction varies directly with the concentration for the Feulgen nucleal reaction and for ultraviolet absorption of at least some living cells; and (d), as expected from the above, we