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## ENVIRONMENTAL HEALTH—PAST, PRESENT AND FUTURE<sup>1</sup>

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I recall old-timers referring to "the good old days." I am sure they were not reflecting so much on the hard work, long hours, horse and buggy, and primitive tools of the yesteryears, but were harkening back to the leisurely pace, the wide open spaces, a less troubled life and lack of tensions. Today our environment seems not to permit this.

Man has always had to come to terms with his environment. Ancient medicine declared that Man was part of Nature; that a harmonious relationship to Nature produced health; and that disharmony produced disease.

Thus, the ancient Hebrews had a standing rule to the effect that a permanent threshing floor, a place for depositing carcasses, or a tannery should be set up a minimum of so many feet beyond the city wall—and to the East—presumably to guard the population from harmful dusts and offensive odors. The Egyptians recognized the need to drain swampland, burn refuse in big dumps, and filter water for drinking, in order to reduce the diseases prevalent at that time. Hippocrates, the Father of Medicine, wrote

a book titled *Airs, Waters, and Places*. In it, he urged the physician to study the patient's background—climate, water supply, vegetation, and other matters—to get an idea of what may have affected the patient's condition. Some 500 years ago in England, in the reign of Edward the First, the first Sanitation Act was passed forbidding the pollution of rivers, ditches, and open spaces.

Beginning with the 17th century, and continuing through the 18th and 19th centuries, Man's inquiring and ingenious mind slowly but surely freed him from utter dependence upon, and subjection to, the raw forces of nature, and he became better equipped to deal with the problems of his environment. As the population grew, and industry increased in many countries, town and villages became crowded slum cities with devastating epidemics of communicable disease. Environmental health measures like water supply treatment, sewage treatment, heat processing and refrigeration of perishable foods, garbage and refuse collection, and insect and rodent control were started then. Also, at the end of the 19th century, bacteria were revealed, and provided a scientific basis for the control of communicable diseases to which most of our public health effort has been devoted during the past 50 years.

What about the environmental health problems of

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today? Since 1850 we have fashioned ourselves a new world. We produce more than *three times* as much in a 40-hour week as we did in a 70-hour week a century ago. By the year 2000, just 40 years away, this country will be able to produce as much in one 7-hour day as is now produced in a 40-hour week!

The Radio Corporation of America, which is primarily engaged in electronics, recently exceeded one billion dollars in annual sales volume for two successive years. However, the most extraordinary fact about this statistic is that 80 percent of this volume was in products and services that did not exist, or were not on the market, in 1946. In the fields of chemistry and pharmacology, more than 150,000 preparations are now in use, of which 90 percent did not exist 25 years ago, and 75 percent of which did not exist 10 years ago.

Is it strange then that we have created a whole new set of environmental hazards whose threat to our health is just now being recognized? Our advancements in technology have resulted in vast quantities of contaminants being introduced into the environment. The total effect of these new forces on the health and life expectancy of Man is not yet fully understood, but there is evidence that some of these may be responsible for some of our most serious impairments. As our industrial civilization progresses, more and different contaminants will be produced and will be introduced into the air, water and food on which we depend for life itself unless we take corrective measures. Let me illustrate with a few examples.

The automobile has in many ways completely reshaped our way of living, but currently some 70 million autos are exhausting sulfur di- and trioxides and the olefins, into the air we breathe.

Today, we have plastic, synthetic fiber, antibiotic, herbicide, rocket and detergent industries. These spew new types of wastes into our streams and into the air—wastes with toxicities yet to be determined. The water used in the manufacture of one pound of a particular antibiotic is 3,000 or 3,500 gallons. This indicates a total volume of wastes for antibiotic processes alone from 30 to 35 million gallons per day. These requirements result from cooling water, floor and equipment washings, and fermentation, purification, and recovery processes.

The development of nuclear energy for peaceful purposes has brought us many isotopes for industrial research and for medical diagnosis and therapy. Today, there are some 6,000 licensed users of radioisotopes. Of these, 1,800 are industrial firms. More than 2,500 licensees using radioisotopes are in medical research, diagnosis, and therapy. About half of these are physicians in private practice, and hundreds

of thousands of patients are currently treated yearly with radioisotopes in diagnosis and therapy. I don't have to remind this audience of the tremendous savings to industry resulting from radioisotopes used as tracers and gauges, or of their tremendous diagnostic and therapeutic value. However, with such developments has come the problem of disposing of large amounts of radioactive wastes; and this is on top of other radiation hazards, such as, fallout from weapons testing.

Another example is the imposing array of chemicals used in the production of foods. About 100 years ago, a farmer produced enough food in this country to sustain five other people. By 1900, his productivity had risen to feed eight additional persons. Today, he can feed 24 other people—a fivefold productivity increase in 100 years! A major factor has been the development and use of a host of pesticides, herbicides, fertilizers, and other chemicals to control pests and crop diseases and to increase per acre yield. Some of these products, which are highly toxic, may be taken up by the plants; may lodge on the food itself; may be transmitted to animals which are used for food; may find their way into milk; or may be washed from the soil into water courses. We frankly don't know enough about the acute or chronic and cumulative effect on Man of many of these products or of the additives now used in foods. This must be determined.

Moreover, in the next 20 years, most of the population, 3 of every 4 of us, will be concentrated in metropolitan areas. Environmental sanitation will have to be maintained and extended in the face of this development to protect against communicable and enteric diseases. Already, among the environmental health problems of urbanization are sufficient and clean water, unpolluted air, better sanitation measures for foods, more recreational facilities, and better housing.

Occupational health problems, to which we have been devoting attention for many years, will increase as our industrial civilization progresses. We know that emotional and psychological problems add to, compound, and may even originate organic disorders which may appear as the result of the work environment. Hence, we can anticipate that some of the workers subject to new manufacturing processes and wastes will be more susceptible to heart disease, peptic ulcers, and vascular disturbances. The effects of rocket and missile propellants are brand new to practitioners of industrial medicine. Yet today, more than half of the industrial plants in the country do not have even a rudimentary type of industrial health program.

The incidence of accidents rises in a machine

world. New skills, new speeds, and new ways of doing things always involve mishap. Accidents in the home and on the highways are rising to alarming proportions.

The Public Health Service is concerned with the threats posed by all of these environmental health hazards, and has developed operating programs in the fields of air pollution, radiological health, water pollution, and accident prevention. We have bolstered our activities and are expanding our research effort in the areas of milk and food sanitation, and occupational health. Pilot studies on metropolitan planning for environmental health needs have recently been initiated. We have sought the advice of scientists, and of industrial and economic experts in developing and reforming these programs.

We seek the ability to shape our environment and to control it, and to prevent certain deleterious conditions from developing. The Public Health Service is currently regrouping its skilled staff and techniques to strengthen its efforts to control or eliminate the major health hazards originating in today's environment.

I wish to identify certain approaches we believe will be helpful in this work.

First, we will use all the skills—engineers, physicians, and add many others—oceanographers, meteorologists, aquatic biologists, microbiologists electron microscopists, to name a few.

Second, we will keep in mind the theory of the multiple etiology of disease. As Rene Dubos has indicated: "Unquestionably the doctrine of specific etiology has been the most constructive force in medical research for almost a century. . . . In reality, however, search for *the* cause may be a hopeless pursuit because most disease states are the indirect result of a constellation of circumstances rather than the direct result of single determinant factors."

Third, we will recognize that biological effects are the summation of all exposures. For example, the effects of specific trace metals upon the human biological system require air pollution, water pollution, food, and occupational health studies, since Man may take in these metals in each of those ways.

Fourth, being a new endeavor, great emphasis will be given to environmental health research, even though, it is no doubt true, that considerable knowledge currently available is not being used to ameliorate many health hazards. The application of known data to the solution of environmental hazards raises questions to which there are no known answers yet.

Fifth, greater attention will be given to problems of standards, regulation and enforcement. Environmental health problems require collective action to preserve the collective welfare. By their very na-

ture, the problems of air and water pollution, and radioactive contaminants, reach far beyond local boundaries and jurisdictions. Great populations are attacked and affected simultaneously by these hazards.

In our democracy, we acclaim self-regulation. The Federal role is that of leadership. In this pattern, the Public Health Service develops codes which guide industry and the States. The *Milk Ordinance and Code* is one such guide. Some of these codes work; some fall short. Many people would say that, from an economic point of view alone, State or regional control of a national problem creates serious competitive inequities. You in the milk industry have had experience with such inequities arising from different standards and different degrees of regulation by various States and municipalities. Would the control of specific environmental health problems nationally by means of a set of uniform common denominator standards and Federal regulation help? I raise these questions to point out our concern, lest carefully designed local or state regulations bearing health labels become the cover for competitive economic interests.

Health regulations require knowledge of the facts. Hence, principal emphasis, at least in terms of the Federal effort, must be placed on research to seek the answers to the problems of prevention and control raised by increasing pollution of the physical environment by newer types of contaminants.

The complexity of research needed in this area staggers the imagination. In many cases, we are dealing with very low concentrations of substances. For example, perhaps one or two parts per billion in water or air of some substance may be a killer if absorbed by an individual over a long period of time. The detection of these substances, the measurement of their effect on humans, and the practical problems of removal of these small quantities from water and air, present research problems of a new order of complexity and difficulty unlike most of those which have been resolved in the past. These problems are typified by low-level radiation hazards, occupational exposures, and by chemical additives to milk and food.

Viruses—a hang-over problem from communicable disease—are another example of a complex area of research to be undertaken in air, water and food. For example, the infectious hepatitis virus can filter through any mechanism or procedure we have yet devised for water treatment.

These problems make an integrated environmental research approach essential if we are to integrate the effect and its control. Man's intake is the sum of his water, air, and food exposure.

In this great research task, we must stimulate and support the work of other scientists and agencies in these fields. We have already made a start through the research grants mechanism which the Public Health Service administers. For your information, grants have been approved for the current year in the amount of \$186,000 to support research studies at various institutions on problems of milk technology, milk microbiology, and milk sanitation administration. We hope that researchers in this field will make increased use of the research grants mechanism.

Speaking specifically to research needs in the milk field, we must also strengthen our intramural research effort. Our current effort is not commensurate with today's needs; let alone, future needs. With the resources available, we have undertaken studies on such milk sanitation problems as thermal inactivation of pathogens, radioactive and chemical contaminants, staphylococcal enterotoxin, and the development of new laboratory methodology and techniques. But even in these areas, this is a limited effort. We are aware that acceptance of new industry developments are being delayed for lack of knowledge as to their public health implications. To expand our research, we must have your support.

Research, of course, is the way we improve the future. For the present we must use the measures and techniques we already possess to control polluted air and water, radiation hazards, occupational disease, and milk and food contaminants.

You and I set our goals by what we call standards. We revise them when new information indicates. These standards may require capital investment, as well as public health practice; and capital investment, of necessity, must be a long-range expenditure. Standards cannot be changed every day at one's whim and fancy. Thus, we need facts and this means science.

I think you will agree that in the standards field we must go forward, using the tools at hand to do the job. We must use "what we know"—and we know much.

If we are to be successful, a strenuous and coordinated effort by all groups will be required. Industry bears a responsibility for prevention of many environmental pollutants, and for improvement of environmental conditions. Your industry will accept this responsibility, as the past record shows. I look forward to this kind of close industry-government cooperation.

The 3-A Sanitary Standards program is one example of close industry-government cooperation in the public's interest. The Dairy Industry Committee, the International Association of Milk and Food Sanitarians, and the Public Health Service have worked together for many years to improve the public's milk supply, not only through the 3-A Sanitary Standards program but by other joint endeavors as well. The dairy industry is to be commended for its leadership and foresight in these efforts, and for the spirit of cooperation which it has demonstrated.