The Porto Rico Journal of Public Health
and
Tropical Medicine

Official Bulletin of the Department of Health of Porto Rico and the School of Tropical Medicine of the University of Porto Rico Under the Auspices of Columbia University
Published quarterly by the Department of Health of Porto Rico.

Entered as second-class matter August 1, 1925, at the Post Office at San Juan, Porto Rico under the Act of August 12, 1912

VOL. V SAN JUAN, P. R., SEPTEMBER 1929 No. 1

FIELD STUDIES OF ACUTE RESPIRATORY DISEASE *

W. G. SMILLIE
From the Department of Public Health, Harvard University.

The medical literature of one hundred years ago was concerned largely with two factors in the causation of disease; first, constitution of the individual in its relationship to resistance to disease, and second, environmental factors and their effect upon the prevalence of disease in the community.

Individual constitution was considered as of primary importance to the individual in his personal struggle against illness. For example, one certain physical type was considered as susceptible to tuberculosis; another and quite different type was susceptible to hypertension. The description of any clinical case in medical literature always included a minute description of the constitutional type of the individual.

The influence of environmental factors upon the prevalence of disease was well understood by our forefathers. For example, it was assumed that since malaria always occurred near wet, low places where relative humidity was high, therefore this environmental condition was related to and probably a causative factor in the disease. Pneumonia which occurred in the cold winter months and was prevalent in cold climates, while relatively infrequent in warm climates, was considered to be closely related to the environmental factor of low external temperature. The very word for the common acute respiratory infections in English is "colds", indicating the conception that cold weather is an important environmental factor influencing the incidence of this disease. So ingrained was this conception that when any puzzling clinical picture was encountered the recent environmental changes were scrutinized carefully to determine whether any relationship existed between those changes and the onset of symptoms.

* Lecture delivered at the School of Tropical Medicine, Porto Rico, May 10, 1929.

When epidemics occurred, the study of environmental influences was much more exhaustive. It has been noted for centuries that certain epidemic diseases occur in cycles,—smallpox, plague, cholera, influenza and many others. In these epidemics careful observations were made of environmental conditions both before, during, and after the epidemic, including temperature, hours of sunshine, direction and velocity of the wind, rainfall, phases of the moon, the tides, currents, the seasons, planetary conjunctions, etc. One of the most exhaustive of these studies was that of Noah Webster, best known as author of Webster's dictionary.

Then came the studies of Pasteur and his discovery of actual causal agents of disease. How medical literature changed its character and how things were simplified, for it seemed clear that for every disease there was some specific causal agent. In rapid succession the etiological agents were discovered for tuberculosis, plague, leprosy, typhoid fever, diphtheria, cholera, malaria, dysentery, pneumonia and many others.

It was assumed first that each disease had its specific etiological agent and when that disease existed the organism would be found present. Second, it was assumed that where the agent existed, there one found the disease. It was soon found, however, that though for many diseases the first premise held, the second did not. In many instances the specific organisms of a disease were found in perfectly normal individuals. Gradually there was built up the science of immunology, the resistence of the individual to etiological agents of disease, and laws of natural and acquired immunity were determined. Gradually there has been a return to the ideas of our forefathers in relation to one of their fundamental conceptions of disease; namely, the inherent constitution of the individual in his natural resistance to disease.

More recently we have begun to realize that neither the discovery of etiological agents nor the discovery of laws of immunity were sufficient to explain certain phenomena, particularly in epidemics of disease.

For example, if the degree of immunity of individuals in a community to typhoid fever is a constant and the prevalence of typhoid bacilli carriers in the community is also a constant, why is there always a rise in the typhoid fever incidence in the community at certain seasons of the year? Why does diphtheria occur each year at about the same period, reach its maximum at the same period and decline always in the same manner? It is obvious that if this phenomenon of seasonal prevalence of disease is solved, it may give us

important information concerning the whole mechanism of disease production and perhaps aid us in disease prevention.

What are the factors which enter into seasonal variation? Clearly they are changes in external environmental factors, such as temperature, hours of sunlight, barometric pressure, wind velocity, rainfall, relative humidity, etc. Here, in truth, we have returned to the second conception of our forefathers, namely, the importance of environmental factors upon the prevalence of disease both in the individual and the community. One very recent and exhaustive study of the influence of environment upon disease is that of Rentschler, Vauzant and Roundtree, who have studied the question of arthritic pain in relation to weather changes, and in which they have shown clearly a correlation between the degree of arthritic pain and changes in barometric pressure.

Aycock has made a careful study of the significance of geographic and seasonal variations in the incidence of poliomyelitis. He suggests that there are two types of resistance to disease, first, immunity which is built up as a result of invasion of the body by the etiological agent of disease, and second, the power of resistance which exists by reason of a balanced physiological activity and which he calls "autarcesis". It is suggested that variation in physiological balance of the body due to environmental influences may explain variation in resistance to poliomyelitis and thus seasonal prevalence of the disease.

One group of diseases that is closely associated with changes in environment is the group of acute infections of the respiratory tract.

The causal agent and the epidemiology of some of these infections are quite well understood; for example, diphtheria, scarlet fever, tonsilitis, pneumonia, etc. We are quite at sea, however, in regard to the etiology of the most common of all acute respiratory infections,—namely, common colds, grippe, and influenza. The clinical picture of this group of diseases is not clear cut, and differential diagnosis is rather an arbitrary one. These diseases have been studied exhaustively from the bacteriological standpoint. The bacteriologists are divided roughly into two groups, those who believe that influenza is caused by the bacillus of Pfeiffer and those who believe it is caused by one of the group of filter-passing organisms described by Olitsky and Gates. A great variety of organisms have been considered as causal agents of colds. Bacteriological findings have been conflicting and quite confusing. The bacillus of Pfeiffer is found frequently in other conditions than influenza, is not always found in typical epidemic influenza and, when found, is often most prevalent in the nasopharynx of influenza cases late in the course of the disease.

The pneumosintes group of organisms consists of a large group of quite similar, filterpassing, Gram negative, tiny anærobic forms, which have not always been found in epidemics of influenza and which have not produced influenza when inoculated into the nasopharynx of presumably susceptible individuals.

It is obvious that unless we can determine the etiological agent of this group of acute respiratory infections, or at least to determine clear-cut procedures for differential diagnosis of the group, we cannot succeed in developing methods of prevention or control of this group of very common infections.

We may be dealing with an etiological agent that has not yet been discovered; on the other hand, the etiological agent may be one of the many types of organism found normally in the nasopharynx and with which we are familiar. Infection may occur because of changes in virulence of the organism, or changes in the physiological balance of the individual producing an "anautarcesis", which permits invasion of the tissue by an organism which under normal conditions would be avirulent. In either case, we must assume that environmental factors play the deciding part in influencing the change of either increased virulence of the organism or decreased resistance of the individual.

One method of attacking this problem is to undertake a study of the normal flora of the nasopharynx and to follow the changes which occur in the individual and in the environment when these persons already studied develop an upper respiratory infection. Such studies have been made by Jordan, Park, Dochez, Noble and their co-workers. All this work has been done in densely populated centers where the persons studied are in direct contact with a large number of other persons and subjected to a great variety of environmental factors which may affect the respiratory flora. In an attempt to minimize these extraneous factors we have undertaken a field study of acute respiratory disease in isolated communities where life is simple, contacts relatively infrequent, and environmental factors more readily estimated and controlled.

This field unit consists of a portable laboratory with a small personnel of epidemiologist, bacteriologist, and technician. Supplementary non-technical personnel are secured at each post. The first area selected for study was "Happy Hollow", Alabama, an isolated section along the Patsiliga River near the Gulf of Mexico. Here a small group of normal people were studied over a period of four months. During the study an epidemic of acute respiratory disease occurred which was followed throughout its course. In May, 1928,

the field unit went to Northwest River, Labrador, a Hudson Bay Company fur trading post in the interior of Labrador. A group of fur trappers were studied for three months. At the same time, a tribe of nomadic Indians from the highlands of Labrador came out to the post to trade, and studies were made of this group. During the period of study an epidemic of acute respiratory disease occurred which was followed through its course. In March, 1929, the field unit went to Porto Rico, and using the School of Tropical Medicine as a base of operations, established a field laboratory in St. John's, one of the small Virgin Islands, where field work is being continued. In each field post serial cultures are made of the bacterial flora of the nasopharynx of a group of selected individuals. In addition, records are kept of barometric pressure, rainfall, daily maximum and minimum temperature, relative humidity, etc. It is not anticipated that any startling discoveries will result from these studies, but it is hoped that a slow and painstaking compilation of data over a period of time under widely varying conditions may offer some suggestions which may aid us in our solution of the etiological agent, the epidemiology and possibly methods of prevention of acute respiratory disease.

BIBLIOGRAPHY

Aycock, W. L.: (1929) Jour. Prev. Med., 3: 245.

Rentschler, E. B., Vauzant, F. R. and Roundtree, L. G.: (1929) Jour. Am. Med. Ass'n, 92: 1995.