THE LABORATORY IN PUBLIC HEALTH WORK*

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THE LABORATORY has long been recognized as an important agency in public health. From small beginnings in the application of chemistry and later of bacteriology to sanitation, the scope of laboratory operation has greatly increased until it touches upon practically every phase of work dealing with the control of the environment and the examination of the individual suspected of being potentially a danger to his fellows. It also renders service in the periodic health examinations now so strongly recommended as a means of maintaining accurate knowledge of one's physical condition. The position of the laboratory as one of the main factors in the promotion of public health work is thus unquestioned, unassailable, and needs no defense so long as the point of view of personal and public service is maintained. Obviously, the methods employed, both qualitatively and quantitatively, must be scientifically grounded, properly developed and thoroughly tested as to their reliability and accuracy in detective and confirmatory work. They must be sound in relation to their general application and adaptability to the problems of inspection and control commonly encountered. Furthermore, the general methods must be adaptable to the equipment and skill of the ordinary technician before the service rendered reaches its highest efficiency.

It is only necessary to point to the splendid results already attained in the examination and control of water supplies, the improvement brought about in milk supplies as a sequence to the routine bacteriological examinations, and in the restriction of communicable diseases through the effectiveness of diagnostic laboratory procedures and their immediate applications in bringing about preventive measures, to show how indispensable this arm of the public health service has become.

There is little danger that the sanitary engineer will fail to appreciate or give a true valuation to the laboratory findings of the chemist or bacteriologist because of the close relationship between the two services, and the fact that the laboratory supplies the immediate method of measuring the success of the engineer's efforts. There is more likelihood that those immersed in the intensive study of the individual, may overlook the significance of the efforts of the chemist, the bacteriologist, the engineer or the sanitary inspector in improving environmental conditions, especially when the effect of the work is not instantaneous and striking, but gradual and continuous, and noticeable only after a considerable period.

Similarly, the statistician in his tabulations and his study of trends may fail to recognize that his data are affected by the service which may have been rendered by the immunologist, the industrial hygienist or the health teacher who at some earlier time may have applied new methods based on results of the laboratory method. It would be difficult to find any branch of public health endeavor which did not directly or indirectly con-

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connect with some phase of the laboratory work. It is because of these remote relationships as well as of the immediate applications to public health problems that the developments and extensions of laboratory procedures should command the interest of all who are working in public health, even though in a restricted and highly specialized field.

Our public health procedures may be roughly divided into those that modify the environment, as in improvement of water supply and sewage disposal, control of milk supplies, housing, factory sanitation, and industrial hygiene, and those directly concerned with the individual as in the control of communicable disease, through the diagnostic laboratory, the specific tests for susceptibility, and preventive treatments. In all of these the laboratory plays an important part, either by supplying the methods of measurement, or the materials for application.

So brief a survey of recent progress in laboratory work can but touch upon some of the things that seem to have special significance from the standpoint of our Association, omitting reference to many matters which may be of importance.

Of the events of the year, the revision of Standard Methods of Water Analysis should certainly be mentioned as a notable step in advance in our studies on the control of water supply and related processes. Let it be understood that standardization does not imply perfection, but rather a basis for greater accuracy, and better comparison and coordination of the results of the many workers over a wide and varied area. Standard methods therefore are not static and final but progressive. In the revision of methods for microscopical examination of water two important possibilities not hitherto featured are mentioned in the new report: first, the fact that such examination may throw important data on the clogging of filters and thus affect the operation as well as the sanitation of water supplies, a fact of great significance to the engineer; and second, that such examination may indicate the presence of an excess of toxic industrial wastes which have even wider public health significance in the general health and resistance of consumers, in child welfare, and in industrial hygiene. A complete revision of the details of the laboratory procedure adds greatly to the accuracy and service of the method.

The latest modification of bacteriological methods, while not extensive, has taken into account new research work, and has also been in the direction of greater accuracy and delicacy. It is significant and noteworthy that the work which has been so painstakingly developed by the Laboratory Section of our Association during the past 20 years has been so useful that the present revision is accepted as standard procedure not only by our own Committee on Standard Methods, but also by the Council on Standards, and Committee on Standard Methods of the American Water Works Association. The service of our own committee especially entitles it to our gratitude and commendation.

The excellent work of Hinman bearing on the relative significance of Bact. coli and B. aerogenes adds materially to our knowledge of pollution of water, and the interpretation of results. The report of the Advisory Committee on Official Water Standards, appointed by the U. S. Public Health Service on the examination of water supplies on common carriers in interstate traffic, with the statement of standards imposed, is also a notable contribution to the subject of bacteriological water examination, and deals with the protection and method of examination of waters used on trains and steamships, a matter certainly of general public health importance, since it may affect the well-being of all who travel. No radical change of method has been introduced, but the procedure has been made of more definite character. A new method of rating the bacterial contamination of raw waters previous to filtration, developed in the laboratory of the Little Falls, N. J.,
Filtration Plant is worthy of note. Mention should also be made of the work of Norton, Levine, Wolman, Koser and the members of the U. S. Public Health Service whose investigations have added materially to the establishment of improved methods. In the field of sewage disposal, the excellent papers by Miss Hotchkiss and her coworkers on the biology of sewage and especially of the Imhoff tank constitute a laboratory contribution which adds greatly to our knowledge of processes of purification, and may have extended significance in relation to general public health. The chemical studies of Mohlman are also of importance in this respect.

The relation of milk supply to public health is a perennially fertile field for study. Laboratory control of milk supplies has greatly extended, and the cities now employing this method of supervision are numbered by hundreds. The milk dealers themselves recognize more than ever before their responsibility to the consuming public and are probably doing even more than most health departments in the improvement of sanitary quality of milk supply through the establishment of laboratories for the sanitary classification of raw milk and more adequate control of efficiency of pasteurization. That this is still a matter of great importance is indicated by such studies as those of Shrader and his associates, and by the appearance during the year of the voluminous bulletin published by the U. S. Public Health Service (Bulletin No. 147), dealing with extensive studies on the destruction of human and bovine types of tubercle bacilli and of typhoid bacilli by commercial pasteurization, and also by papers by Heulings and others. These indications of progress are most encouraging. It is obvious that this widespread study of pasteurization is a matter of such public health significance that it will continue to demand attention, as it is apparent that the final word has not yet been spoken.

The results of the laboratory leading to progress in the sanitary handling of foods and in the examination of food handlers is a cause for general satisfaction. The possibility of infection of foods by carriers is so general in its application that all types of workers in the public health field must recognize its importance. Major Parsons has pointed out the practical value of the examination of food handlers to the U. S. Army and it is clear that it is of equal importance to the greater army of industrial workers and the whole population.

When we consider the great number of individuals who subject themselves daily to the possibilities of food infections through public eating houses, dishes and utensils, cooks, dishwashers, milk handlers, and the multitude of those who may unwittingly infect articles of food or drink, the importance of this subject, not merely to public health administration, but to industrial hygienists, nurses and health teachers, is clearly seen. Such an advance in method of detecting typhoid carriers as has been made by Dr. Havens in Alabama is a notable and distinct contribution to the subject. A swift survey of important laboratory studies on food in relation to public health would be deficient if it did not include a reference to the fundamental work of Eddy on the relation in the cooking and canning to vitamin content in which he points out the dangers of too great generalization of statement and the need of specific studies on individual foodstuffs in order to secure the truth regarding the destruction or non-destruction of these food essentials.

Typhoid epidemics due to infected oysters have again directed attention to this field and led to the recent laboratory studies on the viability of typhoid bacilli in shell oysters by Jordan and by Tonney and White. Dr. Jordan's work has shown that the organisms introduced by floating in artificially contaminated sea water may survive for as much as 24 days. The work of Drs. Tonney and White on the relation to temperature and viability indicates that the period of survival may be
even longer than this at icing temperature. It is evident, therefore, that the organisms may survive for periods much greater than those that would normally be applied in storage of uncooked oysters to be used for food. These careful studies have again called attention to the necessity of the greatest care in the protection of areas used for oyster growing from pollution. In this connection the act passed by the Senate and Assembly of the State of New York extending the marine district to three nautical miles off the coast and specifying sanitary conditions for boats, houses, cribs and containers, controlled by laboratory examination must be looked upon as a notable piece of sanitary legislation. In this connection also, the prompt action of the health officer of Chicago in securing laboratory studies and the equally active and comprehensive general study of the epidemic by Dr. Lumsden and his associates in the U. S. Public Health Service are noteworthy as excellent examples of co-operative work in public health.

The importance of dust, its relation to general air purity, and especially its relation to certain types of industrial disease has long been recognized. The reviews and work of Dr. Greenburg on "Dust Inhalation and Industrial Tuberculosis" and on "Methods of Sampling Aerial Dust" have brought into small compass the important observed facts and the methods of investigation which may be of greatest assistance to the industrial hygienist and the general laboratory worker, as well as to the statistician and engineer.

Mention should also be made of the experimental procedures which have added to our knowledge of scarlet fever. In this field the progress made in the study of scarlet fever by the Dicks and their experiments on the production of antitoxin for protective purposes have been noteworthy. This work, as well as that of Dochez and Sherman and Blake gives great hope of eventual success in the control of this disease.

In the prevention and control of certain types of communicable disease, such as whooping cough, measles, diphtheria, tuberculosis, smallpox, scarlet fever and the venereal diseases, the control of infected individuals and the protection of the susceptible by immunological methods become of major importance. Here, the hospital, the physician, the school nurse and the laboratory cooperate. Mention should also be made of the continued work of Kahn and the numerous other investigators inspired by his work on the precipitation test in the diagnosis of syphilis.

The work of Madsen on whooping cough may also be mentioned as stimulating laboratory and clinical researches in this field. Similar studies on measles are also reported.

Interesting and important studies on a comparison of methods of staining tubercle bacilli have been conducted by workers in the laboratory of the Michigan State Department of Health with results that show a close agreement between the two principal procedures now in use.

Research in many lines in the field of public health is constantly increasing, both in quantity and in scope, and honor is due to the army of workers in many specialized fields who are adding fact to fact, and building up a body of data which, whether it is eventually translated into diagnostic methods for general use, or special methods of laboratory control, is adding materially to the information which contributes to public health. In this work the members of our own Laboratory Section are doing their part, and I bespeak a recognition of the fact that we are all working for a common cause.

It is evident that the laboratory, instead of diminishing in importance is everywhere occupying a broader field of usefulness in control measures and in the discovery of new facts, in the testing and confirmation of hypotheses and the establishment of relationships not previously known.