Public Health Reports

Vol. 61 • NOVEMBER 1, 1946 • No. 44

Printed With the Approval of the Bureau of the Budget as Required by Rule 42 of the Joint Committee on Printing

EDITORIAL

CONTROVERSIAL ISSUES IN TUBERCULOSIS CONTROL

In the field of tuberculosis control there are many tools and methods about which there is considerable controversy. As in any field where the thinking is healthy and progressive, the variety of opinion is vigorously expressed and firmly held. In consequence, practice differs.

Among the most highly controversial problems, the use and importance of the tuberculin test is of first significance. In the diagnosis of tuberculosis and for mass surveys, the tuberculin dosage is in dispute. A high initial dose is used in some quarters, while a low dosage is employed in others. There is also great difference of opinion concerning the interpretation of tuberculin reactions. Similarly, the reading of tuberculous activity in the X-ray evidence of lesions has its champions, while opposing groups believe it impossible to read such activity on an X-ray film. These opposing groups also present contrary solutions to the problem of interpreting primary and reinfection tuberculosis from the X-ray film. Many specialists think we cannot perceive from the X-ray film whether a lesion is primary or reinfection. In spite of the extensive researches done in this field, many interpreters still classify cases principally on the evidence of X-ray films. Furthermore, there is some difference of opinion on the proper disposition of cases that have positive gastric lavage. The more advanced school of thought believes that such cases can be released from the sanitorium and that children with positive gastric findings can go to school.

This is the ninth of a series of special issues of PUBLIC HEALTH REPORTS devoted exclusively to tuberculosis control, which will appear the first week of each month. The series began with the Mar. 1, 1946 issue. The articles in these special issues are reprinted as extracts from the PUBLIC HEALTH REPORTS. Effective with the July 5 issue, these extracts may be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for 10 cents a single copy. Subscriptions are obtainable at $1.00 per year; $1.25 foreign.

There are other issues, such as the value of miniature films, the significance of BCG vaccination, and the immunity that may be given by a positive tuberculin reaction. These and many other differences of opinion need clarification. It is obvious that extensive research should go forward, so that unanimity of opinion may in future reinforce diagnosis.

Because it is basic in the control of tuberculosis, the importance of the tuberculin test should have first consideration. It must be clearly understood at the outset that mass radiography has not displaced the tuberculin test. Indeed, it must be stressed that there is greater need than ever for such testing. The tuberculin test is invaluable in detecting reactors to tuberculin among contacts; it permits more accurate differential diagnosis; and it provides sample checks of population groups at yearly intervals in order to arrive at variations in levels of infection. This determinant combined with the findings of mass radiography, which in many instances has resulted in the examination of a majority of the adults in entire communities, will be a precise tool for evaluating the tuberculosis problem in any given area.

Some leading workers in tuberculosis control have utilized the results of tuberculin tests in only two categories—reactors and nonreactors. Others have criticized such usage by pointing out that there is a third group—converters; that is, persons who convert from nonreactor to reactor from one time to another.

Extensive researches among more than 15,000 student nurses in many areas throughout the country have led the Tuberculosis Control Division to conclude that the most critical time for the reactor is the first several years after the change from negative to positive. During these first years the body is fighting infection, and everything should be done to maintain high resistance. The Division is apprehensive of the apparent neglect of this critical period in the life of the converter. It is emphasized that the immediate postconversion period requires close follow-up in order to keep resistance at a high level. Also, it appears to be desirable to minimize exposure until the body has gained control of the infection, and the danger of disease has lessened.

We do not yet know what is the ultimate effect of early massive exposure which does not result in immediately apparent tuberculosis. The later experience of the cohorts of those among whom there was a high mortality rate when young needs extensive study, and the tuberculin test is perhaps our most effective instrument in the discovery of such knowledge. We must institute a long-time life-table study of the converters at various ages. At the same time we must extend the use of tuberculin tests in conjunction with mass radiography, for the purpose of obtaining the infection rate in various age, race, and economic groups in the United States. The tuberculin test properly applied to random groups at regular intervals is a sensitive index to what is being accomplished by all other control methods now in use.

The leading article of this issue, "The Establishment and Use of Fundamental Procedures in Tuberculosis Control," is a forceful description of a point of view that is at variance with the thinking of some other workers in the field. All opinions, however various, merit the most careful study if we are at last to solve the many complex problems of tuberculosis control.

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THE ESTABLISHMENT AND USE OF FUNDAMENTAL PROCEDURES IN TUBERCULOSIS CONTROL

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A chronic disease that may exist in a person for several years or decades is best studied through early detection and subsequent observation in the person affected. Prior to 1920, however, this procedure was seldom followed in the study of tuberculosis in human beings. In that year, an opportunity was afforded to study the disease among university students, where many could be observed over a considerable period of time. For the past 26 years, these observations have been continued. In 1921 the Minneapolis Division of Health arranged for a longitudinal study of tuberculosis among children, from birth through 18 years of age; and later a provision was made by which the studies could be continued among those who had reached adulthood, as well as among other adults.

A serious tuberculosis problem confronted the city of Minneapolis in 1920. The mortality rate was 120 per 100,000 population, and though the morbidity rate was unknown, the health department had many ill persons on record—less than half, probably, of all those who suffered from clinical tuberculosis. Only a small number of sanatorium and hospital beds were available. The majority of persons with infectious disease remained in their homes, and advanced cases in institutions were often permitted to return home so that they could "die happy among friends." A considerable amount of tuberculosis prevailed among animals, particularly cattle, and frequently dairy products were found to be contaminated with living tubercle bacilli of the bovine type. Hence the disease was readily communicated from person to person, and not infrequently, from animal to person.

The incidence of tuberculin reactors had not been determined by 1920 for any large group of persons at a given age level. It was estimated, however, that in the United States, almost 100 percent of the adult population would have reacted if tested. A sharp distinction was made between tuberculous infection and tuberculous disease. A person was said to have "infection without disease" if he reacted to tuberculin but showed no symptoms or lesions, and was regarded as having "disease" if he showed lesions or was ill. Those of the former class—more numerous at any given time than those of the latter—were considered to have been immunized; and it was supposed that for the rest of their lives they would walk within a charmed circle of safety. A tuberculin reaction was thought to be an asset. The person who did not react, by young adulthood at least, was believed to be in a hazardous position: if he then became infected, having failed to become immune through a previous infection, he was liable to develop uncontrollable tuberculosis.

Despite this belief, a national movement was under way to increase the number of hospital and sanatorium beds, to pasteurize milk, and to eradicate the disease from cattle. To many, this was tantamount to national suicide; for it was thought that these steps, if carried to extremes, would deprive infants and children of tubercle bacilli, especially of the bovine type, and would necessitate their reaching maturity without immunity—to be vanquished if later infected. This and other paradoxes, by the confusion they created in the minds of physicians, greatly complicated tuberculosis control work.

Tuberculosis in children was considered to be highly fatal. While infection was generally regarded as an asset, the opinion prevailed that if it occurred within the first 2 years of life, death would follow in 50 to 80 percent of those infected, before immunity could be established. This erroneous view was based on observations of ill infants, the majority of whom had reinfection type of disease, such as pneumonia, meningitis, and miliary tuberculosis. A group of infants with tuberculin reactions but without illness had not been observed to determine whether all infections were highly fatal. Nor had older children been observed to determine the actual evolution of tuberculosis during childhood and adulthood, or the course of the disease in persons first infected as adults.

In 1920, almost all of the present-day diagnostic equipment was available, including the stethoscope, clinical thermometer, microscope, tuberculin test, X-ray, and bronchoscope. Much emphasis was placed upon history of exposure, symptoms, and signs elicited by the conventional chest examination. Tuberculin tests and chest X-ray inspections were seldom made. All equipment was employed routinely, with a view to the proper evaluation of the various diagnostic procedures, methods of dealing with cases, and preventive measures, and especially to the study of the evolutionary process of tuberculosis in the human body.

In little more than a quarter of a century, radical changes have been made in the approach to the total problem of tuberculosis control. The following results have been achieved.

THE TUBERCULIN TEST

Prior to 1921, the tuberculin test was not given extensively, as all adults and most older children were thought to be infected with tubercle bacilli. It was used merely as a confirmatory procedure when examinations revealed, for example, rales and X-ray shadows. In the work among children begun in 1921 in Minneapolis, however, the test was administered routinely; and since 1928, it has been used in examining all students entering the University of Minnesota. The epidermal (Pirquet) method of administration was employed until 1929, when the intracutaneous (Mantoux) method was adopted. Other methods were given adequate comparative trials, but each was discarded in favor of the intracutaneous.

Old tuberculin, procured from the Saranac Lake Laboratory, has been used for the most part, but comparative tests with purified protein derivative (PPD) have been made occasionally on sizable groups. No significant difference has been indicated by the results obtained with the two substances. In using the former, the initial dose has been 0.1 mg., and 1.0 mg. has been given if no reaction to this occurred. In using PPD, first and second injections of 0.00002 mg. and 0.005 mg., respectively, have been given. At first, readings were made 48 hours after administration, but the interval was later increased to 72 hours, in view of the finding that, as a rule, erythema due to trauma will have disappeared in that time, whereas a characteristic tuberculin reaction always lasts 72 hours, and usually much longer.

A true tuberculin reaction presents definite characteristics, consisting of an area of edema, induration, or both, with a diameter of 5 mm. or more at the site of administration. This may or may not be surrounded by hyperemia. In the absence of induration or edema, hyperemia does not constitute a tuberculin reaction and should therefore be ignored. In the majority of instances, however, there is either a total absence of response to the test or an unmistakable reaction. (Hence, we no longer speak of negative and positive reactors, but rather of nonreactors and reactors.) Edema or induration of slightly less than 5 mm. in diameter, which is seen occasionally, should be read as a questionable reaction, and the test should be repeated in one or two months. Such a reaction may represent only residual trauma, or may be due to a low degree of allergy. The latter possibility may be explained as follows: Infection may have occurred so recently that only a low degree of allergy has been established, or the allergy may have so diminished that a milligram of tuberculin cannot elicit a characteristic reaction, which may be the case if tuberculous lesions of the primary or reinfection type have existed for several years without the occurrence of exogenous or endogenous reinfections. If, in a given instance, the former explanation is correct, the repetition of the test in a month or so will elicit a characteristic reaction. If the second test is not decisive, the latter explanation is indicated, and the dose should be doubled. And if a question still remains, it is entirely safe to administer 5 mg. of tuberculin. These larger doses are unnecessary, however, unless a lesion of undetermined etiology has been located. In most children and young adults with primary tuberculosis, there has not been time as a rule for the allergy to wane significantly; and therefore a single dose of 0.1 mg. of old tuberculin, or a corresponding dose of PPD, is usually adequate.

It may be stated that there are three main sources of error in administering and reading the tuberculin test: (1) Material is not tested to assure adequate potency; (2) the needle is inserted too deeply, so that the tuberculin is deposited subcutaneously; (3) the characteristics of edema or induration, or both, are not present, and erythema or minute nodulation at the site of injection is considered a reaction. This can usually be avoided by reading at 72 hours.

Regardless of the age of the person tested, a characteristic tuberculin reaction indicates the presence of primary tuberculous lesions produced by either the bovine or human type of tubercle bacillus. Since tuberculin is not, as was formerly believed, specific for infection caused by the type of tubercle bacillus from which it is prepared, it is satisfactory for testing whether made from organisms of the bovine or human type. As a result of the efforts of the veterinarians and their allies, it has been uncommon, in recent years, for a person in the United States to become infected with tubercle bacilli of the bovine type; and therefore, among the young children of this country, organisms of the human type are responsible for nearly all of the existing primary lesions. Among adults, however, primary lesions produced by the bovine type probably remain. This is an important consideration in the epidemiology of tuberculosis.

Although the tuberculin test admits of an absolute diagnosis of primary tuberculosis, it is of no value in locating the lesions, in differentiating primary from reinfection type of disease, in determining the extent of lesions, or in detecting the presence of clinical activity. A relatively recent infection or reinfection is apparently indicated by a high degree of allergy. There is some evidence to the effect that in persons with primary tuberculosis, a waning allergy may from time to time be augmented by exogenous or endogenous reinfections. If allergy persists at a high level, it may indicate that the person is in association with a contagious case of tuberculosis, or is being occasionally reinfected endogenously.

The presence of primary tuberculosis cannot be determined by the tuberculin test, or by any other procedure of the examination, during the first 3 to 7 weeks of development. This period is required for allergy to tuberculo-protein to develop to such a degree as to cause a reaction. At the opposite extreme of the evolution of tuberculosis—when the disease is rapidly progressive or is approaching a fatal termination—allergy may so decrease that it cannot be detected by the usual test. In such cases, however, it is extremely rare for allergy to disappear completely, and it can usually be detected by administration of sufficiently large doses of tuberculin.

Twenty-five years ago, the tuberculin test was believed to be only applicable to children; but experience has taught that it is of great value in testing persons of any age. In the Minneapolis area, more than 90 percent of the young adults, and even many elderly persons, do not have primary tuberculosis, and are therefore nonreactors to tuberculin.

It has been found that as an epidemiological agent, the test excels every other procedure of examination. The tuberculin reactor has received tubercle bacilli from some person or animal, and often the contact has been directly with a person emitting tubercle bacilli. On numerous occasions, only the tuberculin reaction of a child or adult has revealed unsuspected infectious cases among his associates.

Every person who reacts characteristically to tuberculin has tuberculous lesions, regardless of his state of health and the lack of other evidence. Such a person has tuberculosis just as certainly as the patient who is dying from the disease. The difference is one of degree. In the person who is dying, the disease has evolved through various stages; but at one time that person could have been found to have no evidence of tuberculosis except the tuberculin reaction.

The test excels, further, in determining the effectiveness of a tuberculosis control program. In 1926, for example, children in grade schools selected throughout the city of Minneapolis were tested with tuberculin, and 47.3 percent reacted. Tuberculosis control measures were increased by adding sanatorium beds, by eliminating infected cattle from herds, by more extensive educational work, etc. The effectiveness of the additional measures could only be determined by the tuberculin test. In 1936 the test was given in the same schools; 18.9 percent reacted, and control measures were again intensified. Testing in these schools in 1944 revealed that only 7.7 percent of those tested were reactors.

Among the children 6 years of age tested in 1926, the percentage of reactors was 20.8, representing an infection attack rate of 3.46 per year. In 1936 the percentage of 6-year-olds who reacted was 13.5, and in 1944 only 2.1 percent reacted—an attack rate of approximately one-third of 1 percent per annum. Hence, of 300 uninfected children aged 6 or under in 1926, about 10 were infected by 1927; whereas only 1 of 300 uninfected in 1944 was infected by 1945.

Among the 6,668 grade-school children tested in 1944, only 512 reacted; and of these, all but 17 who declined for such reasons as refusal of parents, were given X-ray inspection. Of the 495 inspected, only 68 presented X-ray evidence of calcium deposits, and 4, evidence of pleural adhesions. Had X-ray inspection alone been used and the assumption made that the 72 were tuberculous, only 14.5 percent of 495 with tuberculosis to some degree would have been recorded as having the disease, and the other 423 would have been overlooked. The total picture of conditions thus would have presented a fallacious aspect. Had morbidity and mortality rates been used exclusively as evidence, an even greater sense of false security would have been occasioned.

Jordan, using the same control methods, achieved the ultimate among school children in Minnesota. In 1930, 14.3 percent of the children in an appreciable number of schools reacted to tuberculin. In 1944, no child in these schools was a reactor. It could be said, in passing, that only the tuberculin test could have informed him that this goal had been attained.

The tuberculin test has been our best educational agent. It has given more usable information to more people than any other implement of tuberculosis work. When one has a characteristic reaction and perceives that others have no reaction, he apprehends that he differs from them—that he has something which they do not have. His curiosity is aroused; he immediately experiences a personal interest and manifests a desire for information. If the facts concerning the significance of the reaction are properly presented—if tangible evidence, in other words, is proffered—he is likely to act upon recommendations made for his welfare. One who does not react, on the other hand, can appreciate that he has escaped something that has overtaken the other. He is desirous of information regarding the prevention of tuberculous infection.

THE X-RAY

In the tuberculosis control work in Minneapolis, X-ray film inspection of the chest was only resorted to in 1920 when symptoms or physical signs were present. This procedure was continued among the university students until 1929. When the work among children was begun in 1921, however, routine stereoscopic X-ray films of the chests of all children were requested, regardless of the presence or absence of symptoms, physical signs, or tuberculin sensitivity. X-ray observation in 1921 revealed findings that were almost unbelievable. Shadows, varying from those barely visible to those representing extensive disease in both lungs, appeared on the films of children and young adults who had seemed to be in excellent health. And even after this evidence was made available, abnormal signs could often not be elicited by the conventional examination. During the next few years, such observations were so frequent that it was concluded that examination of the chest was of little value without supplementary X-ray films. Efforts were made immediately to publicize, through journals, talks, and exhibits, the importance of this procedure in every chest examination.

During the first decade of the Minneapolis work, however, the excessive cost of X-ray inspection was recognized as an absolute deterrent to its use. Then in 1931 a photographic emulsion was placed on paper, forming a substitute for the cellulose film. Through use of the paper film, rapid exposing, developing, and reading was possible. In a single working day, more than a thousand exposures could be made with one machine, greatly reducing the cost of the finished product. A year later the work that had been done by this method was thoroughly investigated, and comparative studies, using persons in the Minneapolis survey, were made of the new paper and the cellulose film. All significant shadows on the cellulose films were as clearly seen on the paper ones. Because of its economy and potentialities, the paper film was immediately adopted and highly recommended.

The new method was soon applied to the production of photofluorograms—the 35-mm., the 4 x 10-inch, and finally, the 70-mm. size. All of these techniques have proved to be equally satisfactory in detecting and determining the extent of pulmonary lesions. The X-ray problem that seemed insurmountable in the twenties has been reasonably well solved.

During the first 10 years of the Minneapolis study, many physicians believed that most children were infected with tubercle bacilli, and that evidence of the primary lesions should be visible on X-ray films of the chest. There was a tendency, therefore, among those who described films, without knowing the results of corresponding tuberculin tests, to report a disproportionate amount of calcification in the parenchyma, root region, or both. This resulted in a tremendous difference between the number reacting to tuberculin and the number reported to have X-ray evidence of calcium deposits. If all shadows so reported, and all tuberculin reactions, had indicated primary tuberculosis, the discrepancy would not have occurred.

It may be offered, by way of illustration, that of 1,412 cases described in 1925, 1,024 were said to present evidence of calcium deposits. Of these, only 45 percent reacted to tuberculin. Again in 1927, 2,816 cases out of 4,500 were said to present evidence of calcification; but only 1,569 of those with "calcium deposits" were tuberculin reactors. Two questions were asked: (1) Why do so many tuberculin reactors present no evidence of calcification? and (2) Why is so much evidence of calcification reported among nonreactors to tuberculin? Concerning the first, the following was offered:

> The foci may be so small as to cast no shadow on the X-ray film, or they may be in some part of the chest not readily accessible to X-ray inspection.

Concerning the second:

> There is the possibility that the interpretation is not correct in all of the cases. The calcification may be due to other causes than tuberculosis, and a tuberculous lesion resulting in calcification may become completely healed and sterilized so as to give no evidence of infection by the tuberculin test.

In 1927, McPhedran showed that round shadows may be cast by vascular trunks so directed towards the target that the primary ray is approximately axial, and that semi-oval shadows are often recorded when the plane of the curve of vascular trunks is directed slightly above or below the axis of the ray. Obviously, many persons reading X-ray films had been interpreting these vascular shadows as deposits of calcium. The error, it seemed, had occurred frequently in reports of the Minneapolis work, and in 1930 all of the previous films were reinterpreted.

In 1941, 5,968 children who had been nonreactors to tuberculin throughout the observation period were reported, as well as 4,377 who had been reactors. There was X-ray evidence of calcification in 1.2 percent of the former and in 27.6 percent of the latter. Neither coccidioidomycosis nor histoplasmosis is endemic in Minneapolis (though some persons from endemic areas immigrate), and apparently no other fungus infection results there in a significant number of calcium deposits. There are other causes of pulmonary calcification, however, such as foreign bodies, which probably account for the majority of calcium deposits among the Minneapolis nonreactors and for a small percentage among the reactors.

The tuberculin reaction practically coincides with the results of careful post-mortem examinations both in human beings and animals. Primary lesions can be found, that is, in the body of nearly every tuberculin reactor, irrespective of the cause of death, if sufficient time and care are given to the examination. The wide discrepancy between tuberculin reactions and X-ray evidence of the presence of primary lesions in the living body has been explained by pathologists. Sweany offers the following:

(1) Many of the primary lesions of tuberculin reactors never attain such size or density as to cast visible shadows. Eight to twelve weeks after primary lesions are established, there is rarely X-ray evidence in more than 5 to 10 percent of the cases in which they exist. From 1 to 5 years later, however, enough calcium has been deposited in some of the lesions to cast shadows that appear on the films; but even this rarely occurs in more than 25 percent of the cases, and usually in much less.

(2) In approximately 25 percent of the lungs, primary lesions develop that are obscured by shadows of other structures, such as the heart or diaphragm.

(3) In an appreciable number of persons with primary tuberculosis (10 to 12 percent), the lesions have extrathoracic locations.

One would expect little correlation, therefore, between tuberculin reactions and X-ray evidence of the presence of primary lesions.

Among the Minneapolis children who reacted to tuberculin from 1921 to 1931, X-ray film inspection of the chest so rarely revealed evidence of significant disease in those under 12 to 14 years of age that its use upon young children was discontinued. To date, no reason for changing this procedure has been found.

During the first 10 years of the study, no significant disease could be detected on one film of the stereoscopic pair that was not equally discernible on the other. Stereoscopic film production was therefore discontinued, and single-film inspection has since been used.

The 10-year data also revealed that no phase of the examination had resulted in discovery of a single proved case of either primary or reinfection type of tuberculosis among nonreactors to tuberculin. From 1921 to 1941, 5,968 children who were nonreactors to tuberculin throughout the period were observed. In 95.6 percent, no evidence of disease of any kind was detected by X-ray film inspection of the chest, and in the remaining 4.4 percent, there was only evidence of pleural changes, calcium deposits, and nontuberculous pulmonary disease. Among 4,377 reactors, on the other hand, only 58.1 percent had films that were entirely clear. The remaining 41.9 percent gave evidence of such pathologic conditions as pleural changes, primary lesions in the pneumonic or atelectatic stage, calcification, nontuberculous pulmonary disease, and pulmonary tuberculosis of the reinfection type. The unimportance of making chest X-ray films of nonreactors to tuberculin in searching for tuberculosis of any form, and the great importance of periodically making such films for all adult reactors, were further manifested by these observations. Chest X-ray inspection of nonreactors was discontinued.

The Minneapolis work has indicated that an extremely valuable use of the X-ray is in the periodic inspection of the chests of adult reactors to tuberculin—those who react upon first examination as well as those who become reactors later. Between 1921 and 1926, for example, 1,033 children who were reactors upon first examination were again observed. Fifteen, at the average age of 14 years, showed evidence of already having the reinfection type of pulmonary tuberculosis. Nine of these died at the average age of 20; in 1941 the 6 survivors were 26 years old. By that time, 41 others had developed pulmonary tuberculosis of the reinfection type. Two of these had died of tuberculous pneumonia in infancy, and the remaining 39 had shown evidence of chronic reinfection at the average age of 19. Of these, 14 died at the average age of 22; and the remaining 25, at an average age of 26, were still living in 1941. Of the 1,033 children first mentioned, there were 18 who, at first examination or later, gave evidence of the reinfection type of extrathoracic tuberculosis.

From 1921 to 1926, 216 children became tuberculin reactors. By 1941, 13 had developed pulmonary tuberculosis of the reinfection type, detected at the average age of 20 years. It was observed, throughout the period, that after the chronic reinfection type of pulmonary tuberculosis was first detected by X-ray shadow, 2 or 3 years usually elapsed before it evolved to such proportions that symptoms appeared, stethoscopic findings were present, or tubercle bacilli were found in the sputum. This again emphasized the great importance of periodic X-ray inspection of the chests of all adult tuberculin reactors. Beyond a doubt, the high mortality among the earlier cases was due, in part, to insufficient X-ray inspection of their chests, and it was accordingly recommended that the interval between X-ray inspections never exceed 1 year.

In the Minneapolis work, a considerable number of adult tuberculin reactors have recently been seen who at first present clear X-ray films of the chest, but within a year show evidence of moderately or far advanced disease. When inspection was made for reasons such as symptoms, surveys, etc., extensive disease was found in some cases within 3 to 6 months after clear chest films were observed. Apparently this occurs in a minority of tuberculin reactors who develop the chronic reinfection type of pulmonary tuberculosis as a result of bronchogenic spread from lesions of the previously existing primary complexes. It now appears, however, to be a sufficiently large minority to suggest strongly that annual X-ray inspections of the chests of adult reactors are inadequate, and that inspections should be made at least every 6 months. In the Minneapolis area, the number of adults who react to tuberculin has become so small that such inspection is a physical possibility.

At the beginning of the Minneapolis work, it was held that all who were to develop clinical tuberculosis would do so in early life. Observation has shown, however, that demonstrable clinical lesions develop in tuberculin reactors of any age. The futility of setting an age limit, such as 25 years, for discontinuing periodic X-ray inspection of the chest is therefore obvious. These inspections should be continued, regardless of age, as long as the person reacts to tuberculin.

Although the great value of X-ray inspection of the chest was early recognized, enthusiasm for this phase of the examination was never allowed to outrun judgment. It was obvious that the X-ray had serious limitations, and that it was just as important to establish facts concerning them as concerning its advantages. Data on all phases of the examination, accumulated for 10 years, were analyzed. The results showed that a good many persons who had been diagnosed as tuberculous because of chest X-ray shadows did not have pulmonary tuberculosis, but had, instead, other pulmonary pathologic conditions that produced shadows indistinguishable from those cast by tuberculous lesions. The number of such cases was so large that the observers were convinced that X-ray shadows were never pathognomonic.

It was strongly recommended, therefore, that no one—roentgenologist, pediatrist, internist, surgeon, or chest specialist—attempt to diagnose any pulmonary pathologic condition by X-ray. It was further recommended that those reading films limit themselves to describing shadows with reference to location, extent, etc., and then list the conditions that might have resulted in the shadows. And it was pointed out that actual diagnosis could only be made by other phases of the examination—that it was enough for the X-ray to supersede other investigative procedures in locating areas of disease. To attempt to carry the X-ray beyond this point is to enter the field of speculation in diagnosis. Moreover, to attempt to determine the activity of proved tuberculous lesions by a single X-ray shadow is preposterous. In the years following the demonstration, no evidence has been adduced to change this opinion.

DETERMINING ACCURATE DIAGNOSES

In 1921, symptoms such as marked loss of weight, anemia, and fever played an important role in the diagnosis of tuberculosis among children. X-ray shadows and physical signs, such as rales and those thought to indicate the presence of large lymph nodes at the roots of the lungs, particularly d'Espine's sign, were given much consideration. Little attention was paid to evidence elicited by the tuberculin test, and diagnoses were often based upon rales or X-ray shadows in nonreactors. Long observation revealed that such diagnoses were never correct. Lesions thought to be tuberculous proved to be the result of conditions such as bronchiectasis, abscess, and unresolved pneumonia.

In Minneapolis the tuberculin test was administered routinely from the first, and all were given stereoscopic X-ray inspection of the chest, regardless of the tuberculin reaction. In addition, a number of special procedures were included. Data were assembled that later proved of extreme value in determining the efficacy of the various diagnostic methods.

Although a characteristic tuberculin reaction is sufficient to justify a definite diagnosis of the primary type of tuberculosis, it gives no information as to the presence or absence of the reinfection type. But since this type develops only in persons who are sensitized to tuberculo-protein, it is obvious that any lesion demonstrated in the body of a tuberculin reactor may represent this type of disease. That a person reacts to tuberculin is not proof, of course, that a given lesion is tuberculous: nontuberculous pulmonary lesions are as likely to develop in the bodies of reactors as in those of nonreactors. Hence, the tuberculin test serves only to identify persons with primary tuberculosis who may, at the time of testing, have the reinfection type of disease, or may subsequently develop it. This, in itself, is a definite requisition for other procedures in examination.

X-ray inspection of the chest constitutes but one of these procedures. When lesions are sufficiently large and dense to be regarded as evidence of gross pathologic processes, they absorb X-rays so as to cast shadows on sensitized film. But the shadows, it should be emphasized, are not pathognomonic: one cannot determine whether they represent tuberculous or nontuberculous lesions. Hence, the X-ray denotes those persons with gross pulmonary disease, but does not determine its etiology. By chest X-ray shadows alone, it is impossible to differentiate new primary lesions from those of the reinfection type. Only when the duration of the sensitivity to tuberculo-protein is known is such a differentiation immediately possible.

Calcification revealed by chest X-ray films of nonreactors to tuberculin is almost never due to tuberculosis except in an undetermined percentage where all tubercle bacilli in the body have died and the allergy has disappeared. The recent work of Aronson, Palmer, and Christie has revealed that in certain parts of the country, the long-suspected fungi are responsible for far more of the calcium deposits in human bodies than is the tubercle bacillus. This is true in the areas where coccidioidomycosis and histoplasmosis are endemic. Tests specific for tuberculosis, coccidioidomycosis, histoplasmosis, etc., are therefore essential in diagnosis. It is also true that not all calcareous deposits in tuberculin reactors are due to tuberculosis. The deposition of calcium is not a specific process, and therefore evidence of calcification found in chest X-ray inspection never justifies a diagnosis of any disease.

When a lesion is found in a tuberculin reactor through the shadow it casts, its etiology must still be determined. Symptoms and signs elicited by the conventional physical examination are not pathognomonic; when due to pulmonary tuberculosis, they are usually not in evidence until the disease has reached an advanced stage; and therefore symptoms and conventional physical signs are of little value in differential diagnosis.

Like the tuberculin reaction, the recovery of tubercle bacilli is specific for tuberculosis. This is not true of evidence obtained by any other procedure in the examination. When a tuberculin reaction denotes the presence of tubercle bacilli, our immediate concern is whether they are being liberated from the suspected lesion, constituting a hazard to the infected person and his associates. In the Minneapolis work, gastric lavage has been employed with considerable success upon failure to find acid-fast bacilli in the sputum, or in the absence of sputum. Pulmonary lavage, however, though said to be harmless, has not been used. The examinee's body is inspected for draining sinuses, and if found, the discharges are searched for acid-fast bacilli. Examinations of feces for bacilli have occasionally been made.

In the early years of the Minneapolis work, the recovery of acid-fast bacilli was regarded as prima facie evidence of tuberculosis. Errors in diagnosis resulted, however, for the following reasons:

(1) Some acid-fast bacilli are nonpathogenic saprophytes.

(2) Containers, though sterilized, may retain dead tubercle bacilli from previous specimens if the proper methods are not used to insure their disintegration.

(3) Laboratory mistakes occur, such as mislabeling and confusing of specimens, as well as improper identification.

Hence, in questionable cases, only a presumptive diagnosis is made when acid-fast bacilli are found, and the final judgment awaits the evidence of culture, or better, of animal inoculation.

Failure to discover tubercle bacilli in any suspected case does not prove their absence. Perseverance may result in their disclosure weeks or even months after the search is begun.

Serial X-ray film inspections of lesions are helpful when tubercle bacilli cannot be recovered. Lesions that produce shadows thought to represent tuberculosis often prove to be due to acute infections, which may disappear promptly; and in such cases, films made 1 month later are usually clear. Infections of this kind were apparently responsible for 10 to 15 percent of the rejections for military service in World War II.

The Minneapolis observations have revealed that many lesions found by X-ray among adults have neither receded nor progressed, as far as can be determined by shadows, throughout the observation period. This finding, in the absence of other evidence, strongly suggests stability; and if a diagnosis of tuberculosis is justified (such lesions are often nontuberculous), the disease may be classified as arrested or apparently cured. Again, shadows on serial films may show evidence of decrease or increase in size, as well as of persistence, thus indicating instability. When such shadows are due to tuberculous lesions, there may be a total absence of symptoms; but if they are due to such conditions as unresolved pneumonia, abscess, etc., the final diagnosis is assisted by evidence of toxemia, blood findings, etc.

Among adults, particularly those over 35 years of age, there is enough likelihood that a recently discovered pulmonary lesion is malignant to suggest that waiting for a long series of films would be dangerous. If the shadow does not disappear promptly, the bronchoscopist should always be consulted. "X-ray diagnosis" in the early years sometimes resulted in failure to diagnose malignancy until it was widespread. Bronchoscopy, skillfully performed, does no harm, and in many cases results in accurate diagnoses, which are impossible in its absence.

As diagnostic evidence, the red blood cell sedimentation rate has not been especially efficacious among the Minneapolis examinees. It has often been found to be within normal limits in persons with recent, sizeable primary and reinfection type of tuberculous infiltrations. When the rate is accelerated, one may question its importance, inasmuch as it is not pathognomonic. It has been found of considerable value, however, in observing the course of disease in well-established cases when other conditions have, as far as possible, been ruled out. As differential leucocyte counts are not pathognomonic, they have not been taken routinely in the Minneapolis work.

The futility of making a diagnosis of tuberculosis in the absence of a tuberculin reaction or a recovery of tubercle bacilli has been emphasized. This practice has always led to incorrect diagnoses. The only results of the examination that give specific information are demonstrations of a sensitivity to tuberculin and of the presence of tubercle bacilli. Evidence obtained through all other procedures permits only speculation.

SURVEYS

The manifest value of stereoscopic chest X-ray inspection of apparently healthy persons occasioned a provision, in 1922, whereby all of the 2,000 students in a Minneapolis high school were offered this service without charge. It was expected that chest lesions would be brought to light, and that physicians would then be convinced of the need for chest films of all apparently healthy adults. The school officials approved the survey; it was widely announced and encouraged. But unfortunately, the time was not ripe. The idea was belittled by many persons, including some physicians. Not enough educational work had been done to dispel the old prejudices or to convince physicians that X-ray inspection of the chest is more valuable in determining the location and extent of pulmonary lesions than any other procedure of the physical examination. Only a small number of the 2,000 students availed themselves of the opportunity. Although the response was discouraging, enthusiasm was not dampened—nor could it have been by any amount of opposition. Evidence of the efficacy of this procedure continued to accrue.

The second special tuberculosis survey was begun in 1933, when an adequate examination of all employees for tuberculosis was made mandatory by the Minneapolis Board of Education. The examination consisted of a tuberculin test, X-ray film inspection of all reactors, and a complete follow-up of those who presented shadows that might have resulted from tuberculosis. X-ray films of the chest were required of those who had recently been tested with tuberculin and of those who refused the test. Had the examination been voluntary, some of the persons found to have clinical tuberculosis would not have been examined, as they were among those who strongly opposed the procedure on grounds of legality, personal liberty, and so forth. Of the 3,602 members of the personnel, only one, who resigned, escaped the examination; whereupon it was discovered that she had known for several years that she had infectious pulmonary tuberculosis. She had been employed to prepare food for high school students.

Other surveys, in recent years, have consisted in the administration of tuberculin tests to high school students and in the subsequent inspection by X-ray of those who accepted investigation, regardless of the tuberculin reaction. A recent survey of personnel of the school system consisted only of making chest films of those who volunteered, and free chest X-ray inspection has been offered in two or three districts of Minneapolis. In none of the recent surveys has the desired number of persons been reached.

The mass survey of school personnel in 1933 and 1934 has been the only satisfactory one to date: it reached everyone. This represents a goal that must be obtained, or nearly so, in any survey that is to be satisfactory. By adequate education and a suitable approach to all citizens, it can be attained.

The work among the 19,000 or so children and 10,000 adults, under observation between 1921 and 1941, and among the 50,000 or so students entering the University of Minnesota between 1928 and 1946, has constituted by far the best survey conducted in the city of Minneapolis. If the X-ray films of these thousands of persons were to be inspected without knowledge of the results of the work, the information derived would be meager. There would be no indication of how many, or of which ones, had primary lesions; and it would be impossible, even, to determine with accuracy which of those with gross lesions had tuberculosis. If the same observers, on the other hand, were to review the complete records—taking into consideration the results of tuberculin tests, X-ray films, and clinical and bacteriological examinations—they would form a true concept of the tuberculosis situation in the groups under observation from year to year.

Facts were established through this procedure that could not have resulted from any other. From 1921 to 1941, for example, 1,011 children were observed who reacted characteristically to tuberculin between birth and 5 years of age. Fourteen (1.38 percent) died from acute reinfection type of tuberculosis; six, from meningitis; five, from generalized miliary disease; and three, from tuberculous pneumonia. Thirteen others (1.29 percent), of whom none died, developed extrathoracic reinfection type of tuberculosis—e. g., bone and joint lesions. Hence, only 27, or 2.7 percent, developed significant clinical lesions in childhood. These observations indicate that at least in this community, infection with tubercle bacilli in infancy and early childhood is well tolerated.

Of 2,979 children, from 6 to 14 years of age, who reacted to tuberculin at the time of the first examination, none gave a history of illness or became ill from the primary lesions. During this age period, extrathoracic lesions of the reinfection type were already present or became demonstrable in 36 instances, and chronic pulmonary tuberculosis of the reinfection type was present in 30. The majority of chronic pulmonary lesions was found in those between the ages of 12 and 14.

Of the many persons observed in the Minneapolis work, more than one thousand adults—mostly students of nursing and medicine—have developed primary tuberculosis while under observation. They have tolerated the first infection type of tuberculosis as well as have those infected in childhood; and moreover, they have not developed, subsequently, significant chronic reinfection type of tuberculosis to a greater degree than have those who entered the observation group as tuberculin reactors. The theory propounded in 1920, therefore—that a first infection postponed to adulthood is exceedingly hazardous—is untenable in Minneapolis. Effort to prevent children from becoming infected with tubercle bacilli is sound practice in tuberculosis control: the longer infection is postponed, the better—in the individual or in the community.

TREATMENT OF TUBERCULOSIS

When the studies on children were begun in 1921, practically no differentiation as to treatment was made between the first infection and the reinfection type of tuberculosis. The vast majority of diagnoses were made when symptoms caused persons to seek examination. These were mostly adults. Of those whose symptoms were found to be caused by tuberculosis, 80 to 90 percent had the disease in an advanced stage, and for the most part were infectious. When shadows of tuberculous lesions were seen in children and young adults who were apparently in excellent health and at the time, presented no other evidence except the tuberculin reaction, it was assumed that the majority of these lesions represented clinical disease that would progress, causing illness and death, if not promptly and adequately treated. In those days, treatment consisted largely of rest in bed, either in the home or in an institution. Artificial pneumothorax was not in general use in Minneapolis, and no one had been treated by chest surgery. As the years passed, the fact became apparent that all reactors to tuberculin have lesions of the primary type, determinable as to location in only a small percentage during life.

The Lymanhurst School for Tuberculous Children, with a capacity of 175, was recommended for those who were anemic, below weight, or who presented evidence of calcium deposits, etc. It was thought that special care in such an institution would aid in so controlling the lesions that they would be harmless in adulthood. A much larger number of children with such conditions, who could not be accorded this privilege because of the limited capacity, served as controls. After the school had been in operation for 13 years, the data were analyzed. Surprisingly enough, the children who had remained at home with no treatment other than attempts to prevent exogenous reinfection had fared as well as those treated in the school.

Two hundred and twenty other children were observed while their primary tuberculosis was in the pneumonic or atelectatic stage. Sanatorium care was strongly recommended, despite the fact that the children were ostensibly in excellent health. Some families accepted this recommendation; others refused. To the latter, the Lymanhurst School was offered, but this was also declined by some. The children were thus divided into three groups: those who were treated in a sanatorium, those in a special school, and those who remained at home. An unusual opportunity was afforded to observe, under three different conditions, the course of the disease and the response to treatment.

No difference could be found among the lesions of the three groups when these children were later seen. Those who received strict bed rest had fared no better than those in the special school, who in turn showed no advantage over those who remained at home: the course of the disease was the same, whether little or much was done. In due time, all of the pneumonic and atelectatic lesions had so diminished in size that they could not be detected by X-ray film inspection. Often this required 2 or 3 years. In some cases, calcium deposits subsequently appeared at the site of a previous lesion, in the regional lymph nodes, or in both locations; while in others, the chests remained entirely clear. It was impossible, moreover, to observe any difference in the incidence of development of the reinfection type of tuberculosis among the three groups of children when they attained adulthood. Those who were treated, as children, in a sanatorium were just as likely to develop the reinfection type of disease in adult life as those who remained in their homes or in the special school.

Thus, the problem of treating children affected with primary tuberculosis—one that seemed of great magnitude at the start of the work—was found to be no problem at all. This was also true among the university students with primary tuberculosis, regardless of the stage of development of the disease. It was therefore recommended in 1933 that all aspects of treatment of the first-infection type of tuberculosis among children and young adults be discontinued—that the funds allocated for this purpose be used to test much larger numbers of children with tuberculin, in a search for the source of infection of the reactors, and to examine annually the chests of all reactors upon attainment of adulthood. Subsequent observation has resulted in no evidence to show that the primary type of tuberculosis, either in children or in adults, requires treatment. There are two important procedures, however, to be followed for everyone found by the tuberculin test to have tuberculosis, regardless of X-ray shadows: (1) prevent exogenous reinfection, and (2) examine annually all who have attained adulthood, including always X-ray film inspection of the chest.

In Minneapolis, experience in treating the reinfection type of pulmonary tuberculosis has been the direct opposite of that in treating the primary type. Although many persons recover spontaneously, the percentage in whom the reinfection type progresses to incapacitating and killing proportions is too high to permit taking the risk involved in not treating a given active lesion. Serious injustice could result from a recommendation of treatment for every lesion found on the first examination, as many of them, regardless of size, have long since been controlled by the body defense mechanism, and therefore require no treatment whatever. Unfortunately, this status usually cannot be determined except by an extended observation.

As age advances, there is an accrual of minimal lesions that have come under control. These may be of long standing. Hence, not all minimal lesions are early. And on the other hand, not all early lesions are minimal. Indeed, a considerable number of lesions are moderately or far advanced when first detectable.

To find lesions as early as possible and to treat them immediately has been a major objective in the Minneapolis work. Only in cases where evidence of infection is limited to the tuberculin reaction can we be sure that a given lesion is early. Only in such cases can there be a subsequent development of the reinfection type of tuberculosis. If these cases are reexamined at sufficiently close intervals (every 6 to 12 months), pulmonary lesions in those who develop them will be found relatively early, when the majority are minimal. A minority will be in an advanced stage. Such cases rarely have symptoms or are infectious when found, and frequently prompt and adequate treatment prevents them from falling ill or becoming contagious. For more than 20 years, such cases have been treated successfully in Minneapolis with ambulatory artificial pneumothorax. When this is not indicated because of extent of disease, temperament, or other reasons considered valid, hospitalization has been recommended as in all cases of active tuberculosis.

Every community should have a bed for each infectious case. Tuberculosis cannot be controlled if tubercle bacilli are allowed to disseminate in the home or community. The protest is often made that it is pointless to conduct tuberculosis surveys because beds are not available for the contagious cases found. This is intolerable. All infectious cases should be located, regardless of bed shortage. A statement of the actual number of beds needed is the strongest argument in requesting them. And moreover, while beds are being procured, at least partial isolation can be arranged for many persons in their homes. A considerable number can be rendered noninfectious by collapse therapy, particularly artificial pneumothorax.

It is believed that the most important factors in improving the tuberculosis situation among children and young adults in the Minneapolis area have been the prevention of cases of clinical tuberculosis from becoming infectious, the isolation of those who are infectious, and the eradication of tuberculosis from cattle.

For several years the most troublesome problem has been among students of nursing and medicine. In one Minneapolis hospital, however, a very effective contagious-disease technique has been developed. The medical students have been protected against contagion to such a degree that the number of infections contracted while in school has been markedly reduced, and for more than 3 years not one case of clinical tuberculosis has developed among the students.

The tuberculosis-control program in the city of Minneapolis has developed slowly but constantly over the past quarter of a century. Every promising procedure that has been suggested anywhere in the world has been tried. Those found to be impractical or of little value have been discarded, and those that could be used to advantage, retained. Awkward and short-cut methods have been discouraged. The results have been a decrease in morbidity, as attested by the fact that 750 beds were needed in the county sanatorium 12 years ago and that, at present, there are 150 to 200 beds vacant; a decrease in the mortality rate, from 120 per 100,000 in 1920 to 27.1 in 1945; a decrease in the incidence of primary tuberculosis among grade school children, from nearly 50 percent in 1926 to approximately 8 percent in 1944; a contrasting annual infection attack rate among young children—3.5 percent in 1926 and 0.003 percent in 1944; and a decline in mortality among children up to 5 years of age, from a high rate in 1920–30 to not a single death from tuberculosis in 1945.

With a fundamental program of proved effectiveness, a complete solution of the tuberculosis problem in Minneapolis could be promptly achieved. That it is necessary to maintain a 3-million-dollar sanatorium costing three quarters of a million dollars a year to operate is absurd. In a single decade, the required number of sanatorium beds could be reduced to 100; the mortality rate, to less than 10 per 100,000. Children with primary tuberculosis, as manifested by the tuberculin reaction, would be almost curiosities. And within the second decade, tuberculosis could be reduced to the irreducible minimum. Present knowledge, equipment, and workers, combined with an intelligent public, are all that is needed to organize, to begin work, and to persevere.

Inexpensive X-ray inspection of the chest of each adult would reveal practically everyone who, at the time, has infectious tuberculosis. The number of such persons in Minneapolis would not be as large as many suspect—probably less than 300. With their removal to hospitals and sanatoria, some would be restored to good health, and infection removed from the city. The tuberculin test would then detect promptly all remaining persons with primary tuberculosis, of whom the total number would probably not exceed a fourth of the entire population. The other three-fourths, as well as those who subsequently migrate to the city, should have the test at least every 2 years, and preferably annually. Those who react to tuberculin on first testing, and those who are later found to be reactors, should have thorough annual examinations, including X-ray inspection of the chest; and those who have developed the reinfection type of tuberculosis should be treated at once, and isolated in hospitals and sanatoria if the disease becomes infectious. The responsibility for these accomplishments lies with those in charge of the public health. Failure to achieve them—failure to control completely, and ultimately to eliminate tuberculosis—is unpardonable.

THE PERSISTENCE OF FLUOROSCOPIC SCREENS [1]

By Willard W. Van Allen, *Physicist, United States Public Health Service*

The luminescence produced in phosphors by excitation with visible light, ultraviolet or X-rays has long been recognized as consisting of emission of two distinct types: (a) fluorescence during excitation, and (b) phosphorescence after the exciting radiation has been cut off. These two types of luminescence differ from each other both in the mechanism by which they are produced and in their characteristics of wave length and duration. Phosphorescent emission is of longer wave length than fluorescent emission and phosphorescence last for an appreciable time after termination of the exciting radiation, whereas fluorescence occurs only during excitation or, at the most, only a few microseconds thereafter. The mechanism of these phenomena has been discussed by Mott and Gurney (*1*), Hirschlaff (*2*), Riehl (*3*), and others.

In the case of phosphors used in X-ray intensifying and fluoroscopic screens, the characteristics of the phosphorescent emission are of interest especially in regard to the time during which this light emission persists and the rate at which its intensity falls off. The delay in returning to the dark state is generally termed the "lag" or "persistence" of the screen. It is well known that screens of different

[1] From the Electronic Laboratory, Radiology Section, Tuberculosis Control Division, United States Public Health Service.

types as well as different screens of the same type exhibit wide differences in persistence. For example, the green-fluorescent screens such as the Patterson type B have an extremely short period of phosphorescence, whereas the blue-fluorescent screens show an enormous range of persistence, from a very short period in some phosphors to a time so long as to render them almost useless.

In many applications, a fairly long persistence offers no disadvantage or may even be intentionally utilized to advantage. On the other hand, in photofluorography or in high-speed radiography, where pictures are taken in rapid succession, screens with a long persistence cannot be used satisfactorily. Even when the persistence of a screen is within the limits of tolerance for a single exposure, the phosphorescence "builds up" during successive exposures until it reaches values many times greater than that after a single exposure. This accumulated persistence is of particular importance in connection with exposures which follow each other in rapid succession, as in chest X-ray survey work, since the increasing amount of light due to phosphorescence produces pictures of decreasing contrast. Furthermore, where the exposures are controlled by a photoelectric timer, this persistent phosphorescence causes the successive exposures to be prematurely terminated. This results in pictures being underexposed as well as lacking in contrast.

In order to study quantitatively the phosphorescent characteristics of fluoroscopic screens and to compare the persistence of various commercial and experimental screens, the following method was devised. A photoelectric cell of the multiplier type was arranged to receive the light emitted by the screen under examination. The output current of this tube was fed to the galvanometer string of an electrocardiograph which served as a recording microammeter. The electrocardiograph was used as a recording device merely because it was available and served the purpose, but obviously any other device of comparable sensitivity, such as a recording oscillograph, could have been used as well. Since the intensity of the light emitted by the screen during excitation is several thousand times that emitted during the period of phosphorescence, a relay was provided to decrease automatically, by a known amount, the sensitivity of the recording element during exposure. This enables the recording of the light intensity during exposure and also gives maximum sensitivity for recording the much smaller intensities of phosphorescence. The circuit is shown diagrammatically in figure 1, and a typical recording is reproduced in figure 2.

Using the apparatus described above, curves are readily obtainable showing the rate of decay of phosphorescence of screens under any desired conditions of exposure. In studying the characteristics of screens adaptable to photofluorography, for example, exposures were made of 0.1-, 0.25- and 1.00-second duration at 85 kv. (peak) and 100 milliamperes through a phantom of 10 cm. of Masonite presdwood.[3]

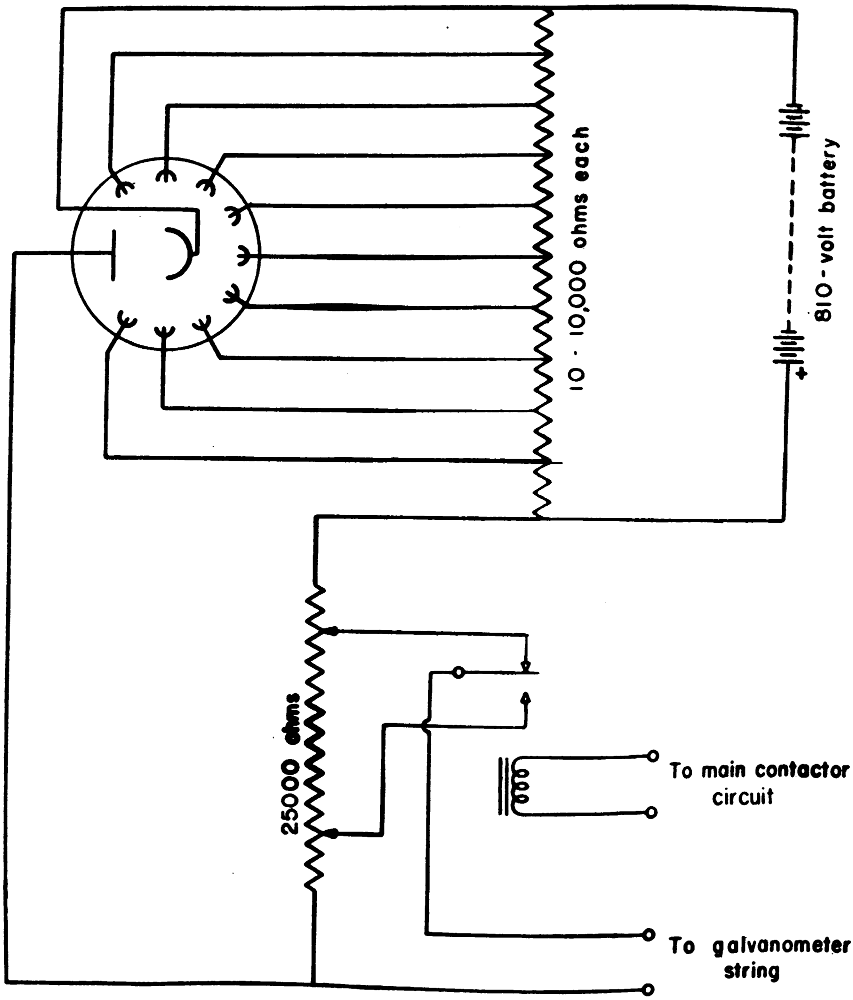

FIGURE 1.—Schematic diagram of circuit used to measure phosphorescent lag of fluoroscopic screens.

The resulting curves for four different screens are shown in figure 3 from which the very great differences in behavior of screens is readily apparent, and a means of comparison of one screen with another is easily afforded. In each set of curves, *A* represents the decay of phosphorescence after a 0.1- second exposure; *B*, after a 0.25- second

[3] A phantom composed of 10 cm. of Masonite presdwood has been shown by Chamberlain to be equivalent to the average chest. See Chamberlain, E. W.: Fluoroscopes and Fluoroscopy. Radiology, vol. 38 (April 1942).

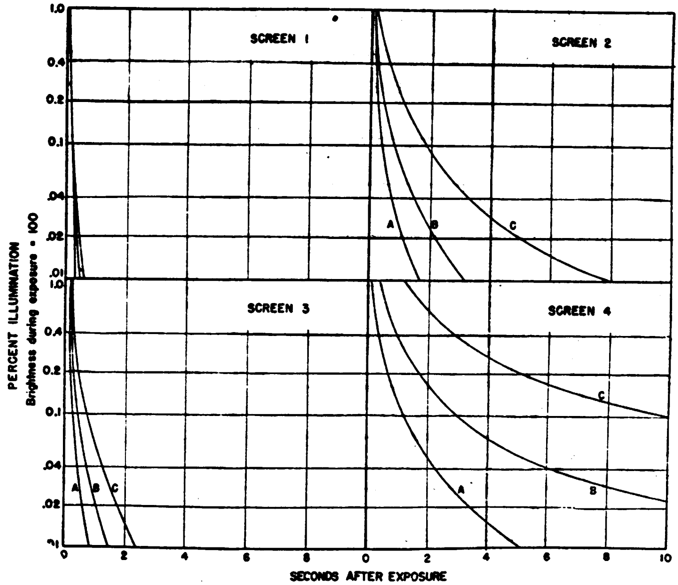

Figure 3.—Curves showing decay of phosphorescence for four different screens. *A*, after 0.1-second exposure; *B*, after 0.25-second exposure; C, after 1.0-second exposure. All exposures made at 85 kv. (peak) and 100 milliamperes, through a phantom of 10 cm. of Masonite presdwood. Screen 1, Patterson type B; screen 2, Patterson type D; screen 3, U. S. Radium Corp. 666D; screen 4, U.S. Radium Corp. 574A.

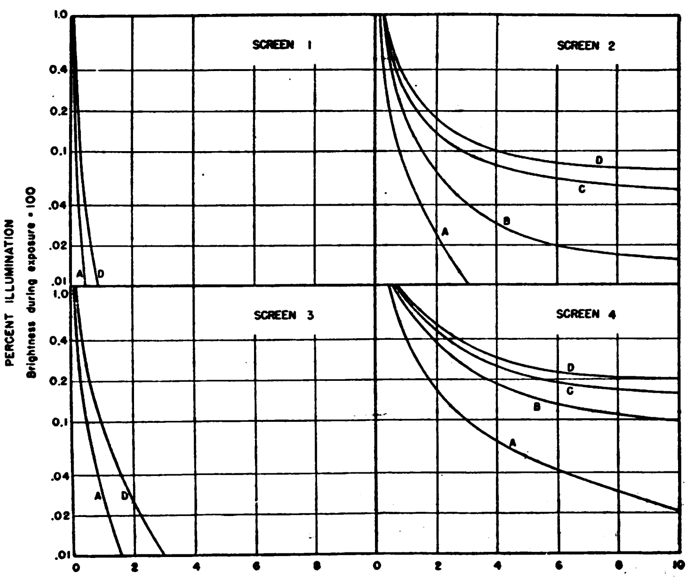

Figure 4.—Curves showing decay of phosphorescence after successive exposures. *A*, after a single exposure; *B*. after one exposure per minute for 1 hour; *C*, after two exposures per minute for 1 hour; *D*, after three exposures per minute for 1 hour. All exposures made at 0.25 second, 85 kv. (peak), 100 milliamperes, through a phantom of 10 cm. Masonite presdwood. Screen designations the same as in figure 3.

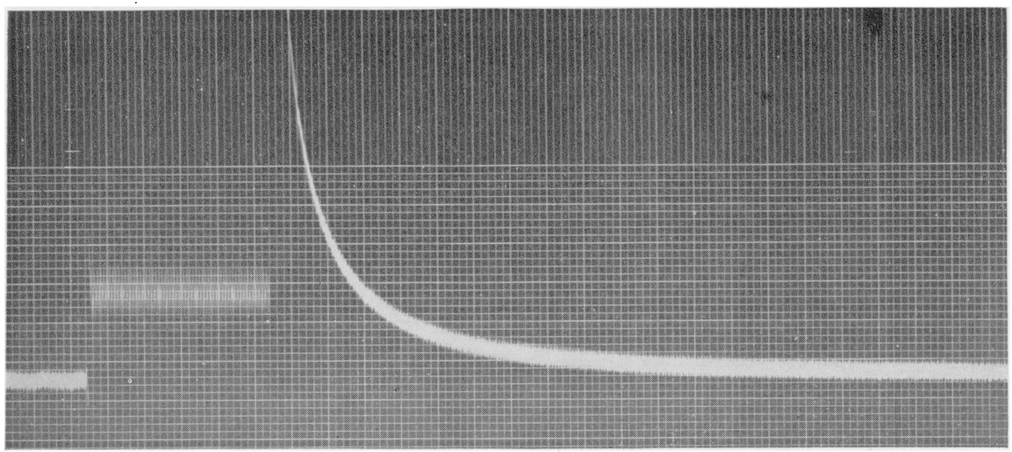

FIGURE 2.—Typical record of the decay of phosphorescence as recorded on an electrocardiograph.

exposure, and C, after a 1.0- second exposure, all exposures at 85 kv. (peak), 100 milliamperes, and through a phantom of 10 cm. of presdwood. Screen 1 is a Patterson type B green-fluorescent screen and shows the very short lag characteristic of this type of screen. Screens 2, 3 and 4 are blue-fluorescent screens and illustrate the wide range of persistence encountered in screens of this type. Screen 2 is the Patterson type D screen, and screens 3 and 4 are two experimental screens submitted by the United States Radium Corporation and designated as 666D and 574A, respectively. It is instructive not only to note the time required for the phosphorescence to fall to a particular fraction of the original brightness, but also to compare the slopes of these curves at that value. For example, the phosphorescence in screen 3 not only requires a short time lapse to decay to 0.01 percent of the original brightness, but it is still falling off rapidly at that point. The other blue-fluorescent screens, 2 and especially 4, not only require a longer period of time to decay the same amount, but also show a much slower rate of decay, indicative of the fact that phosphorescence of low intensity will continue for some time.

The effect on persistence of repeated exposures at different rates over a period of 1 hour is shown in figure 4 for the same screens. Again the very great difference in behavior of different screens is clearly evident. Curve A shows the decay of phosphorescence after the first exposure of 0.25 second at 85 kv. (peak), 100 milliamperes, and through a 10 cm. phantom of presdwood. Curves B, C and D show the decay after a series of similar exposures for 1 hour at the rate of one, two and three per minute respectively. Here again the slopes of the curves are interesting. In the green screen 1 and the blue screen 3, the accumulated persistence is small and falls off rapidly, whereas in blue screens 2 and 4, the accumulated persistence is great and falls off very slowly. Indeed, further measurements showed that persistence, such as illustrated by curves D in screens 2 and 4, lasted many minutes with a very gradual rate of decay and was still evident after several hours. Thus, for exposures in rapid succession, screens such as 2 and 4 never completely recover between exposures, with the resulting unfavorable effect on contrast mentioned above. On the other hand, screens such as 1 and 3 recover completely even between exposures 20 seconds apart. This is shown in figure 5, which shows the phosphorescence at the beginning of successive exposures made under the same conditions as above and at a rate of three per minute. Here the complete recovery between exposures of screens 1 and 3 is shown by the horizontal line, while the increase in phosphorescent lag in screen 2 is shown by the curve.

The four screens reported above all have comparable speeds and resolving power, as shown on table 1. Hence the results indicate that from the standpoint of persistence alone a wide choice is possible. By careful selection of a screen with regard to the use to which it is put, many of the difficulties encountered because of persistence would seem to be resolvable.

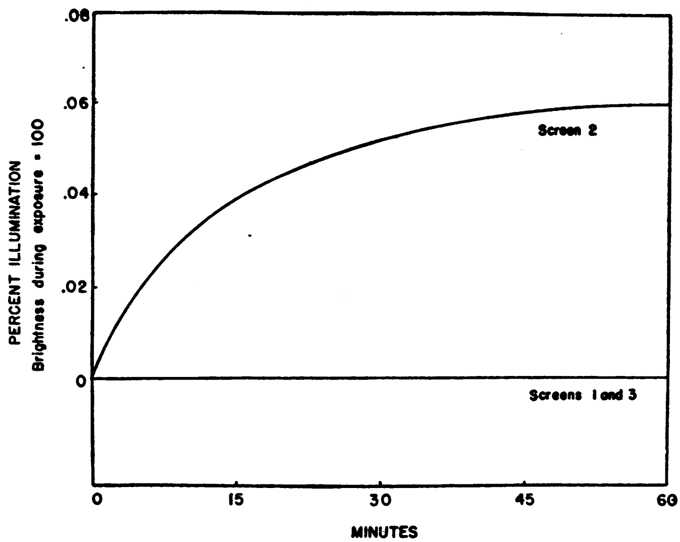

FIGURE 5.—Curves showing phosphorescence at the beginning of successive exposures made at the rate of three per minute. All exposures made at 0.25 second, 85 kv. (peak), 100 milliamperes, through 10 cm. of Masonite presdwood. Screen 1, Patterson type B; screen 2, Patterson type D; screen 3, U.S. Radium Corp. 666D.

TABLE 1

Screen number and type	Relative speed	Resolving power (lines per mm.)	Screen number and type	Relative speed	Resolving power (lines per mm.)
1 Patterson B	90	6	3 U. S. Rad. 666D	90	9
2 Patterson D	100	7	4 U. S. Rad. 574A	120	8

REFERENCES

(1) Mott, Nevill F., and Gurney, R. W.: Electronic Processes in Ionic Crystals. Oxford University Press, 1940.

(2) Hirschlaff, Ernest: Fluorescence and Phosphorescence. Brooklyn, Chemical Publishing Company, 1938.

(3) Riehl, Nickolaus: Physik und technische Anwendung der Lumineszenz. Berlin, Springer, 1941 (in Technische Physik, Bd. 3). Published by license of the Alien Property Custodian by J. W. Edwards and Edwards Bros., Inc., Ann Arbor, Michigan, 1945.

Excerpt from

BIOLOGICAL ASPECTS OF INFECTIOUS DISEASE [1]

"There are going to be some interesting and difficult problems in regard to tuberculosis in the relatively near future. With the diminution in the number of frank infections and the increasing isolation of patients in sanatoria, an increasingly large number of people will reach adult life without coming into contact with infection. Droplets of mucus containing tubercle bacilli are not nearly so common in city air now as they were 50 years ago. This would be all to the good were it not for the increased danger of tuberculosis when it attacks a completely nonimmune adult. Experience with native races has shown that nonimmune adults are by no means bound to develop serious tuberculosis as a result of infection. Under good environmental circumstances, most will escape, but if under stress of any sort the disease does develop, it is much more likely to be fatal than in one who has been through a childhood infection. It may become necessary therefore to develop some form of vaccination against tuberculosis to replace the normal childhood infection. It might even be more logical to start doing so at once, in the hope of avoiding that proportion of primary infections which develop into fatal illness."

NORTHERN IRELAND TUBERCULOSIS ACT [2]

A new Public Health (Tuberculosis) Act was passed by the Parliament of Northern Ireland on February 28. Under it, a tuberculosis authority was set up which met for the first time on April 8 and is already a going concern. Of its members, four are nominated by the Belfast county-borough council, two by each of the county councils of Antris and Down, one by the Londonderry county-borough council, one by each of the county councils of Armagh, Femanagh, Londonderry, and Tyrone, and four by the minister of health. The authority has the right to coopt one or two additional members. At present its only medical member is Dr. W. J. Wilson, professor of public health and hygiene in the Queen's University, Belfast.

The chief duties of the tuberculosis authority are to provide accommodation for people suffering from tuberculosis, including their general care and maintenance during treatment, and their care and reablement after treatment; to discover fresh cases, and prevent spread of the disease; to educate patients and public in treatment and prevention; and to improve medical and nursing training in tuberculosis.

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[1] By F. M. Burnet, Cambridge (1940) pp. 262-268.

[2] From The Lancet, London, No. 6401, vol. CCL, May 4, 1946, page 671.

Notification of tuberculosis in any form has become compulsory; and when a doctor sends in a prescribed form stating that a patient has a primary, complex or any significant tuberculosis condition, the authority will arrange for the patient to be "medically examined for the purpose of diagnosis" without charge. The authority has powers to require any contact to submit himself for examination by an approved medical officer. If an infectious person cannot be segregated safely in his own home the authority will be able to apply for a court order to have him removed to a hospital and detained there for not more than 3 months—a period which can be extended by the court to 6 months if the authority shows that the conditions which led to the patient's detention would be reproduced if he returned home. Where such an order has been made, the authority will, if directed by the court, pay all or part of the costs of hospital care and contribute to the maintenance of dependents.

The authority has powers to acquire, improve, equip, and maintain buildings, to provide medical, nursing, dental, and other treatment, to provide laboratories for research into the disease, and to develop a health center or colony. Capital expenditure of the new authority will be borne by the Government, maintenance costs being shared by the Government and local authorities.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

September 8—October 5, 1946

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State for each week are published in the PUBLIC HEALTH REPORTS under the section "Prevalence of Disease." The table gives the number of cases of these diseases for the 4 weeks ended October 5, 1946, the number reported for the corresponding period in 1945, and the median number for the years 1941–45.

DISEASES ABOVE MEDIAN PREVALENCE

Poliomyelitis.—The number of cases of poliomyelitis dropped from 7,129 during the 4 weeks ended September 7 to 5,488 during the 4 weeks ended October 5. The number was 1.7 times the 1945 incidence for this period and 1.8 times the 1941–45 median. The number of cases was higher than in 1945 in all sections except the New England, Middle Atlantic and South Atlantic sections, and higher than the 1941–45 median in all sections except the Middle Atlantic and South Atlantic sections. More than 75 percent of the total cases were reported from 12 States, viz, Illinois 676, Minnesota 508, California 506, Wisconsin 384, New York 380, Missouri 322, Kansas 264, Michigan 257, Ohio 197, Colorado 183, Nebraska 156, Washington 140, Iowa 128, and Massachusets 110.

A comparison of geographic areas shows that in the South Atlantic section where the current epidemic started, the number of cases has dropped below the 1941–45 median and in the Middle Atlantic section where only about the normal seasonal increase occurred, the number of cases was also below the median expectancy. While the cases have fluctuated considerably from week to week, it is apparent that the peak of the present epidemic has been reached in all sections of the country, with the possible exception of New England where the highest incidence was reported during the week ended October 5. Since the beginning of the year there have been 19,656 cases of poliomyelitis reported, as compared with 13,527, 19,882, and 12,856 for the same number of weeks in 1945, 1944, and 1943, respectively.

Number of reported cases of nine communicable diseases in the United States during the 4-week period September 8–October 5, 1946, the number for the corresponding period in 1945, and the median number of cases reported for the corresponding period, 1941–45.

Division	Current period	1945	5-year median	Current period	1945	5-year median	Current period	1945	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	1,232	1,959	1,732	3,592	3,906	3,503	2,403	2,450	2,484
New England	80	30	25	4	50	16	521	229	286
Middle Atlantic	129	77	74	30	19	19	575	325	460
East North Central	156	170	143	86	112	112	350	455	455
West North Central	71	99	110	44	18	29	55	69	164
South Atlantic	260	643	643	721	1,085	1,013	220	80	124
East South Central	195	419	273	110	100	100	79	55	54
West South Central	152	328	294	2,332	2,310	1,828	160	146	127
Mountain	44	67	67	248	169	298	169	336	270
Pacific	145	126	91	17	43	77	274	755	558
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	249	359	359	5,488	3,198	3,032	3,447	5,035	5,035
New England	22	11	20	231	262	199	299	306	386
Middle Atlantic	50	78	78	487	905	793	613	772	772
East North Central	54	72	72	1,616	655	655	867	1,087	1,169
West North Central	16	41	41	1,530	343	313	278	447	482
South Atlantic	36	46	46	166	258	258	474	919	919
East South Central	20	28	28	117	112	112	243	370	385
West South Central	18	35	24	288	216	55	140	389	181
Mountain	10	3	5	367	172	59	115	179	179
Pacific	23	44	44	686	275	137	418	566	550
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	16	11	17	411	646	647	7,364	8,184	10,045
New England	0	0	0	29	23	34	813	933	933
Middle Atlantic	0	0	0	66	71	108	1,587	2,525	2,525
East North Central	7	1	7	61	75	85	2,587	1,720	2,898
West North Central	1	3	3	33	26	45	249	262	451
South Atlantic	1	1	1	48	113	133	657	969	1,108
East South Central	1	2	2	32	161	107	181	303	303
West South Central	1	3	3	76	109	110	685	563	563
Mountain	5	0	0	41	41	46	211	299	478
Pacific	0	1	0	25	27	33	394	610	834

[1] Mississippi and New York excluded; New York City included.
[2] Mississippi excluded.

Influenza.—For the country as a whole the incidence of influenza during the 4 weeks ended October 5 was about normal, 3,592 cases being reported as compared with 3,906 during the corresponding period in 1945, and a 5-year median of 3,503 cases. More than 60 percent of the total cases occurred in the State of Texas (2,229 cases). Minor increases were reported from the Middle Atlantic, West North Central and East South Central sections, but in other regions the incidence was lower than the seasonal expectancy.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—The number of cases of diphtheria rose from 843 during the 4 weeks ended September 7 to 1,232 during the 4 weeks ended October 5. An increase of this disease is normally expected at this season of the year, but the current rate of increase was somewhat less than in preceding years. For the third consecutive 4-week period the current incidence has been below that for the corresponding period in 1945, with the last two periods showing fewer cases than in any corresponding period in the 18 years for which these data are available. From October 1944 until July 1946, inclusive, the number of cases for each 4-week period was higher than for the corresponding period in the preceding year, as well as higher than the preceding 5-year median for each period. Prior to the latter part of 1944 there had been a consistent decline in the incidence of this disease and recent reports seem to represent the beginning of another downward movement.

An examination of diphtheria cases by geographic sections shows that the decrease was due largely to a sharp decline in the numbers of cases in the South Atlantic and South Central sections where the disease has been unusually prevalent. However, in all other regions except the West North Central and Mountain sections, the number of cases reported during the current 4 weeks was higher than the preceding 5-year median.

Measles.—The incidence of measles was about normal, the number of cases reported (2,403) being slightly below the 1945 incidence for the corresponding 4 weeks, and lower than the 1941–45 median. Excesses over the seasonal expectancy were reported from the Atlantic Coast and South Central sections, but in all other regions the incidence was relatively low.

Meningococcus meningitis.—For the 4 weeks ended October 5 there were 249 cases of meningococcus meningitis reported, as compared with 359 in 1945, which figure also represents the 1941–45 median for this period. The incidence was about normal in the New England section, above the preceding 5-year median in the Mountain section, and lower than the normal seasonal expectancy in all other sections. For the country as a whole the current incidence was the lowest since 1942 when 192 cases were reported for these same weeks.

Scarlet fever.—The incidence of scarlet fever was also relatively low. The number of cases reported for the country as a whole was 3,447, or about 70 percent of the incidence for the corresponding period in 1945; the 1941–45 median expectancy was 5,035 cases, represented by the 1941 incidence. The number of cases in each geographic section was less than the 1941–45 median. For the country as a whole the current incidence was the lowest in the 18 years for which these data are available.

Smallpox.—For the current 4-week period there were 16 cases of smallpox reported as compared with 11 for the corresponding period in 1945 and a preceding 5-year median of 17 cases. Seven of the total cases occurred in the East North Central section where the 1941–45 median was also seven, but the five cases in the Mountain sections compared with a median of zero cases.

Typhoid and paratyphoid fever.—The number of cases (411) of these diseases was about 60 percent of the normal expectancy (647 cases). The incidence was lower than the 1941–45 median in each section of the country. The current incidence of these diseases was also the lowest in the 18 years for which these data are available.

Whooping cough.—For the 4 weeks ended October 5 there were 7,364 cases of whooping cough reported. In the corresponding 4 weeks of 1945 there were 8,184 cases and the 1941–45 median was approximately 10,000 cases. The incidence was below the 1945 level as well as below the 1941–45 median in all sections of the country except the West South Central.

MORTALITY, ALL CAUSES

For the 4 weeks ended October 5 there were 33,532 deaths from all causes reported to the Bureau of the Census by 93 large cities. The average for the corresponding weeks of the three preceding years was 32,849 deaths. In the current period the number of deaths was higher than the average in the first and fourth weeks, and lower than the average in the second and third weeks. The total number of deaths was 2.1 percent more than the average for the corresponding 4 weeks in the three preceding years.

DEATHS DURING WEEK ENDED OCTOBER 5, 1946

[From the Weekly Mortality Index, issued by the National Office of Vital Statistics]

	Week ended Oct. 5, 1946	Corresponding week, 1945
Data for 92 large cities of the United States:		
Total deaths	8,893	8,255
Average for 3 prior years	8,241	
Total deaths, first 40 weeks of year	358,227	353,932
Deaths under 1 year of age	776	593
Average for 3 prior years	611	
Deaths under 1 year of age, first 40 weeks of year	25,564	24,004
Data from industrial insurance companies:		
Policies in force	67,282,507	67,797,900
Number of death claims	11,117	11,625
Death claims per 1,000 policies in force, annual rate	8.6	8.9
Death claims per 1,000 policies, first 40 weeks of year, annual rate	9.6	10.2

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED OCTOBER 12, 1946

Summary

The decline in the incidence of poliomyelitis for the country as a whole continued through the eighth consecutive week. Decreases occurred in all sections of the country except the New England area, where increases were reported in Vermont and Connecticut. A total of 1,042 cases was reported, as compared with 1,142 last week, 711 for the corresponding week in 1944, and a 5-year (1941–45) median of 484. More than half of the current cases and of the total to date occurred in the North Central States. Of 31 States reporting currently 5 or more cases, 16 showed an increase (311 to 393), while a decline (756 to 604) occurred in the other 15 of these States. Reports from the 22 States reporting currently 12 or more cases each are as follows (last week's figures in parentheses): *Increases*—Connecticut 17 (6), New Jersey 13 (10), Pennsylvania 12 (10), Michigan 57 (54), Iowa 39 (24), Missouri 70 (65), North Dakota 14 (10), Kansas 71 (66), Mississippi 12 (4), Oklahoma 17 (10), Washington 36 (29); *decreases*—Massachusetts 32 (33), New York 77 (86), Ohio 14 (44), Indiana 23 (24), Illinois 139 (142), Wisconsin 67 (74), Minnesota 67 (97), Nebraska 44 (51), Texas 21 (24), Colorado 21 (28), California 65 (100).

The total of 341 cases of diphtheria for the current week is lower than reported for the corresponding week of any prior year, the lowest number previously recorded being 415, reported for the week in 1943. The cumulative total, 12,128, however, is above that for any corresponding period since 1939.

Of the total of 124 cases of undulant fever (as compared with 78 for the corresponding week last year), 52 occurred in Iowa, where 39 cases were reported last week in 29 counties.

Deaths recorded for the week in 93 large cities of the United States totaled 8,585, as compared with 8,503 last week, 8,380 and 8,390, respectively, for the corresponding weeks of 1945 and 1944, and a 3-year (1943–45) average of 8,488. The cumulative figure is 371,107, as compared with 366,622 for the same period last year.

Telegraphic morbidity reports from State health officers for the week ended Oct. 12, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria: Week ended— Oct. 12, 1946	Diphtheria: Week ended— Oct. 13, 1945	Diphtheria: Median 1941-45	Influenza: Week ended— Oct. 12, 1946	Influenza: Week ended— Oct. 13, 1945	Influenza: Median 1941-45	Measles: Week ended— Oct. 12, 1946	Measles: Week ended— Oct. 13, 1945	Measles: Median 1941-45	Meningitis, meningococcus: Week ended— Oct. 12, 1946	Meningitis, meningococcus: Week ended— Oct. 13, 1945	Meningitis, meningococcus: Median 1941-45
NEW ENGLAND												
Maine	4	1	0	----	1	----	30	4	4	1	0	1
New Hampshire	0	0	0	----	----	----	38	----	1	0	0	0
Vermont	1	3	0	----	----	----	64	----	1	0	0	0
Massachusetts	20	0	3	----	----	----	80	67	67	2	2	3
Rhode Island	0	0	0	----	20	----	----	2	4	1	0	2
Connecticut	0	0	1	4	----	6	11	5	6	1	1	1
MIDDLE ATLANTIC												
New York	21	5	11	[1] 2	([1])	[1] 3	67	16	66	7	8	8
New Jersey	2	4	2	3	4	5	18	14	19	1	4	4
Pennsylvania	15	6	8	1	1	1	147	100	67	7	5	8
EAST NORTH CENTRAL												
Ohio	16	10	11	2	----	2	42	11	19	3	5	5
Indiana	16	13	9	5	2	5	7	3	5	0	3	1
Illinois	7	7	14	1	1	7	14	50	19	4	4	7
Michigan [2]	5	12	12	3	1	1	12	60	57	3	2	2
Wisconsin	0	2	2	11	21	19	31	15	43	2	2	2
WEST NORTH CENTRAL												
Minnesota	8	5	5	----	----	----	2	6	6	0	1	0
Iowa	4	3	2	----	3	----	1	2	8	5	0	0
Missouri	4	5	5	1	2	1	4	3	5	2	3	3
North Dakota	0	0	1	1	3	4	4	----	----	0	0	0
South Dakota	2	2	4	----	----	----	----	2	2	0	0	0
Nebraska	2	7	7	8	----	2	3	4	4	0	1	0
Kansas	4	5	2	4	2	2	3	13	6	2	0	0
SOUTH ATLANTIC												
Delaware	0	1	1	----	----	----	----	1	1	0	0	0
Maryland [2]	2	26	7	----	----	3	3	1	4	2	2	2
District of Columbia	0	0	0	1	----	----	1	----	1	0	0	1
Virginia	21	30	30	165	119	123	9	20	20	1	2	2
West Virginia	5	30	11	6	----	1	5	----	2	1	0	1
North Carolina	15	84	59	----	----	1	29	3	7	2	2	2
South Carolina	1	30	30	52	302	218	----	49	6	0	0	1
Georgia	12	33	33	7	18	13	3	3	5	0	1	1
Florida	11	7	7	2	8	8	2	----	1	3	0	1
EAST SOUTH CENTRAL												
Kentucky	24	28	16	----	----	----	4	23	7	0	1	2
Tennessee	20	26	23	18	38	11	8	1	6	2	3	3
Alabama	10	23	32	4	18	18	----	1	3	3	2	1
Mississippi [2]	17	44	17	----	----	----	----	----	----	1	1	1
WEST SOUTH CENTRAL												
Arkansas	3	12	12	17	28	17	1	4	5	0	2	1
Louisiana	8	8	10	1	4	3	1	1	1	0	1	1
Oklahoma	1	5	10	13	9	23	2	1	1	0	2	0
Texas	24	60	46	1,077	712	647	31	25	25	8	2	2
MOUNTAIN												
Montana	0	1	2	----	----	2	1	15	11	3	1	0
Idaho	1	0	0	9	7	3	1	57	1	0	0	0
Wyoming	0	2	1	----	1	2	----	1	4	1	0	0
Colorado	5	9	8	11	33	25	11	5	12	0	0	0
New Mexico	2	4	4	----	3	1	9	2	----	0	0	0
Arizona	2	1	1	30	20	47	3	1	13	0	0	0
Utah [2]	0	0	0	11	----	----	4	8	8	0	0	0
Nevada	0	0	0	----	----	----	----	1	1	0	0	0
PACIFIC												
Washington	11	12	3	----	----	----	7	80	9	0	4	2
Oregon	5	9	2	2	----	7	7	----	11	0	2	2
California	10	17	24	1	7	28	59	157	101	6	6	6
Total	341	592	517	1,473	1,388	1,290	779	837	980	74	75	75
41 weeks	12,128	11,855	10,537	198,538	78,593	88,361	643,810	106,311	546,291	4,939	6,845	6,845

[1] New York City only.
[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended Oct. 12, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis: Week ended— Oct. 12, 1946	Poliomyelitis: Week ended— Oct. 13, 1945	Poliomyelitis: Median 1941-45	Scarlet fever: Week ended— Oct. 12, 1946	Scarlet fever: Week ended— Oct. 13, 1945	Scarlet fever: Median 1941-45	Smallpox: Week ended— Oct. 12, 1946	Smallpox: Week ended— Oct. 13, 1945	Smallpox: Median 1941-45	Typhoid and paratyphoid fever [3]: Week ended— Oct. 12, 1946	Typhoid and paratyphoid fever [3]: Week ended— Oct. 13, 1945	Typhoid and paratyphoid fever [3]: Median 1941-45
NEW ENGLAND												
Maine	3	5	4	15	19	14	0	0	0	1	2	2
New Hampshire	4	1	1	0	7	2	0	0	0	0	0	0
Vermont	6	1	1	4	2	4	0	0	0	0	1	0
Massachusetts	32	28	19	33	66	92	0	0	0	1	3	3
Rhode Island	9	0	1	1	4	4	0	0	0	0	0	0
Connecticut	17	9	7	6	5	18	0	0	0	0	1	1
MIDDLE ATLANTIC												
New York	77	68	68	91	108	126	0	0	0	2	13	12
New Jersey	13	32	25	52	14	35	0	0	0	3	3	3
Pennsylvania	12	27	27	55	117	112	0	0	0	1	7	7
EAST NORTH CENTRAL												
Ohio	14	20	20	92	111	129	0	0	0	3	5	5
Indiana	23	3	3	54	49	49	0	0	0	3	2	3
Illinois	139	48	36	52	104	104	0	0	0	1	4	4
Michigan [2]	57	16	22	70	71	74	0	0	0	1	5	4
Wisconsin	67	49	12	34	61	68	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	67	16	16	21	30	43	1	0	0	0	0	0
Iowa	39	34	14	16	44	44	0	0	0	1	0	1
Missouri	70	6	4	23	31	31	0	0	0	4	2	3
North Dakota	14	1	1	0	3	6	0	0	0	1	0	0
South Dakota	6	0	1	3	4	13	0	0	0	0	0	0
Nebraska	44	7	6	14	11	24	0	0	0	0	0	0
Kansas	71	5	6	10	36	57	0	0	0	1	0	1
SOUTH ATLANTIC												
Delaware	4	0	2	9	3	4	0	0	0	0	2	1
Maryland [2]	2	1	2	9	14	25	0	0	0	1	2	2
District of Columbia	1	6	3	1	9	11	0	0	0	0	0	0
Virginia	4	6	6	63	79	42	0	0	0	0	10	10
West Virginia	4	2	2	75	114	51	0	0	0	0	2	3
North Carolina	[4] 3	5	5	18	82	82	0	0	0	2	0	4
South Carolina	0	6	2	3	8	12	0	0	0	1	2	2
Georgia	1	0	1	12	19	23	0	0	0	2	2	3
Florida	11	5	3	5	7	7	0	0	0	1	5	1
EAST SOUTH CENTRAL												
Kentucky	1	2	4	24	62	62	0	0	0	3	7	5
Tennessee	4	19	7	34	36	51	0	0	0	0	3	4
Alabama	1	1	1	15	13	21	0	0	0	0	2	2
Mississippi [2]	12	6	1	23	10	12	0	0	0	2	1	2
WEST SOUTH CENTRAL												
Arkansas	10	5	3	5	20	13	1	0	0	1	9	6
Louisiana	9	0	1	1	10	10	0	0	0	4	2	4
Oklahoma	17	12	2	2	20	17	0	0	0	2	2	4
Texas	21	20	12	28	57	33	0	0	0	12	10	9
MOUNTAIN												
Montana	5	7	0	4	18	10	0	0	0	0	2	0
Idaho	4	3	0	2	5	12	0	0	0	0	1	0
Wyoming	2	7	1	0	8	8	0	0	0	0	0	0
Colorado	21	2	2	5	29	20	0	0	0	1	1	1
New Mexico	5	0	0	1	8	5	0	0	0	0	0	1
Arizona	4	3	0	5	13	3	0	0	0	2	1	1
Utah [2]	3	7	2	10	13	10	0	0	0	1	0	0
Nevada	0	0	0	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	36	14	8	26	25	25	0	0	0	0	0	1
Oregon	8	4	5	12	19	19	0	0	0	2	2	1
California	65	30	14	94	138	114	0	0	0	7	5	5
Total	1,042	549	484	1,132	1,736	1,736	2	0	5	67	121	122
41 weeks	[4] 20,681	10,845	10,319	93,055	143,991	108,609	297	286	644	3,364	4,063	4,618

[2] Period ended earlier than Saturday.

[3] Including paratyphoid fever reported separately, as follows: Massachusetts (salmonella infection) 1; New Jersey 1; Ohio 1; Illinois 1; Missouri 1; Georgia 1; Colorado 1; Arizona 1; Utah 1; California 1.

[4] Corrected report: North Carolina, poliomyelitis, week ended September 21, 2 cases (instead of 3).

Telegraphic morbidity reports from State health officers for the week ended Oct. 12, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough			Week ended Oct. 12, 1946							
	Week ended—		Median 1941-45	Dysentery			Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
	Oct. 12, 1946	Oct. 13, 1945		Amebic	Bacillary	Unspecified					
NEW ENGLAND											
Maine	4	12	12								
New Hampshire		2	2								
Vermont	5	14	12								2
Massachusetts	95	108	99		2						
Rhode Island	29	6	19								
Connecticut	26	22	22								3
MIDDLE ATLANTIC											
New York	142	209	209	3	5			1		2	3
New Jersey	91	101	92								
Pennsylvania	110	132	171	1			1			1	1
EAST NORTH CENTRAL											
Ohio	32	97	139								5
Indiana	19	17	13		2		2	1	1		4
Illinois	84	60	150	1	1		1				11
Michigan [2]	222	101	167	1	1						4
Wisconsin	115	62	137	1							
WEST NORTH CENTRAL											
Minnesota	12	19	41								
Iowa	14	3	11								52
Missouri	4	13	13			3		1	2		1
North Dakota	1		11				1				1
South Dakota			6								1
Nebraska	5		5								4
Kansas	5	26	26				1				1
SOUTH ATLANTIC											
Delaware	4	1	1								
Maryland [2]	18	26	49			3		2			
District of Columbia	9	7	7								
Virginia	28	10	29			28			1		1
West Virginia		25	11								
North Carolina	12	58	69					2		1	
South Carolina	4	74	37								
Georgia	7	31	17		2				1	9	2
Florida	20	1	5							3	3
EAST SOUTH CENTRAL											
Kentucky	10	32	32		4						
Tennessee	26	14	34	1			1		3	3	1
Alabama	7	7	7							7	2
Mississippi [2]									1	8	3
WEST SOUTH CENTRAL											
Arkansas	5	1	9	2			([5])		4	3	
Louisiana		2	1	1				1		16	
Oklahoma	1	2	3	7							1
Texas	151	86	96	7	193	15			1	29	7
MOUNTAIN											
Montana	3	6	17								1
Idaho	1	1									
Wyoming		1	4								
Colorado	18	21	21	1							
New Mexico	10		5			2					
Arizona	8	7	7			26					
Utah [2]	3	9	16						1		
Nevada											
PACIFIC											
Washington	9	10	17								
Oregon	5	4	12								1
California	61	126	126	3	9		1			3	9
Total	1,435	1,566	2,357	29	219	77	8	8	15	85	124
Same week, 1945	1,566			56	438	262	10	2	14	164	78
Average, 1943–45	1,765			50	435	199	11	[6] 2	11	[6] 137	
41 weeks: 1946	78,899			2,275	12,988	5,358	[5] 515	543	749	2,824	4,072
1945	100,909			1,525	20,994	9,259	521	445	617	3,955	3,780
Average, 1943–45	109,904		[6] 144,350	1,554	17,564	7,666	544	[6] 440	584	[6] 3,349	

[2] Period ended earlier than Saturday.
[5] Delayed report: Arkansas, week ended August 17, 1 case, included in cumulative total only.
[6] 5-year median, 1941–45.

Anthrax: California, 1 case.

WEEKLY REPORTS FROM CITIES

City reports for week ended Oct. 5, 1946

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	----	0	----	0	2	1	7	0	0	1
New Hampshire:												
Concord	0	0	----	0	----	0	0	0	0	0	0	----
Vermont:												
Barre	0	0	----	0	1	0	0	0	0	0	0	----
Massachusetts:												
Boston	16	0	----	1	6	0	11	22	12	0	0	25
Fall River	0	0	----	0	----	0	0	0	1	0	0	2
Springfield	0	0	----	0	15	0	1	0	2	0	0	7
Worcester	0	0	----	0	----	0	7	5	1	0	0	----
Rhode Island:												
Providence	1	0	----	0	----	0	3	0	1	0	0	8
Connecticut:												
Bridgeport	0	0	----	0	----	0	0	0	0	0	0	----
Hartford	0	0	----	0	----	0	0	2	4	0	0	4
New Haven	0	0	----	0	1	0	2	0	1	0	0	2
MIDDLE ATLANTIC												
New York:												
Buffalo	1	0	----	0	----	0	2	0	4	0	0	6
New York	8	1	3	0	12	5	31	40	23	0	3	30
Rochester	0	0	----	0	5	0	0	3	4	0	0	1
Syracuse	0	0	----	0	----	0	0	1	3	0	0	9
New Jersey:												
Camden	0	0	----	0	----	0	1	0	1	0	0	1
Newark	0	0	1	0	----	0	6	4	4	0	0	15
Trenton	0	0	1	1	----	0	4	0	1	0	0	2
Pennsylvania:												
Philadelphia	2	0	1	1	4	0	12	1	11	0	0	28
Pittsburgh	3	0	----	0	24	0	13	0	7	0	0	4
Reading	0	0	----	0	2	0	4	0	0	0	0	2
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	1	0	----	0	1	1	3	3	9	0	0	4
Cleveland	2	0	2	0	14	1	2	18	7	0	0	9
Columbus	1	0	1	1	----	0	1	0	5	0	0	4
Indiana:												
Fort Wayne	0	0	----	0	1	0	1	0	0	0	1	----
Indianapolis	0	0	----	0	----	1	8	5	2	0	2	6
South Bend	0	0	----	0	1	0	0	1	0	0	0	----
Terre Haute	0	0	----	0	----	0	0	0	0	0	0	----
Illinois:												
Chicago	1	1	----	1	5	2	23	37	16	0	1	44
Michigan:												
Detroit	1	0	----	0	3	0	6	14	18	0	0	57
Flint	0	0	----	0	----	0	1	0	2	0	0	1
Grand Rapids	0	0	----	0	----	0	0	1	4	0	0	9
Wisconsin:												
Kenosha	0	0	----	0	----	0	0	4	0	0	0	----
Milwaukee	0	0	----	0	4	0	1	11	3	0	0	48
Racine	0	0	----	0	----	0	0	2	5	0	0	4
Superior	1	0	----	0	----	0	0	0	0	0	0	----
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	----	0	----	0	0	8	0	0	0	----
Minneapolis	0	0	----	0	1	0	3	6	2	0	0	----
St. Paul	0	0	----	0	----	0	2	6	2	0	0	10
Missouri:												
Kansas City	0	0	----	0	----	0	5	15	4	0	0	6
St. Joseph	0	0	----	0	----	0	0	1	0	0	0	4
St. Louis	2	0	----	1	----	2	7	16	2	0	1	5

City reports for week ended Oct. 5, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
North Dakota:												
Fargo	1	0	-	0	-	0	0	4	3	0	0	-
Nebraska:												
Omaha	1	0	-	0	1	0	0	17	0	0	1	3
Kansas:												
Topeka	0	0	-	0	-	0	0	1	3	0	0	4
Wichita	0	0	-	0	-	0	3	2	1	0	0	-
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	-	0	-	0	0	1	2	0	1	-
Maryland:												
Baltimore	5	0	4	3	-	1	5	2	4	0	0	16
Cumberland	0	0	-	0	-	0	0	0	0	0	0	1
Frederick	0	0	-	0	-	0	0	0	0	0	0	-
District of Columbia:												
Washington	0	0	-	0	5	0	1	3	0	0	0	10
Virginia:												
Lynchburg	0	0	-	0	2	0	0	0	0	0	0	1
Richmond	1	0	-	0	-	0	2	0	1	0	0	4
Roanoke	5	0	-	0	-	0	0	0	3	0	0	-
West Virginia:												
Charleston	0	0	-	0	-	0	0	0	1	0	0	-
Wheeling	0	0	-	0	-	0	1	1	0	0	0	-
North Carolina:												
Raleigh	0	0	-	0	1	0	0	0	0	0	0	5
Wilmington	0	0	-	0	-	0	1	0	0	0	0	-
Winston-Salem	0	0	-	0	2	0	0	0	1	0	0	2
South Carolina:												
Charleston	0	0	4	0	1	0	4	0	0	0	0	-
Georgia:												
Atlanta	0	0	1	0	-	0	5	0	2	0	0	-
Savannah	0	0	-	0	3	0	0	0	0	0	0	-
Florida:												
Tampa	0	0	-	0	1	0	2	0	2	0	0	-
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0	-	0	-	0	6	2	4	0	0	5
Nashville	0	0	-	1	-	0	6	0	0	0	0	1
Alabama:												
Birmingham	0	0	-	0	-	0	4	1	3	0	0	-
Mobile	1	0	-	0	-	0	1	2	0	0	0	-
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	-	0	1	0	0	0	0	0	0	-
Louisiana:												
New Orleans	1	0	1	0	3	0	3	3	2	0	0	-
Shreveport	1	0	-	0	-	0	0	2	0	0	1	-
Texas:												
Dallas	1	0	-	0	-	0	2	0	3	0	0	-
Galveston	3	0	-	0	-	0	0	0	0	0	0	1
Houston	0	0	-	0	-	0	4	0	0	0	0	-
San Antonio	1	0	-	0	-	0	2	0	1	0	0	-
MOUNTAIN												
Montana:												
Billings	0	0	-	0	-	0	0	0	0	0	0	-
Great Falls	0	0	-	0	3	0	0	0	0	0	0	-
Helena	0	0	-	0	-	0	0	1	0	0	0	-
Missoula	0	0	-	0	-	0	0	0	1	0	0	-
Idaho:												
Boise	0	0	-	0	-	0	1	0	0	0	0	-
Colorado:												
Denver	3	0	4	0	3	0	0	6	2	0	0	14
Utah:												
Salt Lake City	0	0	-	0	5	0	1	0	1	0	0	-

City reports for week ended Oct. 5, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	2	0	-----	0	1	0	1	4	3	0	0	2
Spokane	0	0	-----	0	-----	0	1	4	0	0	0	1
Tacoma	0	0	-----	0	1	0	0	0	0	0	0	2
California:												
Los Angeles	3	0	-----	0	8	0	3	30	21	0	0	5
Sacramento	0	0	-----	0	-----	0	1	0	0	0	0	-----
San Francisco	0	0	1	0	1	0	5	3	8	0	0	1
Total	70	2	24	10	142	13	227	316	240	0	11	436
Corresponding week, 1945	70	-----	48	8	209	-----	254	-----	327	0	22	564
Average, 1941-45	73	-----	44	[1] 11	[2] 193	-----	[1] 265	-----	402	0	25	796

[1] 3-year average, 1943-45.
[2] 5-year median, 1941-45.

Dysentery, amebic.—Cases: New York 3; Philadelphia 1; Los Angeles 1.
Dysentery, bacillary.—Cases: New York 5; Richmond 1.
Dysentery, unspecified.—Cases: San Antonio 5; Great Falls 1.
Leprosy.—Cases: Tampa 1.
Rocky Mountain spotted fever.—Cases: New York 1; Richmond 1.
Typhus fever, endemic.—Cases: Boston 1; New York 3; Raleigh 1; Charleston, S. C., 1; Savannah 1; Little Rock 1; New Orleans 2.

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1943, 34,238,800)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	44.4	0.0	0.0	2.6	60	0.0	68.0	78.4	76	0.0	0.0	128
Middle Atlantic	6.5	0.5	2.8	0.9	22	2.3	33.8	22.7	27	0.0	1.4	45
East North Central	4.3	0.6	1.8	1.2	18	3.1	28.2	58.9	44	0.0	2.5	114
West North Central	8.0	0.0	0.0	2.0	4	4.0	39.8	151.2	34	0.0	4.0	64
South Atlantic	18.1	0.0	14.8	4.9	25	1.6	34.6	11.5	26	0.0	1.6	64
East South Central	11.8	0.0	0.0	5.9	0	0.0	100.3	29.5	41	0.0	0.0	35
West South Central	20.1	0.0	2.9	0.0	11	0.0	31.6	14.3	17	0.0	2.9	3
Mountain	26.0	0.0	34.7	0.0	95	0.0	17.3	60.7	35	0.0	0.0	121
Pacific	7.9	0.0	1.6	0.0	17	0.0	17.4	64.8	51	0.0	0.0	17
Total	10.7	0.3	3.7	1.5	22	2.0	34.7	48.3	37	0.0	1.7	67

PLAGUE INFECTION IN KERN COUNTY, CALIF.

Under date of October 7, 1946, plague infection was reported proved, on September 30, in a pool of 5 ticks from 24 ground squirrels, *C. beecheyi*, shot 1 mile south and 2 miles east of El Tejon School, Kern County, Calif., and received at the laboratory on September 11.

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague (rodent).—Under date of October 9, 1946, plague infection has been reported in a mass of spleen and liver from a pool of 36 rats trapped on September 10, 1946, in District 3A, Kapulena, Hamakua District, Island of Hawaii, T. H.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended September 21, 1946.—During the week ended September 21, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		3		17	73	10	7	19	27	156
Diphtheria		1	2	27	11	1	2	1		45
Dysentery, bacillary				2						2
Encephalitis, infectious								1		1
German measles		1		2	6			6	10	25
Influenza		2			1	1				4
Measles		8	2	40	21	8	33	56	1	169
Meningitis, meningococcus				3	2	2				7
Mumps				9	87	24	46	23	44	233
Poliomyelitis	7	2	6	121	26	4	5		2	173
Scarlet fever		8	9	43	48	7		4	10	129
Tuberculosis (all forms)		22	15	158	34	14	21	9	45	318
Typhoid and paratyphoid fever		1		20	2	1	2		4	30
Undulant fever					2				1	3
Venereal diseases:										
Gonorrhea	8	18	13	118	132	44	40	47	71	491
Syphilis		8	6	99	72	7	8	10	32	242
Other forms									3	3
Whooping cough		8		55	45	12	5	13	2	140

IRISH FREE STATE

Vital statistics—Second quarter ended June 30, 1946.—The following table shows the numbers of marriages, births, and deaths in the Irish Free State for the second quarter ended June 30, 1946. The figures are provisional:

Number of marriages	4,115
Number of births	18,045
Births per 1,000 population	24.1
Number of deaths (all ages)	10,534
Deaths per 1,000 population	14.1
Deaths under 1 year of age	1,020
Deaths under 1 year of age per 1,000 births	57
Deaths from:	
Cancer	936
Diarrhea and enteritis (under 2 years of age)	184
Deaths from—Continued	
Diphtheria	30
Influenza	219
Measles	9
Puerperal infection	2
Tuberculosis (all forms)	1,000
Typhoid fever	3
Whooping cough	31

NOTE.—Estimated population, July 1, 1946, 2,992,000.

JAMAICA

Notifiable diseases—4 weeks ended September 21, 1946.—During the 4 weeks ended September 21, 1946, certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis		1	Scarlet fever		1
Chickenpox	2	11	Tuberculosis (respiratory)	32	68
Diphtheria	6	6	Typhoid fever	6	90
Dysentery, unspecified		4	Typhus fever (murine)	3	1

NORWAY

Notifiable diseases—May 1946.—During the month of May 1946, cases of certain notifiable diseases were reported in Norway as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	16	Measles	570
Diphtheria	350	Mumps	188
Dysentery, unspecified	33	Paratyphoid fever	6
Epidemic encephalitis	4	Pneumonia (all forms)	2,012
Erysipelas	436	Poliomyelitis	30
Gastroenteritis	3,804	Rheumatic fever	233
Gonorrhea	1,288	Scabies	3,902
Hepatitis, epidemic	486	Scarlet fever	530
Impetigo contagiosa	2,872	Syphilis	174
Influenza	3,494	Tuberculosis (all forms)	546
Lymphogranuloma inguinale	2	Whooping cough	3,559

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Cholera

China.—Cholera has been reported in certain provinces of China as follows: Chekiang Province—July 1–31, 1946, 739 cases, 66 deaths in Huchow; August 11–20, 1946, 122 cases, 29 deaths including 42 cases in Ningpo; September 1–10, 1946, 141 cases, 21 deaths in Ningpo; Honan Province—August 11–20, 1946, 277 cases, 16 deaths; Hopeh Province—August 11–20, 1946, 56 cases, 27 deaths, September 11–20, 1946, 13 cases in Tientsin; Hunan Province—August 21–31, 1946, 135 cases, 49 deaths; Kiangsu Province—July 21–31, 1946, 712 cases, 122 deaths including 202 cases with 13 deaths in Chinkiang, 204 cases with 12 deaths in Nantung, and 93 cases with 65 deaths in Kuyang.

Plague

China—Chekiang Province—Wenchow.—For the period August 11–20, 1946, 48 cases of plague were reported in Wenchow, Chekiang Province, China.

Peru.—For the month of August 1946, 3 cases of plague were reported in Cayalti Farm, Chiclayo Province, Lambayeque Department, and 1 case of plague was reported in Pampa de Gallina, Tumbes Province, Tumbes Department, Peru.

Smallpox

Colombia.—For the month of September 1946, 68 cases of smallpox with 1 death were reported in Colombia. Departments reporting the highest incidence are: Santander, 23 cases; Cundinamarca, 11 cases; Bolivar, 8 cases; Cauca, 6 cases; North Santander, 6 cases; National Territories, 7 cases.

Mexico.—For the month of August 1946, 38 cases of smallpox were reported in Mexico. States reporting the highest incidence are: Guerrero, 20 cases; Michoacan, 10 cases; Jalisco, 7 cases; Guanajuato, 1 case.

Typhus Fever

Colombia.—For the month of September 1946, 69 cases of typhus fever with 5 deaths were reported in Colombia. Departments reporting the highest incidence are: Caldas, 26 cases, 1 death; Narino, 14 cases, 2 deaths; Antioquia, 13 cases, 1 death; Cundinamarca, 7 cases, 1 death; Santander, 6 cases.

Mexico.—For the month of August 1946, 209 cases of typhus fever were reported in Mexico. States reporting the highest incidence are: Federal District, 45 cases including Mexico, D. F., 35 cases; Mexico, 34 cases; Nuevo Leon, 24 cases; Hidalgo, 20 cases; Coahuila, 16 cases; Puebla, 11 cases.

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