REPORT OF THE DELEGATION OF THE UNITED STATES OF AMERICA
TO THE TENTH PAN AMERICAN SANITARY CONFERENCE

Bogota, Colombia

September 4-18, 1938.
I. PROGRESS IN PUBLIC HEALTH AND MEDICAL SCIENCE

While statistics for the general population of the United States are not yet available fragmentary returns indicate a remarkably low mortality record for the year 1937 and the first 4 months of 1938. A large life insurance company reports that the mortality from typhoid fever, scarlet fever, tuberculosis, chronic nephritis and conditions arising from pregnancy and childbirth are the lowest ever recorded. The occurrence of this unprecedented low era of mortality is supported by data from other reliable sources.

One of the especially noteworthy and well organized disease campaigns was that directed to the reduction of the incidence of syphilis. In several States and cities facilities for free or low-cost diagnosis and treatment have been greatly increased. Frank discussion of the venereal disease problem, including the causation, diagnosis and treatment, is now so general that a better and wider understanding of the means of prevention is general. Several States have enacted legislation directed to the eradication of congenital syphilis. This has taken the form of compulsory blood tests for those contemplating matrimony, a positive test resulting in the refusal of a marriage license. The Federal Government has manifested its interest in the venereal disease problem by appropriating 3 millions of dollars to be distributed among the States. There should also be mentioned a Federal appropriation for intensive cancer research.

The extension of pneumonia typing and the wider use of type-specific sera for treatment have provided the means for more effectively combating pneumonia. The United States Public Health Service has taken the lead in this fight by establishing field epidemiological and consultation services for State and local departments of health.

Among the more striking scientific advances only the most important will be mentioned. The confirmed value of sulfanilamide in the treatment of hemolytic streptococcus infections such as puerperal fever, erysipelas and streptococci blood poisoning places this remedy among the most valuable of the physician's armamentarium.

In nicotinic acid it is believed that a comparatively simple and effective remedy has been discovered for the treatment of pellagra.

The value of protamin insulin in greatly prolonging the action of insulin in the treatment of diabetes has also been confirmed.

A contribution of tremendous importance has been made by medical scientists who have studied the nature of filterable viruses. It has already been discovered that a virus can be crystallized. A virus becomes active only when placed in an environment to which it is accustomed.

The Public Health Service has been busily engaged in scientific endeavor on many fronts, as will be shown in the contributions of some of its officers in the papers that follow.
Great emphasis was given to this phase of public health work by the passage this year of an Act of Congress authorizing the appropriation of definite sums for use in assisting State and local health departments to establish new programs for the control, treatment, and prevention of the venereal diseases or to further the development of those already established. The Act provides not only for direct monetary aid to assist in carrying out these programs. It also authorizes the use of funds for the prosecution of studies to develop adequate measures for the prevention and treatment of venereal diseases, and for the establishment of training centers for the postgraduate instruction of health officers, private physicians cooperating with health departments, laboratory personnel, public health nurses, medical social workers, and other scientific personnel.

For the first time in more than 15 years Federal funds have been appropriated specifically for assistance to the States in the control of the venereal diseases. The amount appropriated for the present fiscal year is $3,000,000, of which $2,400,000 has been allotted to the several States and Territories.

Objectives of the Venereal Disease Control Campaign. - It is believed that the most effective program in a large country such as the United States with a heterogeneous population group and varying social and economic conditions can be administered if developed in accordance with the diverse conditions existing in the several States.

Certain broad principles have been accepted by most authorities throughout the world as being necessary for the successful organization of a venereal disease control program. These principles are being applied in the development of the work in the United States. Briefly, the objectives are as follows:

(1) The development of an efficient laboratory service freely available to every physician, clinic and hospital treating patients infected with the venereal diseases.

(2) Treatment facilities to be provided for (a) the diagnosis and emergency treatment of any person who applies; (b) any person referred by a private physician either for continued treatment or for consultation, advice, and opinion; and (c) any person unable to afford private medical care. Diagnostic and treatment facilities are to be made as freely available for infected non-resident people as for those who reside in the governmental unit providing the services.

(3) To facilitate the treatment of syphilis in rural areas, antisyphilitic drugs are to be furnished free on the request of any physician for the treatment of any of his patients.

(4) Specific requirements are made for clinics receiving assist-
ance. These requirements pertain to the physical arrangements of the clinic and its method of operation.

(5) Due consideration shall be given by State health officers to the re-allotment of Federal funds to municipalities within their State.

(6) The services of a properly qualified full time venereal disease control officer shall be provided in each State and in each municipality when the population of either exceeds 500,000.

**Syphilis as an American Problem.** Although material progress has been made in the control of syphilis in a few countries of the world, the gains in countries of the Western Hemisphere are relatively meager. In the United States we know that syphilis is prevalent in 48 States and that the battle to control it must be waged on 48 fronts.

How can any country remain free of the venereal diseases, granted that it has developed a successful control program, if the disease remains prevalent in others? Modern transportation is rapid. Disease carriers cross boundaries with relative ease and in the case of the venereal disease carriers detection is difficult. There appears to be a definite need at this time for concerted action in the control of syphilis and gonorrhea in both North and South America.

### III. SOCIAL SECURITY AND ITS MEDICAL AND HEALTH ASPECTS

Three years ago the Congress of the United States enacted into law a comprehensive plan of social security for the people. An important part of such a plan provided for the extension throughout the Nation of public health facilities through cooperation of the Federal Government with the several States.

The Social Security Act has been in operation only a little more than two years, but in no similar period during our Nation's history has public health work advanced so rapidly or progressed along sounder lines. The expenditure of $8,000,000 of federal funds annually has been accompanied by increases in State and local appropriations for public health purposes amounting to more than $8,000,000 at the present time. State expenditures through their health departments on the average amount to eleven cents per capita.

The number of counties under whole-time health service has increased from 594 on January 1, 1935, to 1165 at the present time - a net increase of 96.13 per cent. The people of eight States now are served by whole-time county or district health units as compared with three at the close of the calendar year 1935.

Deficiencies in State health organizations have also received considerable attention. Nineteen States which had not made provision for
the promotion and supervision of local health administration developed facilities for doing so. Forty-six State health departments strengthened their public health engineering forces; activities for the control of preventable diseases were materially strengthened in 38 States; laboratory facilities were increased in 43 States; and in 33 States needed improvements to the divisions of vital statistics were made. All of the States strengthened their public health nursing services.

We have witnessed a remarkable increase in the number of whole-time dental units from 12 to 32 in State health organizations which has been the result largely of the impetus offered by the Social Security program. The activities in the original 12 have also been increased through the availability of additional funds.

In addition to the reinforcement of general health organization within the States important progress has been achieved through an attack on specific diseases on a wide front. There are now 33 States which have set up special units within the State health departments for venereal disease control. Twenty-five States have provided special measures for tuberculosis control. Eight States have active programs designed to lower the mortality rate from pneumonia. Six others have made special provision for an attack on cancer. Special emphasis has been placed upon the control of hookworm disease, malaria and typhus fever, trachoma, psittacosis, and rodent plague in certain areas. Mental hygiene is receiving an ever increasing amount of attention.

The progress which has been made with respect to the training of public health personnel is especially significant. The Public Health Service found it necessary to assist through subsidies in the establishment of five short-course training centers to provide minimum amounts of public health training. These training centers together with other established schools of public health have afforded some degree of training to more than 3,000 persons.

IV. MARITIME QUARANTINE
IN RELATION TO INTERNATIONAL TREATIES

The United States of America is party to two sanitary treaties governing quarantine treatment of ships: The Pan American Sanitary Code (signed November 14, 1924, and ratified March 28, 1925) and the International Sanitary Convention of Paris of June 21, 1926 (ratified April 7, 1928). All of the Republics of the Western Hemisphere are parties to the former and six of them to the latter. Canada is not a party to the Sanitary Code but is a party to the Sanitary Convention. It will be seen, therefore, that the great majority of countries of the Western Hemisphere are bound by two treaties governing maritime quarantine. The parties to the International Sanitary Convention of Paris include every nation of maritime importance in the world.
In signing the International Convention of Paris, the United States made the following reservation:

"The Government of the United States reserves to itself the right to decide whether from the standpoint of the measures to be applied, a foreign district is to be considered as infected and to decide what measures shall be applied to arrivals in its own ports under special circumstances."

In general, the two treaties do not materially conflict with one another, and it is significant that both, as principal features, provide for immediate mutual notification, among the contracting Governments, of the occurrence and progress of any of the quarantinable diseases occurring in their respective countries. Principal points of variation may be summarized as follows:

1. The International Convention of Paris:
   a. No mandatory provision for bill of health.
   b. International acceptance of deratization and exemption certificates.
   c. Limitation of fumigation to 24 hours.
   d. Contains special sections applicable to the region around the Suez Canal, to Egypt, and to conduct of pilgrimages.
   e. Sets up the International Office of Public Hygiene as a central body to administer the convention.
   f. Makes no provision for aircraft quarantine.

2. The Pan American Sanitary Code:
   a. Ships must take out bills of health.
   b. No provision for deratization exemption certificates.
   c. Sets up the Pan American Sanitary Bureau as a central office to administer the convention.
   d. Provides (Chap. X) that the provisions of the convention (Code) shall apply to aircraft.

The provisions of both conventions specifying treatment of infected or suspected ships are, in general, similar to the provisions of the United States Quarantine Regulations.

These treaties have both been in concurrent operation for twelve
years without any major conflict among the parties thereto as to their interpretation and application and without any serious material difficulty arising as to the application of their individual provisions among countries that subscribe to both.

There exists at present some difference of opinion concerning issuance of the bills of health required by the Pan American Sanitary Code. It is held by some Governments that these should be issued by port health authorities of countries of departure, while others contend that they are to be issued by the consular officers of the countries of destination. An expression of opinion by the Pan American Sanitary Conference would doubtless clarify this point.

The question is of some importance to the United States since it would require supplying the blank forms and considerable clerical time to prepare these bills of health. At present the quarantine officers of the United States issue to any ship master making application port sanitary statements which give the morbidity statistics of the port and special sanitary measures in force, but do not list information concerning the individual ship.

It is probable that other proposals concerning the issuance of bills of health will be presented, particularly the simplification of the form and its retention on board ship as a ship's document exhibited to quarantine officers at successive ports. Any modification tending to simplification would be in agreement with the spirit of the Pan American Sanitary Code.

Suggestions have been made that bills of health are of little value in present times. It has been pointed out, however, that the requirement that ships secure bills of health is the principal means of insuring sanitary control and of enforcing sanitary inspection of them while in foreign ports.

Those two sanitary treaties have been the means of securing international uniformity of quarantine procedure and, in consequence, have been one of the prime factors in promoting the effective sanitary control of shipping which has been reflected in recent years by a minimum of overseas transfers of the quarantinable diseases. Probably even more important has been the promotion of international unity and mutual understanding in the field of preventive medicine far beyond the relatively narrow limits of maritime quarantine. This is clearly exemplified in any survey of the extensive achievements of the Pan American Sanitary Bureau.

V. AERIAL QUARANTINE IN RELATION TO INTERNATIONAL TREATIES

The United States of America is signatory to one treaty specifically drawn for the purpose of quarantine control of aircraft. It is
the "International Sanitary Convention for Aerial Navigation", concluded at the Hague April 12, 1933, and ratified by the United States June 13, 1935. The Governments entering into this convention include most of the European countries, as well as Australia and South Africa, and three other Republics in the Western Hemisphere.

The United States made the following reservation: "The Government of the United States of America reserves the right to decide whether, from the standpoint of the measures to be applied, a foreign district is to be considered as infected, and to decide what requirements shall be applied under special circumstances to aircraft and personnel arriving at an aerodrome in the United States of America or territory subject to its jurisdiction."

This convention provides:

1. For authorized aerodromes (airports of entry).
2. Sanitary aerodromes providing detention and disinfection.
3. Anti-Amaryl aerodromes providing special features to protect against yellow fever.
5. Signature of aerodrome officials to attest sanitary entries.
6. Surveillance may not be replaced by observation (detention and isolation) unless the danger of introduction of disease is exceptionally serious.
7. Special measures for the control of plague, cholera, exanthematous typhus and smallpox.
8. Special measures for control of yellow fever:
   a. Aerodromes in infected territory must be anti-Amaryl aerodromes (pp. 13 and 14, Art. 38 and 40).
   b. In the absence of anti-Amaryl aerodromes, all aerial navigation from an infected region shall be suspended (Art. 39).
   c. Persons exposed to infection must remain within the anti-Amaryl aerodrome until six days after exposure.
   d. Neighboring territories, when both are infected with yellow fever, may enter into mutual agreements as to navigation exclusively between them.
- 8 -

e. Uninfected territories may not prohibit landing of aircraft from infected territories provided provisions of the convention relative to measures at points of departure are complied with.

9. Continuation of air travel by persons exposed to infection provided appropriate entries are made in the journey log book.

10. Continuation of the journey by aircraft exposed to infection provided appropriate entries are made in the journey log book.

11. Special agreements between two or more parties to the convention.

12. Accession of additional Governments.

It seems probable that the requirement for the establishment of anti-Amaryl aerodromes in countries infected with yellow fever may act as a deterrent to accession to the convention of many countries that would be directly affected.

Authority for quarantine restrictions by the United States of America against aircraft from countries that have not ratified or acceded to the convention is found in United States Code, Title 49, Section 177-b, c, and d, in which the essential statement is: "The Secretary of the Treasury is authorized * * * * * by regulation to provide for the application to civil air navigation of the laws and regulations relating to the administration of the customs and public health laws to such extent and upon such conditions as he deems necessary." This is the general authority at present utilized for quarantine control of aircraft operating between the United States and other Pan American Republics. In applying this authority, the United States has endeavored to follow the general provisions of the International Sanitary Convention for Aerial Navigation.

While it is true that the Pan American Sanitary Code covers air travel, and that this Code is a treaty binding upon the various American Governments, it is also quite obvious that its provisions are drawn specifically to cover the operations of ships, and that it seems fair to consider that the conditions surrounding air travel at the present day could hardly have been accurately foreseen when the Code was drawn. Furthermore, the provisions of the International Convention do not materially conflict with those of the Pan American Code.

The measures at present taken by the United States of America to prevent the introduction of disease, and in particular yellow fever by aircraft, are as follows:

1. Requirement that all aircraft from foreign territories must land first at an airport of entry.
2. Medical inspection at airports of entry.

3. Provision for detention of persons at national quarantine stations should this be found necessary.

4. Requirement of a certificate of origin of passengers from countries where yellow fever exists.

5. Surveillance, to complete nine days from date of last possible exposure, of persons from yellow fever infected areas, excepting those immunized against yellow fever.

6. Disinsectization of aircraft from countries where yellow fever exists.

7. Requirement that operating personnel of aircraft from countries where yellow fever exists be immunized against this disease.

8. Maintenance of a group of trained personnel for immediate, intensive Aedes aegypti control in any communities in which a case of yellow fever appears.

9. Aedes aegypti control in cities near airports of entry utilized by aircraft from South America.

10. Aedes aegypti surveys in cities of the southern States.

11. Maintenance of a reserve supply of yellow fever vaccine for immediate immunization of exposed population in event of appearance of yellow fever.

VI. TRAINING OF PUBLIC HEALTH PERSONNEL

The value and the necessity of having a properly trained personnel is a subject well in the foreground of public health administrative consciousness. A corps of workers politically or, at best, haphazardly hired, many of whom will make the organization suffer through their lack of training, cannot render public health services of high adequacy and quality, and the increasing, though belated, recognition of this fact by governmental agencies may be seen in the many administrative procedures now under way to raise the general level of training among public health workers. Recent acts of Congress providing funds for expanded public health activities have each carried a section specifying financial assistance in the training of personnel. Through funds made available by the Social Security Act, some 3000 persons have already received training in accredited public health institutions. Some of these attended for short periods of time and others for an academic year or more.
Cancer and the venereal diseases have recently been the subjects of legislation directed to their control, and here, likewise, special provision has been made for the training of workers. No large number have as yet been selected for such training, but they will be in time.

As another means of raising the general training level of public health workers, State authorities have set up minimum qualifications that must be met by full-time personnel employed through Federal grants. This is a decided advance since State and local health organizations have long been sadly hampered in their work by having to function through persons inadequately equipped for their jobs. Also, their efforts, as well as those of more competent workers, are made the more uncertain through their mental uncertainties as to their tenure of office. A set of qualifications as a criterion of employment, while not a cure for all evils, will serve to attract personnel of high caliber and do much to prevent political interference in the employing of public health workers.

Our states as a whole have been rather slow to adopt systems of personnel management. Up until 1937 only nine of the 48 had merit systems for the selection and promotion of their governmental employees. Last year five other states joined this group. And even in these fourteen states, one does not always find salary schedules and definite programs of promotion based on efficiency of performance which are so essential to a real espirit de corps.

The training and experience of public health workers, and the policies under which they best work constitute a problem which the State health authorities, the Federal Public Health Service, and the American Public Health Association are jointly studying at the present time. The study attempts to ascertain the level of training of all professional personnel in public health work. The resultant findings will be the starting point of an effort to improve the qualifications of our personnel, and it is hoped and expected that in consequence thereof public health services will grow in quality, value and usefulness. The findings of this study are still nine months or more in the future since the project has only just begun.

VII. RURAL SANITATION

The federal government has no jurisdiction over matters of sanitation in any of the States or territories comprising the United States other than on property belonging to the federal government, on which premises the State and local authorities do not have jurisdiction. Control over the various problems coming under the head of sanitation is a function of the State and local health departments. The various and proper agencies of the federal government act in an advisory capacity in matters of sanitation to the health agencies of the various States, but even where federal funds are being expended in connection with sanitation the requirements of the State in which activities may be carried
on must be complied with.

Due to the large amount of federal funds made available for various types of work in the several States during the past five years there has been a very great impetus to improvement in rural areas in all phases of sanitation. Many of these improvements were incident to and a part of other activities not primarily having to do with health or sanitation.

The $8,000,000 annual appropriation of federal funds made available to State health agencies under Title VI of the Social Security Act together with increased funds appropriated by State and local health agencies has greatly accelerated activities in rural sanitation and should as time goes on bring about greater improvement in so far as water supplies, excreta disposal and improvements in housing are concerned.

In 1933, through the use of federal funds, made available through federal emergency relief agencies, a more-or-less country-wide project for replacement of insanitary privies with types considered sanitary was instituted under the direction of the Public Health Service in cooperation with the State departments of health. This work has continued and up to the present time there have been constructed in 38 States 1,774,300 sanitary privies.

In many of the States much greater attention is now being paid by the State health departments to the protection of rural well water supplies that are accessible to the traveling public. In some instances, small parks with sanitary facilities for the convenience of travelers by motor vehicles have been developed along the rural main highways. There has been an increasing activity on the part of the State authorities in placing signs along the roads notifying motor travelers when they are approaching safe well water supplies which have been constructed and maintained under the supervision of the State. Problems have been complicated to a certain extent by the increased use of motor trailers for private tourist occupancy, but the development of parking camps under public or private auspices with adequate sanitation facilities for these travelers appears to be the logical solution.

In 1933 a federal agency known as the Rural Rehabilitation Corporation was formed to develop low cost rural housing. This agency undertook the construction, using funds made available through the emergency relief appropriation, of about six developments in various parts of the United States. This agency was later merged with the Resettlement Administration, which during its life developed and constructed some 300 rural developments in housing and land utilization. In these developments properly protected home water supplies and proper sewage and excreta disposal was instituted.

The Farm Security Administration, the successor of the Resettlement Administration, has not attempted further development of housing but has continued a program of improvement to water supplies, proper disposal of human feces and screening for farm homes.
Two other emergency federal agencies have been instrumental in improving sanitary conditions in rural areas and in the improvement of housing. The first is the Federal Housing Administration, an agency which insures loans made by banks to private home owners. Wherever properties are located outside areas served by public water and public sewerage, it has been required that such properties be provided with water under pressure and have water carriage sewage disposal. This has called for the proper development of individual home wells and the installation of plumbing fixtures with septic tank and subsurface disposal of the liquid waste. Under the recent amendments to the Housing Act extending the activities of this agency to farm properties it will likewise be required that properly protected water supplies and sanitary privies or other means of proper disposal of fecal matter be installed before loans on such property will be insured by the federal agency.

The second is the Rural Electrification Administration. This agency has been formed to make loans for the development and extension of electric service in rural areas. The installation of water supply under pressure and water carriage sewage disposal in the home has been urged by this administration in connection with the developing of uses for electricity. Installation of such facilities will increase the use of electric power for the pumping of water and other farm household purposes.

So many agencies both federal and State have been engaged during the past few years in activities directly and indirectly pertaining to improvement in sanitary conditions and in housing in the rural areas that it is impossible to state in exact terms just what has been accomplished. That a great deal has been accomplished is known and that there has been created a desire in rural areas for betterment of sanitary conditions is certain.

Due to the availability of federal funds for grants-in-aid and loans to communities for public works projects and relief labor for unemployed persons in communities throughout the United States there has been a greatly accelerated expenditure for extension of public water supplies, together with treatment of water, and for sewerage systems with treatment of sewage. The increase in sewer systems and sewage treatment during the period since 1934 has been extremely striking, exceeding by far the increase taking place in any preceding period of like length. In this connection it is interesting to note that during the five years, 1932 to 1937, while the number of persons tributary to sewer systems increased from 60,000,000 to 72,000,000, the number tributary to sewage treatment plants increased from 21,000,500 to 37,000,000.

VIII. LEPROSY

Studies of the various phases of the Leprosy problem are going forward in many centers but it cannot be said that any very important progress has been made in recent years. Attempts at control of leprosy
vary all the way from ignoring the disease up to drastic measures, chiefly isolation in special institutions.

The modern organization of an anti-leprosy campaign should be adapted to the particular area in which the campaign is to be carried out. Usually large concessions must be made to public sentiment and to economic necessity—to the former on account of misinformation and hysteria, to the latter on account of the expense that must be incurred.

It may be mentioned that in an intelligently directed anti-leprosy campaign there would need to be taken into account the following considerations when the subject is viewed from the strictly public health point of view:

1. The risk of the spread of this disease, depending upon geographical location:
   
   (a) In parts of the world where the disease shows a tendency to spread the patients should be isolated in special institutions at as early a period after the disease is recognized as is practicable.
   
   (b) In areas where experience has shown that the disease does not spread there is no need to take any special steps, and patients may be allowed their liberty insofar as their physical condition permits and the attitude of the community does not forbid.
   
   (c) In areas where the tendency to spread is very feeble, i.e., where cases occur only at long intervals, the decision may be left to the individual patient concerned and his medical adviser and the local health officer, from the point of view of danger to others.

2. The type of case may be important: There is a general impression among students of leprosy that purely neural cases offer very little risk of transmitting the disease, even in areas where experience has shown the disease to be readily communicable. If necessary, this may be taken into consideration in deciding on the disposal of any individual case, especially under conditions such as those referred to under sub-heading (c) above.

3. Protection of children: There is some evidence that the risk of acquiring the infection is greater for children than it is for older persons. This leads to the conclusion that when children are exposed more active measures need to be taken than when adults alone are exposed.

4. In recent years, on account of the lack of conspicuous (if any) success with methods heretofore employed to control leprosy certain jurisdictions have adopted the plan of establishing out-patient clinics with a view to early treatment of the disease and instruction of patients as to prophylaxis.
5. Stress is laid on the importance of early diagnosis in connection with prophylactic measures, and it is beginning to be realized that many early cases need to be kept under observation for long periods before a definite decision is made regarding the presence or absence of the disease.

6. It is still a question whether there is any drug or other agent of any definite or specific value in the treatment of leprosy, with perhaps at least as many experienced clinicians answering in the negative as would answer in the affirmative. Much of course may be done to alleviate symptoms and to mitigate the discomfort of complications.

7. Remarks on isolation: When practicable, institutions for the care of lepers should be located in areas with a salubrious climate in which experience has shown that there is little or no risk of spreading the disease.

The cottage type of institution, with ample grounds for each unit, is preferable to the barrack type.

Patients may be released temporarily or permanently when their physical condition is such that they are no longer considered to be a menace to the public health of the community in which they are to reside. Obviously, the same considerations as respects geographical location apply as under 1(a), (b) and (c) above.

If for any reason isolation in an institution is impracticable isolation in the home may be considered. The patient should be confined to a domicile or part of a domicile and contact with others avoided as far as possible. The patient should have his own bedding and eating and drinking utensils and should, in general, be isolated from family and friends. Except in rare instances this type of isolation is rather unsatisfactory and is to be adopted only when institutional isolation cannot be carried out.

Children born to parents one or both of whom suffer from leprosy, or born into a family where there is an active case of leprosy in the same domicile should be promptly removed from the leprous environment and kept from contact with persons suffering from leprosy.

Every effort should be made to educate the public as to the facts with respect to the spread of leprosy and thus do away with the excessive fear of the disease—a fear usually most prevalent where the risk is small or absent.

We are ignorant of so many of the essential factors leading to transmission of leprosy that the above are to be regarded as tentatively reasonable measures aimed at control.
IX. RICKETTSIA DISEASES

Of the Rickettsia Diseases, two members are endemic in North America—Rocky Mountain spotted fever and endemic typhus.

Endemic Typhus Fever. — This form of typhus is definitely associated with handling of foodstuffs and contact with rats and rat harbors. The epidemiological differences between epidemic and endemic typhus were readily explained when it was shown that the rat flea is the vector of the endemic form of the disease, and that a reservoir of the disease exists in nature in Norway rats. None of the investigations in our Southern States has cast suspicion toward any other vector than the rat flea.

Mild typhus was described in New York City in 1898, and was recognized in the Southern States somewhat later, being reported in Atlanta in 1913, in Charlotte, North Carolina, in 1914, and in Galveston, Texas, in 1916. It is now known to be widely distributed over the world, and is variously known as Brill's disease, endemic typhus, murine or rat typhus and flea typhus.

In 1923, intensive studies of the disease in our Southern States were started. In 1929, it was known that the disease was rather sharply limited to the seacoast, being present in nearly all of the Atlantic seaports, from New York, southward. On the Gulf Coast, it was endemic in Tampa, Pensacola, Mobile, New Orleans, Galveston and Houston, Texas, and in the lower Rio Grande Valley. With one or two exceptions, the disease was concentrated in the coastal cities and towns and had not, in general, been recognized very far inland. For instance, in Alabama, the disease, although present every year in Montgomery, was not found in the towns north of that city. On the other hand, it was of common occurrence in the towns of the southeastern part of that State. Throughout the area in which endemic typhus was recognized at that time, it was essentially a disease of the cities and towns. In the succeeding six years, the disease has spread until at present we find it as far north as Tennessee and Northern Texas. Coming north along the Atlantic seaboard, we find that the disease is still limited to the coastal towns and has not shown the same tendency to spread inland as we have observed in the more southern States.

With the extension of the geographical limits of the disease, there has been a marked increase in the number of cases reported each year. Fifty cases were reported for the Southern States in 1923, the first year in which an intensive study was made in that section. Each succeeding year brought a gradual increase in the number of reported cases, until 300 cases were reported in 1931. In 1932 there was a sharp increase in the number of reported cases for the entire South to the figure 831, followed in 1933 by 1922 cases with a slight recession in 1934 and 1935 to 1308 and 1195 cases, respectively. In 1937 one state, Georgia, recognized over 1,000 cases. The gradual increase in the
number of reported cases from 1923 to 1931 might be explained by increased recognition of cases by physicians, as interest in the disease spread, but the sharp increases in 1932 and 1933 surely cannot be explained on those grounds alone.

Coincident with the increase in number of cases, there has been an extension of the disease from the cities and towns to the rural districts. This rural involvement has not occurred over the entire South, but has been limited to certain sections, chiefly to the counties in Southern Alabama, and Georgia, were peanuts are grown extensively. It has been suggested that the cultivation of peanuts and their subsequent storage in the rural districts has attracted rats from the towns. Such an increase in the rural rat population may be the basic reason for the increase in cases of endemic typhus. A second reason is suggested by the history of bubonic plague on the Pacific Coast. This epidemiologically similar disease was introduced to the West Coast in rats, but a reservoir became established in the native ground squirrels. With this in mind, a study of native wild rodents of the South was made to determine their susceptibility to typhus fever and consequently the possibility of any species of native rodents serving as a reservoir of the disease. To date, practically all of the rodents native to the Southern States that have been examined have been proved susceptible: two species of meadow mice, white footed mice, house mice, chipmunks, one species of squirrel, rice rats, cotton rats and opossums. One species of field mouse was found to harbor the virus in nature.

Rocky Mountain Spotted Fever.—The second member of the typhus group, endemic in North America, is Rocky Mountain spotted fever, which, as the name indicates, was first described in North America, and until comparatively recently, was thought to be limited entirely to the northwestern part of the United States.

Spotted fever is known to have been present among the early white settlers in Montana and Idaho for fifty or sixty years. From Indian legends it seems probable that the disease was encountered by the Indians prior to the advent of the whites. The epidemiology and mode of transmission of the disease have been accurately recorded by a number of investigators. It has been shown that the disease can be transmitted experimentally by several species of ticks, and that at least two species, which feed upon man, are infected in nature. The known vectors are the Dermacentor andersoni, the wood tick of the Northwestern States, and the Dermacentor variabilis, or eastern dog tick. In these two ticks, both of which readily feed upon man, the virus of spotted fever is hereditary, a fact which greatly increases the difficulties of control.

In the early years of this century, spotted fever was thought to exist only in the Northern Rocky Mountain States, but within the past ten or twelve years the disease has been recognized as widespread over the entire United States, with the exception of the New England States,
Michigan and Wisconsin. It is also present in at least two of the provinces in Western Canada — British Columbia and Alberta. In addition, it has been shown that the so-called "exanthematic typhus of Sao Paulo", Brazil, is indistinguishable from spotted fever and immunological studies have indicated that boutonneuse fever is very closely related. The suspicion has been voiced that Kenya typhus of the province of Kenya in East Africa, a tick-borne disease, may also be very closely related or even identical with spotted fever.

Confining ourselves to the known infected region in North America, it is a matter of interest whether the increase in the known geographical limits of the disease represents an actual dissemination, or can be explained by an increased recognition of cases. We are unable to answer this question at the present time. The list of animals that are known to be susceptible to spotted fever embraces several species of squirrels, rats, mice and rabbits, woodchucks and large animals as the dog and sheep.

It would seem that since this disease is hereditary in ticks and since the opportunities for the dissemination of infected ticks on dogs, sheep, rodents, etc., are numerous, the increase in the known distribution of the disease must be real. On the other hand, we know that the disease was occurring in human beings in the Eastern part of the United States for at least 15 years before it was recognized.

The number of cases reported each year since the recognition of the fact that the disease is widely distributed over the United States, has remained at a figure a little short of 1,000 cases. The great majority of these come from the originally known area in our Rocky Mountain States. There is a wide variation in the virulence of the strains of spotted fever as shown by the mortality rates in human beings. Cases occurring in certain districts — as Southern Idaho — give a mortality rate of less than five per cent, while in certain sections in Montana the rate reaches 75 per cent. In the infected areas in the east and in the United States as a whole, the mortality rate is 20 to 25 per cent.

X. VIRUS DISEASES

This consideration of virus diseases will disregard the ordinary ailments such as smallpox, chickenpox, measles, mumps and the like and give attention to ailments of more especial interest in the United States.

Encephalitis (St. Louis Epidemic).—A sudden and explosive outbreak of approximately 1,100 cases of Encephalitis, having a mortality rate of approximately 20 per cent and with slight to negligible sequelae upon recovery, occurred during the late summer and early fall of 1933 at and near St. Louis, Missouri. The causative agent of this outbreak was demonstrated to be a previously undescribed virus which differentiates
this outbreak from both the Economo and Japanese type B Encephalitis. During the summer of 1937, an outbreak of approximately 400 cases of the same ailment reappeared in the St. Louis area and sporadic cases have apparently occurred in other localities since 1933.

**Lymphocytic Choriomeningitis**—During studies of the St. Louis Encephalitis outbreak in 1933, a second previously undescribed virus was encountered. This virus is transmissible to monkeys and mice in which, following intracerebral inoculation, it produces a lymphocytic infiltration of the choroid plexus and meninges. The virus was, therefore, designated as "Lymphocytic Choriomeningitis."

The virus which has been found to be pathogenic for man has been isolated from several localities in the United States, (Washington, Princeton, N. J., and New York) and from England and France. There is additional evidence that the virus is widely distributed in the United States and that it is present in Ireland and in Tunis.

The ailment occasioned in man, which can at present be diagnosed with certainty only by the laboratory, in so far as it has been actually identified manifests itself as a meningitis or meningo encephalitis and most often has been confused with tuberculous meningitis until recovery renders the latter diagnosis improbable. There have been no deaths in established cases. Recovery is usually without sequelae although exceptions occur.

The clinical picture variously designated as aseptic meningitis, lymphocytic meningitis, pseudo-tuberculous meningitis and the like is in part but not entirely known to be due to choriomeningitis infection.

From four to six weeks following onset of the disease, demonstrable antibodies capable of neutralizing the virus appear in the sera of recovered cases and may persist for years.

Over 1,000 human sera have now been studied by the serum protection test and approximately 11 from each 100 sera gave evidence of having had previous contact with the virus. This proportion is far in excess of the number giving a history of central nervous system ailments and suggests that the latter is an exceptional occurrence in infection with this virus. This is in harmony with the results secured in experimental animals when the virus is introduced other than directly into the central nervous system. Experimental inoculations carried out in France indicate that the same is true in man following subcutaneous inoculation of the virus, which led in most instances to a febrile attack resembling grippe or influenza. It seems possible that a portion of such diagnosed ailments are actually due to the virus of lymphocytic choriomeningitis.

The virus has been isolated on several occasions from spontaneously infected white mice and since it is pathogenic for man it becomes a matter of importance where mouse brain tissue vaccine is employed as has been practiced on a limited scale in some instances.
Poliomyelitis.—The incidence of reported cases in the United States during the present season continues favorable.

The astringent nasal sprays found so effective in preventing experimental poliomyelitis in monkeys have been employed extensively in two outbreaks (one in Canada) during the past two seasons. The results, however, were inconclusive owing to the employment of ineffective methods of application of the chemical to the olfactory terminals. While progress has apparently been made in attempts to find a simple effective method of application, the probably transitory nature of the protection, the temporary discomfort, and the resulting anosmia which may persist for several months still constitute objection to the method as a public health measure for general application.

XI. MALARIA

Drainage.—Drainage (or filling) of breeding places of Anopheles quadrimaculatus, the principal vector of malaria in the United States, is the chief method of malaria control practiced in this country. It is the method of choice at larger centers of population or foci of heavy infection. The trend in drainage works is toward permanent types of installations requiring a minimum of maintenance. Ditches with concrete inverts and grass sodded banks are the most popular choice of construction.

Larvicides.—Methods of applying both liquid and dust larvicides have been improved over the last several years. Power equipment is becoming more widely used and airplanes are now employed in situations where dust larvicide is applied on a large scale.

Drugs.—While there are conflicting opinions on the subject, the value of drugs as a method of malaria control has not been demonstrated. Research is being conducted in this field.

Screening.—The use of mosquito barriers or screens as a method of malaria control in rural areas has been revived as a frequent topic of discussion among malariologists. Discussion has included the feasibility of screening porches, better construction of houses, and relocation of homes to minimize the mosquito hazard.

Biological Control.—The control of mosquito production through naturalistic or biological means is the longed-for ideal which is the subject of intensive investigation by malaria control workers.

Impounded Water.—Malaria in the United States is frequently associated with impounded waters. Considerable effort has been devoted to acquainting construction engineers with the hazard of "man-made" malaria. Better coordination of highway and railroad construction, lumbering activities, recreational lake impoundages, and the like, with malaria control programs is being obtained. Application of mosquito control
measures at large scale water impoundings for flood control, navigation, and hydro-electric power, has been notably successful. In this connection the method of control by fluctuation of the water level to disrupt mosquito production has experienced important refinements.

State Wide Malaria Control.--An important recent development in malaria control in the United States is the installation of malaria control and investigational units in southern State health departments. These units are comprised of a medical malariologist for epidemiological work, a sanitary engineer to plan for drainage, larvicides, and screening, an entomologist to make anopheline surveys, and one or more thick film laboratory technicians to examine blood films. Activities of the units also include prosecution of an educational program to reach school children, the medical profession, the laity, and industrial corporations. Better and more complete reporting of vital statistics is sought for. Information based on a survey of the prevalence and distribution of malaria, the mosquito problem at hand, and the corrective resources available, enables the units to formulate specific plans of attack, including an accurate estimation of their cost for consideration by local authorities. This program assures a reasonable chance of securing initiation and maintenance of a malaria control project.

XII. AMEBIASIS


Prevalence.--Amebiasis is probably world-wide in distribution. It is more prevalent in the tropics and sub-tropics than in temperate zones. In the latter, where sanitation is poor the incidence may be as high as in the tropics.

Amebiasis appears to be especially prevalent in Indo-China, China, the Philippines and in parts of India. It is very common in Egypt and in other parts of northern and central Africa. In South America, especially in Brazil, and in the West Indies and Central America, it is prevalent. It is an important disease in Italy and in other parts of southern Europe and also in the southern United States. In northern Europe and in the northern United States this infection is more common than has generally been believed, as shown by the considerable number of carriers in these regions, although clinical dysentery is relatively rare. A conservative estimate indicates that between 5 and 10 per cent of the people of the United States harbor Endamoeba histolytica.

Latest methods of diagnosis.--The diagnosis of amebiasis still rests upon the demonstration of Endamoeba histolytica in the feces, exudates or tissues of the infected individual.

The methods available for the demonstration of the parasite are:
Microscopic examination of fresh and of fixed-stained preparations of feces or the contents of amebic abscesses.

Cultivation of amebae from stools or abscess contents.

Microscopic examination of stained sections of tissue.

Proctoscopic examination and the examination of material so obtained.

The complement-fixation test is used in the diagnosis of amebiasis but there is a difference of opinion concerning its reliability. The following statements are taken from two authoritative sources -

"A positive reaction with the complement-fixation test is practically diagnostic, but it should be supported if possible by the demonstration of the ameba." (Craig and Faust, 1937).

"Complement-fixation. - Craig, 1929, has demonstrated that the serum of infected patients may give a positive reaction with a suitably prepared antigen (from cultures). The technique is difficult, and the reliability of the results has not yet been demonstrated sufficiently to warrant use of the procedure for clinical diagnosis." (Stitt, Clough & Clough, 1938).

For the routine diagnosis of amebiasis the following procedure is, in general, a satisfactory one:

On one end of a slide is placed a drop of physiologic saline solution, and on the other end a drop of iodine stain. With a toothpick or applicator a small particle of feces is thoroughly mixed first in the saline solution and then in the iodine stain and cover-slips applied. The saline smear is then examined with the low power lens of the compound microscope for the detection of o/embae. The iodine smear and high power are used for the identification of the amebae. A minimum of four slides should be examined before regarding a stool as negative. To establish a negative diagnosis on a patient it is desirable to examine at least six daily stools.

The iodine stain mentioned is prepared with a 5% aqueous solution of Potassium Iodide saturated with iodine crystals (one part) and distilled water (one part). This stain has been standardized recently by D'Antoni at Tulane University and can be purchased from Eimer and Amend Company, New York City.

Prevention:—Prevention of infection with Endamoeba histolytica depends upon the prevention of contamination of food and drink with cysts of this parasite.

For this purpose the following methods are indicated:

A properly impounded and filtered water supply.
Sanitary plumbing of hotels and public buildings.

Protection and sterilization of water supplies in rural districts and villages or towns where an impounded and filtered water supply is not available.

Proper disposal of sewage.

Laws prohibiting use of human excrement for fertilization of truck gardens.

Prevention of fly-breeding and protection of food from flies and cockroaches.

Examination and treatment of food handlers in public eating places. This method is the most important one in districts which are well sanitized in all other respects.

Detection of carriers of \textit{E. histolytica} by means of surveys of the population in localities where epidemics of amebiasis may occur or where it is believed that such infection is responsible for illness.

In addition to the above methods concerned directly with prevention of cyst ingestion the following methods are important in the control of amebiasis:

Training of a sufficient number of health laboratory workers in the recognition of \textit{Endamoeba histolytica}.

Education of the public regarding the infection and its importance as a public health problem, by means of printed information, radio talks, and so forth.

Making amebiasis a reportable disease, using a nomenclature for reporting it similar to the one recommended in the Standard Classified Nomenclature of Disease.

Treatment:—Drugs used in the treatment of amebiasis are:

\textbf{Iodine preparations:} Chininofon (also known as anayodin or yatren) and vioform. Of the two, chiniofon is the drug of choice and is capable of curing a very large percentage of infections with \textit{Endamoeba histolytica}. It can be used with safety in mass treatment. No serious toxic symptoms have been reported from the use of chiniofon or vioform.

\textbf{Arsenicals:} Carbarsone, acetarsone and trepaarsol. Of these, carbarsone appears to be the least toxic and most efficient.

\textbf{Alkaloids:} Emetine hydrochloride. This drug is highly toxic and should be used only to control dysenteric symptoms and in the treatment of amebic abscess of the liver.
Carriers of *E. histolytica*, as well as persons suffering from clinical amebiasis, should be treated. Chiniofon appears to be the preferred drug for carriers; a single course of treatment is usually curative, but the course may be repeated, if necessary, after a lapse of two weeks. Resistant infections are rarely encountered and, if chiniofon has proven ineffectual, it is believed preferable to administer one of the effective arsenicals rather than another iodine preparation.

The treatment of clinical amebiasis includes the treatment of amebic diarrhea; of amebic dysentery, chronic and acute; and of amebic abscess of the liver.

The treatment of cases of amebic diarrhea varies somewhat from that of carriers. Rest in bed is indicated and if the diarrhea is severe it should be controlled by emetine hydrochloride, after which a course of chiniofon, vioform or carbarsone should be given. Emetine should not be relied upon to eliminate infection with *E. histolytica* for it has proven curative in only a small proportion of cases. If the patient is seen between diarrheal attacks, the treatment should be the same as that recommended in the case of carriers. In many of these patients a repetition of the treatment will be necessary in order to eliminate the infection.

The treatment of amebic dysentery is in general the same as for the treatment of amebic diarrhea.

In the treatment of amebic abscess of the liver, emetine has been found effective; where it has failed in such cases surgical treatment becomes necessary.

Additional note:—Under the subject "Prevention" in a recent textbook (Craig and Faust, 1937) the following statement is found: "--- chlorine or other chemicals used in water purification are useless, owing to the resistance of the cysts of *E. histolytica* to these agents."

This opinion, which appears to be widespread, is not supported by a recent worker (Stone, W. S.: "The resistance of *Endamoeba histolytica* cysts to chlorine in aqueous solutions," Amer. J. Trop. Med., v. 17 (4), 539-551, July, 1937). In experiments conducted by this author, with cultured material, the cysts of *Endamoeba histolytica* were not more resistant to the lethal action of chlorine than were the ordinary vegetative bacteria. His experiments showed that the colon bacillus as well as the ameba cysts remained viable in fecal suspensions treated with chlorine. The probable reason for this, according to the author, is not that the organisms are resistant to chlorine but that the very large amounts of organic matter present in fecal cyst suspensions use up all the available germicidal and amebicidal chlorine before it can contact all the organisms. Since the author states that the data presented in his paper are purely experimental and without present practical applica-
tion, this note was not included in the above statement on "Prevention". It is added merely as a detail of information that may be of interest.


XIII. PROPHYLACTIC AND CURATIVE SERUMS AND VACCINES

Antitoxins.--The prophylactic and therapeutic value of the antitoxins is unquestioned, and efforts are directed principally toward refinement and removal of substances which tend to produce immediate or delayed allergic reactions. American antitoxins are highly concentrated and uniformly contain excess units for the expiration date far beyond possibility of deterioration. In addition to diphtheria, tetanus and scarlet fever antitoxins, recent years have seen the development of staphylococcus antitoxin and the anaerobic antitoxins, in which latter field a great deal of work is being done at present.

Serums.--With the separation of the pneumococci into more than 30 types and the development of curative serums prepared in the rabbit, a great deal of interest has been revived in antipneumococcic serum. Standard control serums have been prepared for Types I and II, and are in process of preparation for Types V, VII and VIII. Rabbit serum is being used on a considerable scale in the United States and clinicians are favorably impressed. Standardization by the mouse protection test is laborious and perhaps not too accurate, and much effort is being made to develop a dependable biochemical test for this purpose. A great deal of work is being done on standardization of antipneumococcus typing serum, which for obvious reasons must be type-specific. Dependable type serum removes the first variable in connection with the specific diagnosis of pneumonia, leaving the possibility of improperly trained personnel, which can be corrected only by intensive training of laboratory workers. Intensive researches are in progress looking to the development of an agent for producing active immunity to pneumonia.

Meningococcus Serum.--During the past few years the National Institute of Health has studied meningococcus types collected from various sources in the United States. Type IV seems to have practically disappeared, while for purpose of the preparation of therapeutic serum Types I and III are indistinguishable. Considerable experimental work has been done combining meningococcus serum with sulfanilamide with apparently favorable results.
Diphtheria and Tetanus Prophylactics.--Toxoids prepared from both toxins are distributed in the United States in both the fluid and precipitated forms under minimum requirements which are based upon animal tests. Diphtheria toxoid, alum precipitated, probably represents 90 per cent of the material used. Tetanus toxoid is used in industry in groups repeatedly exposed to tetanus and is used by some pediatricians in their private practice. It is safe to say that diphtheria toxoid, alum precipitated, is the most powerful antigen yet developed for immunization against diphtheria. One dose seems to immunize between 85 and 90 per cent of the children, while 2 doses (with an interval of four weeks) immunize practically 100 per cent.

Vaccines.--Included in this group are smallpox and rabies vaccines. Recent years have seen the introduction (for experimental purposes) of smallpox vaccine grown in the developing chicken embryo and of smallpox vaccine grown in vitro with embryonic tissue. The principal advantage of these modifications is freedom from bacterial contamination. The control of the virulence of different batches has been difficult and protection against smallpox has not been established. Smallpox vaccine prepared in the classical way—in the skin of the calf—is still the product of choice in the protection of the public. A number of different varieties of rabies vaccine are used. The classical Pasteur method is available but killed virus, prepared according to the Semple or Cumming technique, is most widely used.

Tuberculin.—Purified tuberculin prepared after the method of Seibert is gaining popularity and is being considered as the basis of the permanent standard. Old Tuberculin, prepared by the original formula of Koch, is available but there is a tendency to shift to the use of a synthetic media, particularly since the widespread use of the Mantoux method of testing.

Bacterial vaccines.—Typhoid and pertussis vaccines are perhaps the best representatives of this group. The efficacy of typhoid vaccine has probably never been subjected to a rigorous test since other well known hygienic measures have been enforced coincidental with the use of typhoid vaccine. A great deal of interest is current in pertussis vaccine, and there appears to be reasonable hope that the disease may be modified, if not prevented, by prophylactic vaccination. An experiment is under way using a precipitated pertussis vaccine, based on the theory that immunity to this disease appears slowly and as a result of antigenic stimulation over a considerable period of time.

During the past few years there has been a tendency in the United States toward the introduction of oral vaccines of various types, particularly for the prevention of typhoid fever and the common upper respiratory infections. Such products are licensed as evidence of purity and truthfulness of the information contained on the label. Only extended trials over a long period of years can determine their usefulness.

Under miscellaneous products, perhaps the most important are the
various allergenic extracts under which may be grouped pollen extracts, vegetable and animal food extracts, and extracts of other substances which may be the cause of hypersensitive states.

"Arsphenamines."—These products are classed under biological products because of their instability and possible toxicity and the delicate animal tests required to control these factors.

Neoarsphenamine represents about 80 per cent of the drug used in the United States, approximately 10 per cent each of arsphenamine and sulpharsphenamine being used, with a negligible amount of the other "arsphenamines". The stability of neoarsphenamine has been very much increased by carrying the drying process of the finished product to the point where it contains not more than 1.5 per cent moisture. An expiration date of 3 years has been established for neoarsphenamine with the above moisture content, and of 5 years for the other "arsphenamines". It is felt that the reaction rate for neoarsphenamine should be reduced materially by this change.

It is the policy of the licensing authority in the United States that there shall be but one standard for biological products both for domestic use and for export.

XIV. CARRIERS IN INFECTIOUS DISEASES

The basic American treatise on carriers is still that of Nichols. In closing his introduction, sixteen years ago, he said, "On the administrative side, there are many perplexing questions of policy in handling carriers. The uncertainty of our knowledge in some diseases and the fallability of laboratory workers often add to the confusion. But one point should be kept clear. The interests of the group or race are supreme over those of the individual. This decision has been handed down by Nature and by Society and other decisions must conform. The interference with the individual should be as slight as possible, but there should be no question about the principle that governs."

In carrier work in typhoid fever, it has come to be recognized that in proportion as the grosser means of dissemination of the disease are controlled, the detection and control of carriers becomes more important. Over some areas on account of a continuing high typhoid rate they are so numerous that individual control measures are out of the question; they include as many as 3 per cent of the population in some regions, but generally far under 1 per cent. All carriers, however, are not of equal importance. Those who have patently given rise to a recent case of the disease deserve the first attention, and then the recent convalescents. The first fifteen years as a carrier are apparently the most dangerous years to a person's environment, partly, it may be, because of some inherent lessened danger, but also because by that time he will have immunized many of his close associates. There is probably no great difference between the sexes as to actual carrier incidence, but prac-
tically all lists of carriers under surveillance have a marked excess of females on account of their greater liability to be dangerous as food handlers.

In the detection of carriers, two or more specimens of authenticated feces at least five days apart should be carefully plated out before a negative report is made, and for declaring a chronic carrier cured, as many or more duodenal specimens at 24-hour intervals should be found negative, with eight certain specimens of feces.

Forsbeck has recently improved the method for securing bile by the duodenal tube. When the Rehfuss tip has passed the cardiac end of the stomach, as can be told by the ease with which air and water pass in and out of the tube, the stomach is distended by letting the patient drink as much water as he can reasonably tolerate; the tube will then slide down to the lower end of the stomach; the water and gastric contents are withdrawn while the patient is still sitting up, but now the patient lies on his right side and about a centimeter of tube per minute is passed down for 5 to 15 minutes, until bile is obtained.

Cholecystectomy is the one cure for fecal typhoid carriers. The operation should be advised for the carrier condition only if the carrier is a good risk, not over 50 years of age as a rule, and only where a good, clear, amber, alkaline sample of bile, obtained by the duodenal tube, contains typhoid bacilli. One state has recently reported 68 operations for carriers with 10 deaths (all over 50) and 68 per cent of the survivors cured of their carrier condition. Another state reported 12 operations, no deaths, all cured. Another, 18 operations, no deaths, 16 cures. The bile ducts in the liver rather than the gall bladder may in some be the source of the bacilli.

The virulence test in detecting diphtheria carriers is recommended to be done with pure cultures if possible. There are apparently more failures to estimate virulence properly, by the use of the entire mixed culture, than was formerly thought. A rapid method for morphological diagnosis has recently been developed - the swab is dipped in horse serum, pressed free of the excess serum against the inside of the glass container tube, and then lightly heated over a flame to inspissate the serum. This serum swab is then used in the throat of the suspect and itself incubated for 4 hours, when smears are made for microscopic examination.

The debate continues as to whether early tonsillectomy aids in preventing or in curing the diphtheria throat carrier. The most assertive evidence is that it does. For the important group of nasal carriers, simple douching with a mild alkaline solution of sodium bicarbonate, sodium chloride, and sodium bborate is recommended.

Though unquestionably carriers are the most important factor in the spread of cerebrospinal fever, and occasional obvious transmitters of infection should be subject to voluntary control, any real carrier program
becomes all the more impossible the more we learn of the facts. The better the laboratory facilities and technique, and the more prolonged the study, the higher the carrier rate is found to be, reaching at some time during the observation as many as 40 per cent of the people in a group with no meningitis cases, about half of this number being chronic, persistent carriers.

The carrier condition is at least as important in the spread of pneumococcus infection as it is in that of meningococcus infection, and in much the same way. It is the carriers, and not the cases, from whom the pneumonia spreads, and the carriers are numerous.

Similarly with streptococcus infections in general. It is generally believed, for example, that there is no justification for the simple cultural examination of scarlet fever contacts in schools with a view to their exclusion if they are found to be carriers. On the other hand, our recent knowledge that Lancefield's group A is almost entirely responsible for human hemolytic streptococcus infections has pointed to the necessity of real prophylaxis in surgery and obstetrics and possibly in other fields of medicine. With the possibility of carriers of Group A in any operating room, really effective masking should be enforced. The nose, mouth and chin should be covered, not with a few layers of open-mesh gauze, but with not less than four layers of cloth of at least 50 to 60 strands to the inch. The advances in surgical and medical asepsis have now reached the point where this attention to the potential carrier should have a demonstrable effect.

XV. CANCER

Cancer is one of the major public health problems of our time.

Ten years ago cancer was 7th in the list of causes of death in the United States. Today it is second - taking a toll of 140,000 lives each year.

The medical director of the Veterans Administration who is charged with the medical care of 4,000,000 war veterans tells us that 3,559 new cases were admitted to the Veterans hospitals in 1936 and 4,157 new cases in 1937. For the first six months of the present year there have been 2,557 new admissions. At this rate over 5,000 new cases will be admitted in 1938.

This continued increase among Veterans is due, of course, to the fact that the World War Veterans are now rapidly approaching the cancer age.

The general and widespread increase in the prevalence of cancer has been explained in three ways:

2. More people living to the cancer age.
3. An actual increase due to unknown factors in our modern complex civilization.

Since the National Cancer Institute Act was passed and approved about one year ago (August 5, 1937) we have witnessed throughout the country a steadily increasing interest in the problems of cancer prevention and control.

To date six states have passed laws either establishing a cancer control division in the state department of health or creating an official cancer commission.

Soon after the passage of the National Cancer Institute Act, the Thirty-Sixth Annual Conference of State and Territorial Health Officers with the Public Health Service passed a resolution urging health departments to secure the passage of state cancer laws which would create divisions of cancer control within state health departments.

The contemplated functions of such divisions are stated as follows: Training of physicians in the early diagnosis and treatment of cancer; dissemination of knowledge to the public concerning the necessity for early diagnosis and treatment; establishment of state aid and with the cooperation of the medical profession of adequate cancer clinics and treatment centers, and free microscopic diagnostic service.

The National Cancer Institute Act.—The provisions of the National Cancer Institute Act clearly recognize the importance of the cancer problem and provide the machinery for a concerted and comprehensive attack on this scourge. The Surgeon General of the Public Health Service is authorized:

(a) To conduct, assist, and foster researches, investigations, experiments, and studies relating to the cause, prevention, and methods of diagnosis and treatment of cancer;

(b) To promote the coordination of researches conducted by the National Cancer Institute and similar researches conducted by other agencies, organizations, and individuals;

(c) To procure, use, and lend radium as hereinafter provided;

(d) To provide training and instruction in technical matters relating to the diagnosis and treatment of cancer;

(e) To provide fellowships in the Institute from funds appropriated or donated for such purpose;

(f) To secure for the Institute consultation services and advice of cancer experts from the United States and abroad, and to cooperate with State health agencies in the prevention, control and eradication of cancer.
The Act also created a National Advisory Cancer Council. This Council was selected by the Surgeon General from leading medical and scientific authorities. It is authorized:

(a) To review research projects or programs submitted to or initiated by it relating to the study of the cause, prevention, or methods of diagnosis and treatment of cancer, and certify approval to the Surgeon General for prosecution under section 2(a) hereof any such projects which it believes show promise of making valuable contributions to human knowledge with respect to the cause, prevention, or methods of diagnosis and treatment of cancer;

(b) To collect information as to studies which are being carried on in the United States or any other country as to the cause, prevention, and methods of diagnosis and treatment of cancer, by correspondence or by personal investigation of such studies, and with the approval of the Surgeon General make available such information through the appropriate publications for the benefit of health agencies and organizations (public or private), physicians, or any other scientists, and for the information of the general public;

(c) To review applications from any university, hospital, laboratory, or other institution, whether public or private, or from individuals, for grants-in-aid for research projects relating to cancer, and certify to the Surgeon General its approval of grants-in-aid in the cases of such projects which show promise of making valuable contributions to human knowledge with respect to the cause, prevention, or methods of diagnosis or treatment of cancer;

(d) To recommend to the Secretary of the Treasury for acceptance conditional gifts pursuant to section 6; and

(e) To make recommendations to the Surgeon General with respect to carrying out the provisions of this Act.

In the near future the new National Cancer Institute, costing $750,000.00 will be erected at Bethesda, Maryland, just outside of Washington. Here fundamental research on all phases of the cancer problem will be carried on. No provision is made at the Institute for the treatment of cancer cases, but the Public Health Service is establishing in Baltimore, 35 miles away, a cancer treatment center where cancer patients among the legal beneficiaries of the Service will be cared for.

At the present time and in compliance with the law, the National Cancer Institute is providing training in the diagnosis and treatment of cancer. Seventeen young recently graduated physicians who have been carefully selected by personal interview and have expressed a desire to enter the field of cancer diagnosis and treatment as a specialty are receiving training at various cancer centers in the United States.

The Institute has also purchased 9\(\frac{1}{2}\) grams of radium which will be
loaned to institutions in the United States for the purpose of research or for the treatment of patients.

The National Cancer Institute has been enabled to round out its research activities and in addition has 10 fellows in research who have been chosen because of proven ability as investigators.

The National Advisory Cancer Council has received a total of 77 applications for grants-in-aid for the purpose of promoting research projects at other institutions. The Council has held six meetings in Washington and has awarded grants totaling approximately $115,000.00 during the first year.

XVI. PNEUMONIA

As our present knowledge does not permit a preventive approach to the problem, control measures are directed toward a reduction in the mortality from pneumonia. In the comparatively few areas in which they have been adequately applied, these measures have already achieved significant and favorable results.

Impressed by the results obtained in hospital practice, the State of Massachusetts in 1931 inaugurated a study which within a few years definitely demonstrated the feasibility of introducing modern methods of laboratory diagnosis and of serum therapy into a State public health program. A comprehensive program was undertaken in New York State two and a half years ago which is serving as a model for similar programs now commencing or being organized in several other States. New Jersey has recently commenced, and Illinois is about to start, a program along similar lines. These programs embrace a widely distributed typing service, with 24-hour service in important centers; distribution by the State of free antipneumococcic serum for the commonest types; post graduate instruction of practicing physicians in up-to-date methods, by regional clinics and demonstrations; provision of nursing care; and education of the laity, through the medium of the press, cinema, and radio, in the recognition of the usual early symptoms and the need for promptness in obtaining medical attention. The program is administered by a full-time unit within the health department.

Less extensive programs are under way in Michigan, Maine, New Hampshire, Vermont, Connecticut, Pennsylvania, Ohio, Iowa, Maryland, and the District of Columbia. Some of these limit their activity to distribution of serum. Typing facilities are now pretty widely available throughout the entire country. A few of the larger cities have control programs operating independently of the State; one of these (Detroit) provides facilities for oxygen treatment. The States of Missouri and Colorado will start on control programs in the very near future. The States of Massachusetts, New York, and Michigan, and the City of New York, manufacture antipneumococcic serum.
Recent diagnostic and therapeutic advances which facilitate successful pursuit of large scale control programs include the separation of the pneumococci into 32 immunologically distinct types, the adaptation of the Neufeld reaction to a rapid direct typing of sputum, and improved methods of concentration of therapeutic serums.

Recent reports indicate a reduction in case fatality rates from 30% in untreated Type I pneumococcus pneumonias to 5%, if treatment is commenced within the first four days. The results with several other types are not strikingly good, but a definite reduction in mortality is achieved.

**Laboratory Studies**

For the control and prevention of pneumonia in humans, laboratory investigations have yielded the most promising results. Observations starting with Pasteur's and Sternberg's isolation of the pneumococcus, and the proof that this organism is the etiological agent of lobar pneumonia in man (Fraenkel), and then the accumulated data by many investigators look toward the ultimate goal of control of this disease.

Accomplishment in the last two and a half decades, based on the early observations of the possibility of producing immune sera in experimental animals, and on the classification of pneumococci by Gillespie and Dochez, and Lister, marks the beginning of practical application in the specific treatment of pneumonia. Recently the heterogeneous group IV has been separated by Cooper into specified types, some 32 in number, thus making possible the development of all the specific sera and the determination of the exact type of pneumococcus in each case in man. Standardization of typing sera of all types of pneumococci is being undertaken by the Public Health Service.

**Antibody.**—The study on the protective antibody has led to the development of methods of concentration in which between 80% and 90% of inert protein has been eliminated. The antibody itself has been shown to be either protein in nature, or associated or combined with a protein molecule. The sedimentation constant of antipneumococcus horse serum antibody as given by Wyckoff is \( s = 16 \times 10^{-13} \). The activity in a protective dose is such that 0.003 mg. nitrogen contains antibody which protects against 1,000,000 lethal doses of virulent pneumococci in white mice: a therapeutic agent approaching the potency of well-known antitoxins. Recently rabbit immune serum has been thoroughly investigated by White and Robinson, and Horsfall and Goodner. It has been shown by the last two investigators that the pneumococcus antibody in rabbit serum is water-soluble and, at least from the samples of immune serum tested, the molecular weight is approximately one-fourth that of pneumococcus antibody in horse serum.

Perhaps as important as the isolation of the antibody - outside of the elimination of the chill-producing substance - is the development of
methods of assay of protective potency. Mouse protection methods have been used for the most part, and the unit of antibody described by Felton as that amount of antibody which would protect mice against a million lethal doses has been accepted as the international standard. Other methods of assay have been suggested: namely, the combining equivalent technic of Felton and Stahl, and the immune protein precipitation test of Heidlerberger and Kendall. These methods are sufficiently accurate for the evaluation of the protective antibody to assure the clinician of adequate dosage in the treatment of pneumonia.

Antigen.—Another phase of the laboratory studies which leads toward the control of pneumonia is the study of the essential immunizing antigen of the pneumococcus. The specific precipitating polysaccharide has been isolated and characterized by Heidelberger and Avery and their associates, but it has been left for Schiemann and Casper to show that this compound actively immunizes white mice. Felton and Kauffmann, making a study of the bacterial cell, found that not only was it possible to isolate a polysaccharide which would immunize white mice, but that the compound isolated contained more immunizing doses for white mice than found in the dried pneumococci from which the substance was derived. Whether or not this immunizing antigen is identical with the specific precipitating polysaccharide of Heidelberger and Avery has not been fully determined, although Felton and Prescott have shown that for mice and human beings the acetyl group, reported to be present in the specific precipitating polysaccharide and essential to production of active immunity, has no bearing on the active immunizing property of their preparations. This antigen has been used experimentally for the immunization of human beings, and it has been found to be fully antigenic. Doses of from 2 mgs. to 0.2 mg. stimulate antibody production in humans to an extent that 1 cc. serum contains from one to ten units of protective antibody. Antibody persists in most of the individuals for a period of approximately a year. In the past four years, 60,000 individuals have been immunized, and from this preliminary study it would appear that the incidence of pneumonia has been reduced 50% in Type I and Type II cases, and the mortality in the immunized decreased below that of the controls. This work was done in younger age groups. For a true evaluation a larger sample of population consisting of various age groups must be studied before conclusions can be drawn as to the efficacy of this prophylactic agent.

Chemotherapy.—Laboratory study on chemotherapeutic agents has been revived following the discovery by Domagk of the activity of prontosil against streptococcus infections, and the observations of Turner and Colebrook, and Trefouel that the activity of the prontosil molecule was entirely found in the sulfanilamide radical. Although sulfanilamide has some slight action against pneumococcus in laboratory animals, particularly with Type III, the activity is about one millionth of that of pneumococcus antibody. Other compounds have been shown to have some
curative effect on pneumococcus infections in experimental animals: notably, disulfanilamide (Rosenthal), ethyl hydrocupreine derivatives (workers at Mellon Institute, Pittsburgh), and more recently 2-(p-amino-benzenesulfoamide) pyridine (Whitty). Experimental studies by well-qualified investigators are being carried forward; and it is within the realm of possibility that a compound will be synthesized of proven activity in experimental animals and successful in the treatment of lobar pneumonia. It is the laboratory approach making use of our knowledge of organic chemistry, and the correlation of chemical constitution and biological activity which will ultimately assure the development of a satisfactory chemotherapeutic agent in the treatment of infections by this organism.