

The Story of the Epidemic of Encephalitis in St. Louis*

JOSEPH F. BREDECK, D.P.H.
Health Commissioner, St. Louis, Mo.

THE story of the epidemic of encephalitis in St. Louis and its vicinity is a very interesting one. Climatic conditions in the area involved were unusual for the three summer months—June, July and August. According to the official Weather Bureau records, the rainfall in St. Louis County for these months was the lowest since 1837, when the first official records began. For the City of St. Louis, the rainfall was the lowest in its history, except for a very small portion of the city which, during a single cloudburst, put the official record somewhat higher. The drainage and sewage problem in St. Louis County was favorable to the breeding of unusually large numbers of mosquitoes in areas commonly infested. In addition, the odors emanating from these open sewage channels were pronounced throughout the unusually dry summer season. In passing, it is of interest to know that there was an epidemic of rabies in St. Louis which began in March of this year.

The first information concerning the epidemic of encephalitis reached the Health Division of St. Louis August 8, 1933, when the superintendent of the Isolation Hospital notified the Health Division that 16 cases of an unusual type of encephalitis were admitted from the St. Louis County Hospital. On

August 9 these cases were examined by a member of the Health Division together with staff members of the Isolation Hospital. The histories, physical examination, and other facts obtained were discussed by the members of the Health Division, and immediate steps were taken to advise the medical profession and the laity of the epidemic. It was important that such knowledge reach the public as well as the medical profession, and the newspapers of St. Louis were very cooperative in promulgating all necessary information.

On August 10 still more cases came in from the County, and it was quite obvious then that the City of St. Louis could not escape the epidemic. Plans for field investigation were formulated and started on the same day, on the County cases, since there were then no cases reported in the City of St. Louis proper.

On August 12 a telegram was received from the Surgeon-General of the U. S. Public Health Service offering us all assistance we might need, and we wired back requesting an epidemiologist. Dr. James P. Leake, Senior Surgeon, U. S. Public Health Service arrived on the morning of August 14. Up to this date we still had no cases reported in St. Louis, so that all of our investigations were concentrated out in the County.

On August 12 it was felt that if we were to get anywhere in the study of this epidemic, we must have the co-

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operation of all the health officers in St. Louis and surrounding territory. Letters were sent out to all of these officers inviting them to a meeting in the Health Commissioner's office in St. Louis on August 14. At this meeting a uniform questionnaire was proposed and general plans for handling the epidemic were discussed. On August 17, the Metropolitan Health Council was formed, composed of all health officers in St. Louis County, St. Louis proper and those on the East side, in St. Clair and Madison Counties, in Illinois. The Metropolitan Health Council was to be a coöperative body, to meet at call of the secretary for the handling of emergencies and the exchange of ideas on public health matters. Rules and regulations for handling the cases of epidemic encephalitis were suggested and adopted.

Early field investigations led us to believe that we were dealing with a disease which was similar in its spread to poliomyelitis. The cases were widely scattered, occurring in the suburban areas of the County. It was apparent very early that rarely more than one member of a family was affected, and that the upper age groups were involved more than younger individuals.

It was important also to decide on the hospital program to be inaugurated. The Isolation Hospital it was evident would not be able to handle all the cases, so that the throwing open of all the hospitals in St. Louis for the care of these patients was an urgent matter. As the field investigations were so strongly in favor of the disease not being readily communicable from one member of the family to another, we felt it would be safe to handle these cases in the general hospitals provided sections of the hospitals were set aside for their care and where the routine isolation could be enforced as with any other communicable disease. This was done by sending a notice to all super-

intendents of hospitals and had their complete and immediate coöperation.

It became manifest early that the diagnosis was delayed for several days in many patients who had nothing more than fever. The early cases also showed the importance of lumbar puncture as a diagnostic procedure. Since it was of the utmost importance to stress lumbar puncture, we deemed that the hospital was the only satisfactory place where this could be done with the minimum amount of risk. While it is true that in some homes lumbar punctures could have been done, in most instances it was not satisfactory. Besides, the clinical symptoms and complications that arose made it almost impossible to care for these patients in the average home without a day and night nurse. Bladder symptoms requiring catheterization, and patients with delirium often requiring restraint would be handicapped by home treatment. Therefore, hospitalization of all cases was urged, and over 95 per cent of the cases throughout the epidemic were handled in hospitals. Hospitalization further gave an opportunity for more accurate clinical studies and laboratory studies than could have been made at home.

Now that the epidemic is practically over the wisdom of such a procedure is more apparent than ever. Today we can gather uniform clinical and laboratory data from the hospitals so that a complete study and analysis of the epidemic can be made with less amount of error and with more satisfactory types of record.

It was important early to draw attention to the fact that all fever cases where there were no obvious signs of any disease should have a lumbar puncture. In this way we emphasized the importance of early diagnosis and the isolation of doubtful fever cases until such a time that an accurate diagnosis could be established.

Through the newspapers and members of the medical profession we were able to create a public sentiment and coöperation that was amazing. The information issued early was complete from the clinical angle so that little difficulty could be experienced in recognizing the importance of fever, headache, and other symptoms so prominent in this disease. The response was almost dramatic. The cases came in from all sources for consultations to the Health Division, and hospitalization was made routine. Hospitalization served a double purpose of establishing the diagnosis more promptly and at the same time isolating the patient. It was urged that this isolation should be maintained for at least 3 weeks from the date of onset of the disease. All the bulletins that were issued called attention to the clinical symptoms and necessity for isolation.

The reports started coming in to the City of St. Louis on August 17. Then a very curious phenomenon occurred when we started to date back the onset of the first case. Medical men commenced to think back and there was a certain amount of friendly rivalry among the profession as to having had the distinction of recognizing the first case. This led to the discovery that cases that had recovered for several weeks were not reported. When we analyzed the cases we found that the first cases in St. Louis proper were on July 30. The first case in the County was July 7.

With the importance of fever of unknown origin, a number of curious circumstances arose in which we discovered that a large number of bloods had been sent to the City Health Laboratory for Widal test for typhoid. The number of such bloods sent in was over 100 per cent higher than the year previous and this occurred during the month of July and continued throughout August. All of these bloods were

negative for typhoid. A complete analysis of these cases is not yet available, but there are suspicions that some of these were probably encephalitis cases of mild character.

With a uniform history blank for the County as well as the City a central clearing-house through the Metropolitan Health Council was established. Daily reports of cases were sent in to the secretary who had them tabulated, and mimeographed copies made and sent out to all health officers of the Council. In this way they kept in touch with the progress of the epidemic. All rules and regulations were based on the strong belief, after field investigations, that we were dealing with a virus disease transmitted through the nasal secretions. Such impressions were reached early because of the very close similarity of spread, and of the seasonal occurrence as in poliomyelitis.

In the County in the first place water was excluded because there were two separate water supplies in St. Louis County, both of which areas were equally involved in the epidemic. The milk supply of St. Louis County is largely supplied from the same dairies as those supplying the City of St. Louis. Home investigations showed no common sources of food in any of the families, so that water, milk and food were excluded early.

Before the first week elapsed numerous theories came pouring into the Health Division office and we had a revival of many of the ancient theories concerned with past epidemics. The miasmatic theory was revived in so far as many felt that the odors from sewers and open drainage channels were responsible for the epidemic. Because the term "sleeping sickness" had been applied, it was thought by less well informed people to have been transmitted by flies. By a strange coincidence a missionary and his family had visited St. Louis County who had just

returned from Africa and within 30 days the epidemic of encephalitis started. The purchase of certain foreign species of animals for the Zoo were also thought to have brought the disease to the City. These, of course, were dismissed without any serious consideration and are mentioned because they are but a few of the many fanciful suggestions that a health officer receives.

Then, as the cases came in with no contact history, the carrier mode of spread became quite important. With the large number of mosquitoes in the areas involved naturally this theory became quite prominent in the minds of many "well-informed" people. However, it never appealed very strongly to the Health Division that mosquitoes played an important rôle in the spread of the disease. With the infection so widely spread and the prevalence of mosquitoes so obvious, they had to be investigated thoroughly. As the result, the Public Health Service men together with the man from the Army Medical School carried on this work to attempt to solve the problem. Up to this time there has been no evidence accumulated to show that mosquitoes have any part to play in the transmission of this disease. While these experiments have not yet been completed, we naturally hold an open mind as to the results.

It was important early to centralize all the laboratory work, particularly from the research angle. All of the pathological material had to be gathered together for animal inoculations since the spinal punctures and brain cultures were negative. With negative cultures by competent laboratory investigators in several hospitals, it was felt that we were on the way to establishing it as a virus disease.

Various animals were selected for the inoculations of brain tissue and other body fluids. Before the susceptible animal was found one of the laboratory

investigators found inclusion bodies in the kidney which lent further support to the virus theory of disease. Following closely upon this, monkeys that had been inoculated with brain substance from autopsy material, developed fever and clinical symptoms of encephalitis as seen in man. The microscopic pictures were not unlike those found in human cases. This was very encouraging indeed, and up to this time the monkey inoculations have progressed and the virus has been carried on through three or four series of monkeys. It is the hope and ambition of those engaged in this research that the virus will be maintained and adapted to this species of monkey so that further valuable data may be accumulated. The difficulties of adapting the virus are many. It is too early to state at this time whether such adaptability will be complete or not.

Even the laboratory workers had many suggestions offered them as to how they should proceed. But we have been very fortunate in St. Louis in having two great medical schools who have so admirably coöperated in this research work. Washington University was selected to carry on the particular animal inoculations together with the Public Health Service men, because they had suitable animals, laboratories, and a personnel particularly interested in virus diseases. It was the most expedient place to carry on the work without any loss of time, and a place in which the Service men might establish their headquarters for field as well as laboratory investigations.

Centralization of authority in the Metropolitan Health Council for handling the entire epidemic was a very important step. The personnel of both universities, the hospitals, and the health officers have coöperated to the fullest extent. Their example of unity of purpose might well be emulated elsewhere. With conflicting views and sug-

gestions coming in from all directions the Metropolitan Health Council has stood firmly on the principles that no regulations should be made without careful consideration of the facts obtained. Theories have their place when based on facts. The best professional minds were mobilized locally with the coöperation of the State Health Department and the Public Health Service. No words of mine could express the gratitude, particularly toward the Public Health Service, that is felt by the local authorities in St. Louis and surrounding areas. Their steadying influence has served to concentrate effort and regulations.

As time went on, the opening of the schools became a problem in the minds of many and the St. Louis Health Division, and the Metropolitan Health Council took a very definite stand that the schools should be opened without any restrictions. Health officers are very often tempted by public sentiment and even by professional men to close schools when anything unusual happens. There was no real basis whatsoever for the closing of the schools. The Health Division of St. Louis felt very strongly that this was a time for education of the public and took the stand that schools should open. Public opinion should be created and not merely accepted. There were many who doubted the wisdom of this recommendation, but almost simultaneous with the opening of the schools the epidemic reached its peak and has continued to subside ever since. Others felt that because of the dryness of the season and the odors emanating from many sewers that the Fire Department should be called out to flush sewers. Another miasmatic revival. No water was wasted and the epidemic subsided.

Most of the aggravation we had to contend with came from without the City where newspapers not in contact with the local situation tremendously

exaggerated the picture. People were afraid to come to St. Louis to transact even urgent business. Parents were afraid to send their children back to schools and colleges. Yet they had been advised by local, state and federal authorities that business matters could be carried on as usual in St. Louis. Up to this date we have had no reports come to us that lead us to believe that the epidemic was spread elsewhere by any persons going through St. Louis.

During the course of the epidemic, the Metropolitan Health Council appreciated the necessity of making official reports of the research investigations and these were to be made in writing by the Research Committee so appointed and given out by the Council alone. Up to this time the Committee has reported only facts as they have come forth with animal inoculations. As the epidemic progressed the Metropolitan Health Council further has appointed a committee for follow-up work every 3 months for the next year and every 6 months for the second year. The purpose of this was to determine the nature and severity of the after-effects that may have resulted from this disease. Another committee has been appointed for publication so that authoritative facts may be forthcoming from this epidemic. In this way we hope to contribute something of value to others who may be confronted with this same problem in the future.

The Metropolitan Health Council has felt deep responsibility locally as well as nationally in the handling of this epidemic. We have been fortunate, indeed, in having the splendid assistance of the U. S. Public Health Service and others outside of St. Louis in attempting to solve some of the difficult problems involved. We have tried to demonstrate modern public health methods in handling this epidemic while conflicting opinions arose. One of the most important precepts govern-

ing the regulations that were issued was to emphasize first principles of handling any communicable disease: "early diagnosis, hospitalization, and isolation of all fever cases until an accurate diagnosis could be established." The practical handling of the problem could not wait for laboratory confirmation. Many questions arose that might involve months or even years to solve. The soundest principles that we felt were justified were in the belief that this was a virus disease and spread by human carriers and mild cases. Because of the rarity with which more than one member of a family was involved, it was not even deemed advisable to quarantine members of the family. The Health Division did not want to impress anyone with the idea that it was doing more than it was possible to do.

The public was thoroughly informed daily as to the actual facts in the epidemic, and the reasons why certain precautions were taken and why many

other procedures were not advocated.

That the measures of early diagnosis, hospitalization and isolation were efficient can be measured only by the fact that 95 per cent of the reported cases were hospitalized. How successful in checking the disease this was, is a matter of speculation. There is no actual method that we can apply in determining the efficiency of such measures. They are, however, those that have been recognized in the handling of all communicable diseases. Our greatest consolation was in the fact that we did not issue regulations which were not based on sound public health practice. Until more fundamental knowledge is forthcoming concerning the true etiology, mode of spread, or specific remedies for this disease nothing could be advocated further.

The epidemic has now disappeared to the point where there are only a few sporadic cases. We have witnessed to date an epidemic of 1,065 cases with 197 deaths.

Epidemiology of Encephalitis*

With Special Reference to the 1933 Epidemic

JAMES P. LEAKE, M.D.

Senior Surgeon, U. S. Public Health Service, Washington, D. C.

THE identity or non-identity of the encephalitis prevalent during August and September of this year in St. Louis and elsewhere, with ordinary lethargic or epidemic encephalitis, is an open question.

Assuming for the present that they are two different diseases, it may be

useful to compare them epidemiologically with poliomyelitis. In spite of the similarity of the St. Louis disease to poliomyelitis as to seasonal epidemic occurrence and minute histological changes (apart from the preponderant selective localization of poliomyelitic lesions in the anterior gray matter of the spinal medulla), they cannot be considered as due to the same virus. Though showing a limited amount of variation from epidemic to epidemic,

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