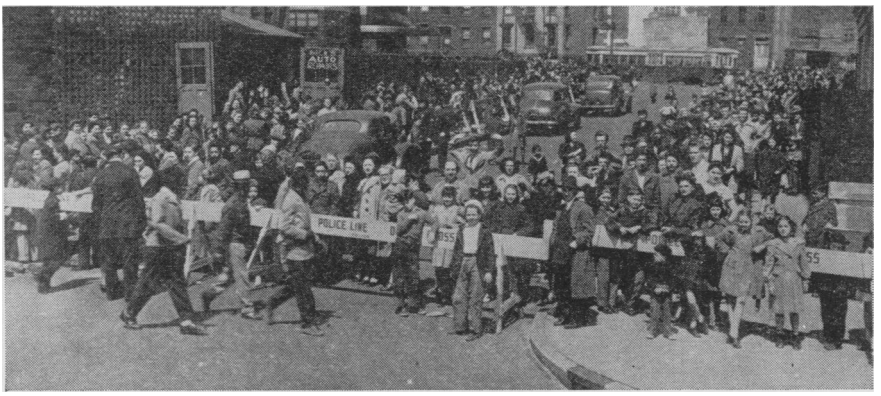


Courtesy of the New York News

Waiting to be vaccinated, New Yorkers form line outside of the Brooklyn Headquarters Building of the Department of Health.

An Outbreak of Smallpox in New York City*

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THE OUTBREAK

ON February 24, 1947, Eugene Le Bar, a 47 year old merchant who had lived in Mexico for six years, started a bus trip from Mexico City to New York City. Ordinarily, such an occurrence would not merit any particular attention, but in this case, it initiated a chain of events that led to headlines in papers throughout the country, hourly bulletins on the radio, laboratories working on a 24 hour schedule to produce vaccine, and hundreds of thousands of people standing on line for hours in order to enter a health center, hospital clinic, or police precinct. The arrival of a sick man in New York City caused millions of people to be vaccinated.

Le Bar was apparently well when he entered the bus, but that evening he became ill. The symptoms were rather mild, consisting of little more than headache and pain in the back of his neck. Two days later he developed a rash. In order to relieve the headache, he took large amounts of a proprietary headache powder as well as aspirin. He arrived in New York City on March 1 and registered at a midtown hotel. Although he was not feeling well, he did a little sightseeing and also walked through one of the large department stores.

On March 5, he entered Bellevue Hospital where he remained until March 8. Because of the rash, he was transferred to Willard Parker Hospital, the communicable disease hospital in Manhattan. There, four diagnoses were considered—drug eruption, erythema multiforme, Kaposi's varicelliform eruption, and smallpox. Smallpox was rejected as the diagnosis because there was denial of exposure to the disease; a well developed vaccination scar, and an

* Presented before the Epidemiology Section of the American Public Health Association at the Seventy-fifth Annual Meeting in Atlantic City, N. J., October 8, 1947.

atypical rash. Le Bar had a successful vaccination in childhood and an unsuccessful one about a year previous to his leaving Mexico. Biopsy of the skin lesions was done, but no Guarnieri bodies were seen in formalin-fixed material. Later when the diagnosis of smallpox had been made in contacts, other sections from the same biopsy material showed the characteristic Guarnieri bodies of smallpox.

The diagnosis of toxic eruption due to a drug was made because the patient had taken medication which often causes a rash in susceptible individuals. On March 10 he died, and at autopsy multiple hemorrhages were found throughout the viscera. The liver was soft and friable, the spleen was large, and there were hemorrhages in the medulla of the adrenal glands. The lungs were also hemorrhagic, and on microscopic section alveolar hemorrhages were noted.

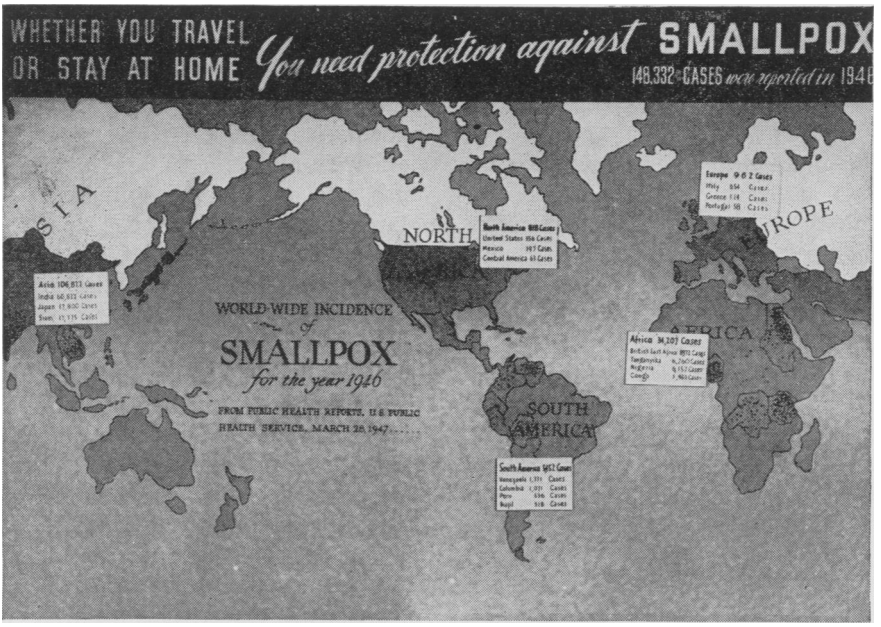
Among the patients who were in Willard Parker Hospital at the same time as Le Bar were Ismael Acosta, age 27, with mumps, and a 22 months old girl suffering from croup. Neither of these patients had ever been vaccinated, and both were discharged from the hospital upon recovery from their illnesses. On March 19, the girl developed a rash and on March 21 was readmitted to Willard Parker Hospital with a diagnosis of chickenpox. On March 22 Acosta, who was working at Bellevue Hospital, also developed a rash and was admitted to the dermatology ward of that hospital. On March 27 he was transferred to Willard Parker as a case of possible chickenpox.

Because in neither instance did the rash appear to conform to that of chickenpox, a tentative diagnosis of smallpox was made. This diagnosis was later confirmed by Dr. Joseph Smadel at the U. S. Army Medical School Laboratory and Dr. Robert F. Parker at Western Reserve University. Fluid

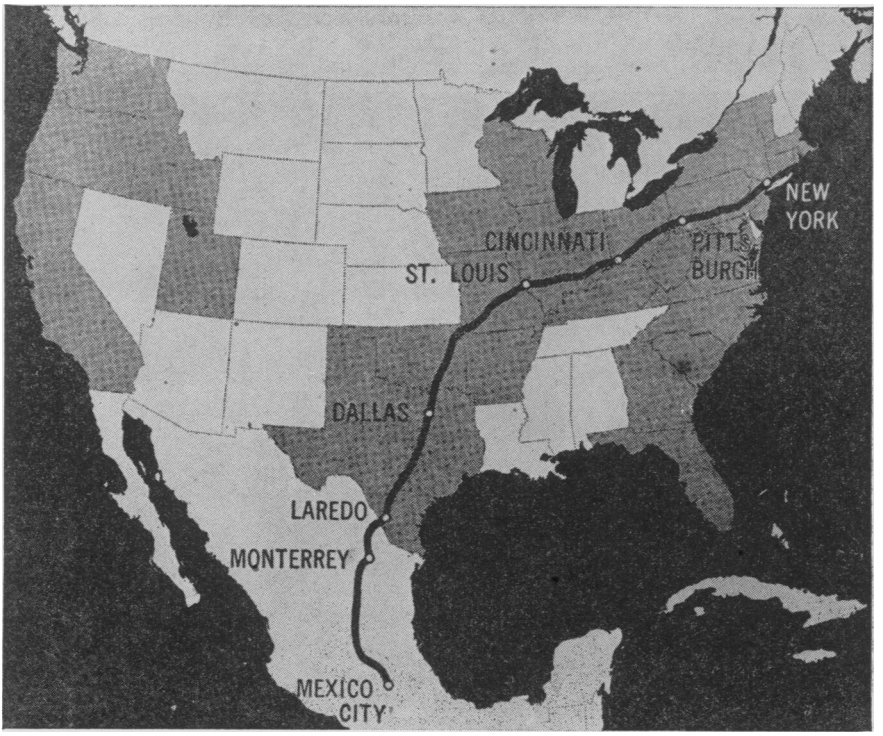


The New York Times

Vaccinations being given at the Headquarters building of the Department of Health. For more than two weeks emergency clinics were operated throughout the city.



World-wide incidence of smallpox, 1946.



Courtesy of Life

Disease might have spread to 29 states (shading) if potential carriers had been infected. Line from Mexico to New York is Le Bar's bus trip.

taken from the pustules of the two patients had been sent to them for laboratory examination. The material had been inoculated into the chorio-allantoic membranes of chick embryos. The report received showed that the membranes were covered with numerous lesions characteristic of smallpox infection. Complement-fixation of these membranes against a known positive anti-vaccinal rabbit serum was strongly positive.

The moment that smallpox was suspected, all employees and patients at the Willard Parker Hospital were vaccinated. The case of Eugene Le Bar was carefully reviewed, further study of the skin lesions was made, and the diagnosis of smallpox was established. It was now evident that he had been the source of infection for the other two cases. All of them had been in the same building, Le Bar and the baby on the ground floor and Acosta on the seventh floor. A search was made for all possible contacts with Acosta and the baby. These were immediately vaccinated, as well as employees and guests still present at the hotel at which the Le Bars had stayed. Guests who had left the hotel were located and were instructed to be vaccinated at once.

A boy 2½ years of age, never vaccinated, who was in Willard Parker Hospital for whooping cough during Le Bar's stay, developed a rash on March 27. The diagnosis of smallpox in this case was confirmed by the laboratory.

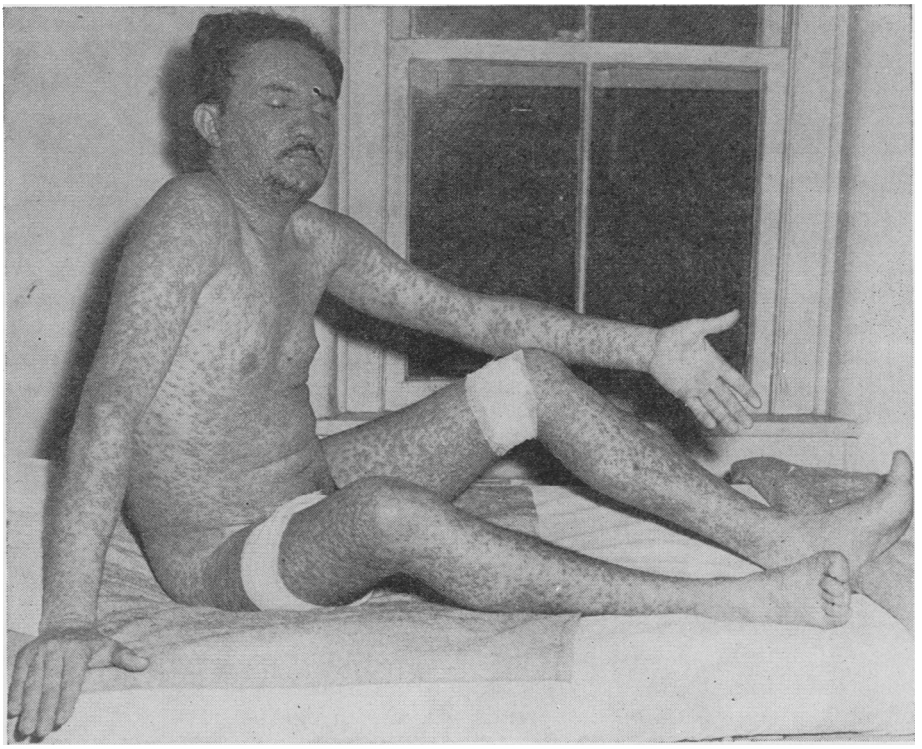
On April 6, Acosta's wife, age 26, was admitted to Willard Parker Hospital with fever. She developed a rash the next day, and died of smallpox on April 12. Although Mrs. Acosta was vaccinated as soon as it was known that her husband had smallpox, she apparently had already contracted the disease.

Three men, ages 43, 57, and 60, all patients at Bellevue Hospital when Acosta was there, developed rashes on April 10, 11, and 13. A diagnosis of smallpox was made in each of these cases and the patients were removed to Willard Parker Hospital.

A 4 year old boy who was discharged from Willard Parker on March 10, the day of Le Bar's death, went to a convalescent home in Milbrook, N. Y. While there, he developed a rash which was subsequently diagnosed as smallpox. He was the source of 3 other cases at the home—a nun, age 62, a 5 year old boy, and a 2 year old girl. Thus the outbreak consisted of 12 cases, 9 originating in New York City and 3 in Milbrook, N. Y. Of the 9 in New York City, 2 died.

THE VACCINATION CAMPAIGN

The diagnosis of smallpox in the case of Acosta was confirmed by Dr. Smadel in a telephone call from Washington, D. C., on April 4, 1947. The U. S. Public Health Service was immediately notified and steps were taken by them to trace the route of the bus on which the Le Bars had traveled, in order to discover whether additional foci of infection had been set up. Mrs. Le Bar was located by the U. S. Public Health Service in Maine, where she had gone after her husband's death. Fortunately, she had been vaccinated against smallpox when she visited her husband at Willard Parker Hospital. She was in good health and had a successful vaccination. Follow-up along the bus route revealed that there were no cases of smallpox in those areas traceable to Le Bar. A plan for vaccinating all the people in the city was drafted by Health Department officials in conjunction with Commissioner of Hospitals Dr. Edward M. Bernecker and members of his staff. The Health Department's Bureau of Laboratories was placed on an emergency work schedule. A statement concerning the situation was given to the press, and messages were broadcast



I. A.—27 years old—smallpox on eighth day of the disease.



Infant 22 months old—smallpox on tenth day after onset.

over the radio urging all New Yorkers to be vaccinated without delay. Vaccination clinics in the Health Department headquarters building, in all Health Department health centers, and in the city hospitals were kept open day and night, seven days a week.

Two hundred and fifty thousand individual doses of smallpox vaccine were available for immediate distribution by the Health Department laboratories. Bulk for an additional 400,000 units was on hand. The Bureau of Laboratories began immediate packaging of the bulk, permission having been granted by the U. S. Public Health Service to put this vaccine up in vials containing fifty doses each. The United States Army and Navy sent several hundred thousand units of vaccine gathered from all parts of the country. Since millions of units were needed to vaccinate the people in New York City, and this amount was not available, Mayor O'Dwyer called an emergency meeting at his office. Present at this meeting were representatives of the manufacturers of vaccine, members of the Health Department staff, and Dr. Thomas M. Rivers, Director of the Rockefeller Institute for Medical Research, and member of the Board of Health. At the urgent request of the Mayor, the manufacturers went on a 24 hour schedule packaging their bulk vaccine and diverting all available supplies to this city. Retail pharmacists coöperated in distributing vaccine to private physicians. Vaccine supply stations were set up at a centrally located police precinct and at the Health Department.

Vaccination stations were set up in all police precincts, in addition to Health Department buildings and municipal hospitals and clinics. There was a total of 179 city installations being used for vaccination. Practically every hospital in the city set up a special clinic where vaccinations were given to all who applied, free of charge. The vaccine was furnished by the Health Department and was administered by doctors on the hospital staff. Many community organizations set up local centers staffed by volunteer physicians and clerks. Labor and industry cooperated by establishing vaccination stations in factories, offices, and union headquarters. In some cases, their own physicians did the vaccinating; in others, it was performed by Health Department personnel. The stations maintained by the city remained open from 9 a.m. until 10 p.m., including Saturdays and Sundays. On April 26, those at the police precincts were discontinued, and on May 3 all other stations were closed.

In a period of less than a month more than 6,350,000 people were vaccinated in New York City, over 5,000,000 of them within the two week period following the appeal for universal vaccination made by the Mayor. Never before had so many people in one city been vaccinated in such a short time and on such short notice. Thanks are due to the press and radio for giving so generously of their space and time to bring necessary information to the public. Had it not been for them and for the intelligent coöperation of the public and the generosity of private physicians and volunteer workers, notably from the American Red Cross and the American Women's Voluntary Services and former Air Raid Warden groups, it would have been impossible to have achieved this remarkable record.

WHAT MIGHT HAVE HAPPENED

The introduction of virulent smallpox into a community, especially a large cosmopolitan city with rail, ship, and air connections with the rest of the nation and many parts of the world, could be a major catastrophe. For example, in 1945 in the Puget Sound area around Seattle, there were 65 cases of

smallpox and 20 deaths. These cases were all attributable to a soldier stationed in Japan who had developed smallpox aboard ship en route to Seattle.

During the period 1900 to 1929, epidemics of virulent smallpox were reported throughout the United States. Notable among these were the outbreaks in 1921 in Denver and Kansas City, when the former city reported 924 cases and 37 deaths, and the latter 943 cases and 160 deaths. In 1924, Detroit reported 1,610 cases and 163 deaths. In 1901, an epidemic of smallpox in New York City resulted in 1,959 cases and 410 deaths. Had the same rate prevailed in the 1947 outbreak, there would have been 4,310 cases and 902 deaths.

All of the cases of smallpox that occurred in New York in April, 1947, were of the virulent type which usually has a fatality rate of 40 per cent in children and 20 per cent in adults. Because of the virulence of the disease and its high communicability, it is little short of remarkable that there were only 12 cases in the entire outbreak.

One of the most difficult problems facing health officials is the control of the spread of the disease through unrecognized mild cases in persons who have retained some immunity from vaccination in infancy. These mild missed cases can be the source of virulent smallpox in unvaccinated persons and in those who have completely lost their immunity from former vaccinations.

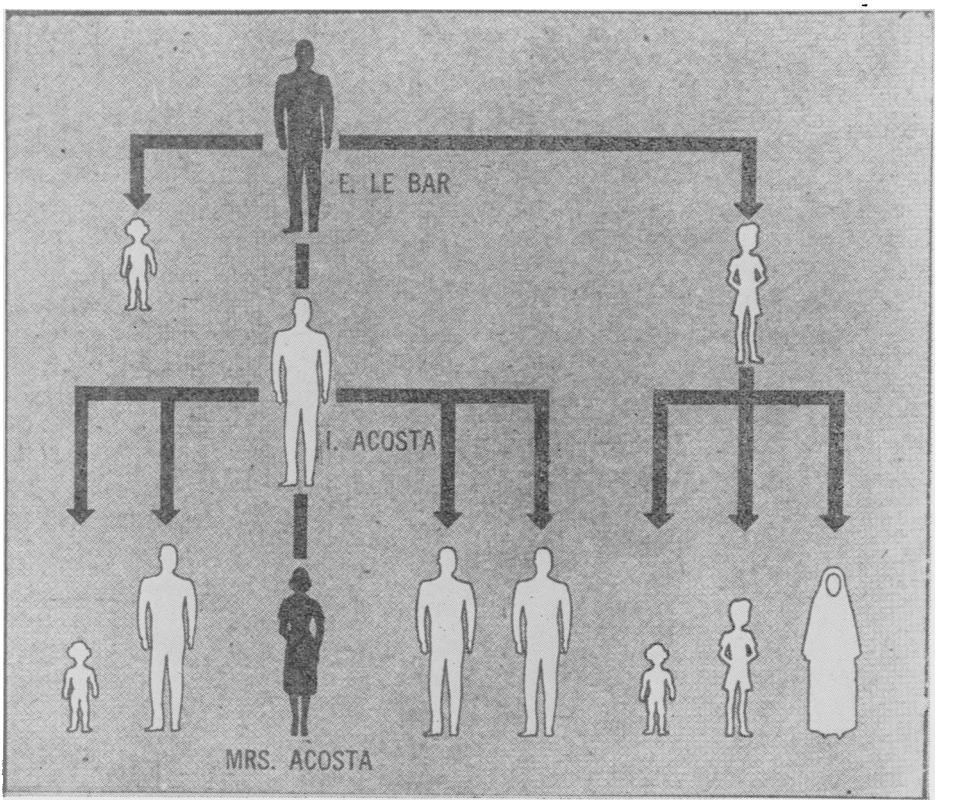
VACCINATION AND IMMUNITY

Of the 12 patients in the recent outbreak, only 3 had ever been vaccinated. These 3 had received protection more than forty years previously. There is no evidence that any person has a natural immunity to the disease. The length of time that immunity lasts in a vaccinated individual varies considerably. It may be just a few months or many years. The soldier who brought smallpox to Seattle in 1945 was returning from the Pacific theatre of war and had been vaccinated as were all persons in the armed forces. Many individuals in New York City who had been vaccinated only a few years before the present outbreak had accelerated reactions when revaccinated, and in some cases, primary takes. Several physicians reported that children, 2, 3, and 4 years of age, who had been vaccinated in infancy, showed primary takes when revaccinated. It is therefore apparent that whenever a case of smallpox occurs in a community, the only safe procedure is for every person in that community to be vaccinated without delay. The vaccination procedure recommended and practised by the Health Department was the multiple pressure method.

SEQUELAE

Whenever a large-scale vaccination program is undertaken, there is always the possibility that there may be some unfortunate complications. Every health officer is aware of this, but also knows that it is a risk which must be taken if there is to be universal protection.

Rumors run riot during a vaccination campaign. Many persons with chickenpox or with simple skin eruptions are thought by their friends to have smallpox. The Health Department received innumerable telephone calls reporting cases of smallpox, which upon investigation proved to be chickenpox. Likewise, many people who, several days after they had been vaccinated, became ill with any one of a variety of symptoms, called the Health Department to find out if the vaccination was responsible. In New York City, there are thousands of people who become ill, and about two hundred of them die every day. Since practically every person in New York City had a recent vaccination, it was inevitable that some of them would become ill and would die. Vac-



Courtesy of Life

Disease spread from Eugene Le Bar to Ismael Acosta and two children. Acosta in turn infected his wife, who died, and four others. One child who was infected by Le Bar passed virus to two children and a nun in Millbrook, N. Y.

cination does not stop the normal course of events. Neither should vaccination be blamed for a death from cerebral hemorrhage, nephritis, or coronary occlusion.

It is well known that encephalitis occasionally follows vaccination. When it is due to vaccination, it almost invariably occurs 11 to 14 days later. It may occur up to 30 days later, but this is exceedingly rare. From the beginning of April, when the vaccination program was instituted, until the second week of June, 50 possible cases of encephalitis were reported to the Health Department. Four of these cases were ruled out as definitely not encephalitis. In the remaining 46 cases, the diagnosis was considered probable. Eight of these 46 individuals died.

A diagnosis of post-vaccinal encephalitis can be made with certainty only after microscopic examination of the brain tissue. Brain tissue of the 8 fatal cases was examined, and in none of them were the characteristic lesions of post-vaccinal encephalitis found. Autopsy showed that 2 of the deaths were caused by tuberculous meningitis, 1 by a brain tumor, 1 by coronary sclerosis, and 4 probably by cerebral lesions. The Health Department has had no proof of any death due to post-vaccinal encephalitis in its vaccination campaign.

Although none of the cases of encephalitis was found to be associated with vaccination, 3 deaths did occur from other complications. A 66 year old man died as a result of septicemia **

** This 66 year old man may have been Saul Sussman

which followed an infection of the vaccination. Two infants, age 8 months and 4 months, who had eczema, developed generalized vaccinia as a result of contact with persons who had been recently vaccinated.

Tragic as these incidents were, it must be borne in mind that had vaccination not been carried out on such a large scale, there very likely would have been thousands of cases and hundreds of deaths.

CONCLUSION

Every health officer must be aware that no community can be considered safe from smallpox even though there has not been a case of it for many years. New York City had not had an outbreak for twenty years. Universal vaccination is the only safeguard. The period of immunity conferred by vaccination varies with each individual. Lasting protection can be assured only by periodic revaccination at intervals from five to ten years, always with a vaccine known to be potent and properly administered. Failure to react to a vaccination indicates an impotent vaccine or poor administrative technique. Contrary to popular belief, it does not indicate that the person is immune. Just as soon as a case of smallpox is suspected in a community, every effort must be made to have everyone vaccinated without delay.