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DATE: July 1968
Two Cases of Accidental Infection of Man by an Attenuated (Vaccine) Strain of Bacillus Anthracis

by M. Fouch and P. Palacios
Archives de l'Institut d'Études
52, 75-77 (1947)

Observation 1.

Mr. X., 30, a technician in the assessment service for microbial vaccines, requested medical examination because of a lesion on the index finger of his right hand which had the appearance of an early anthrax pustule. A microscopic examination of the serous exudate revealed the presence of \textit{B. anthracis}.

The affected finger was slightly swollen, there was no effect on the nerves and the temperature was normal.

The serous exudate from the lesion was inoculated into broth, agar, and Vellum's medium. The following day the aerobic cultures were positive and presented the characteristic appearance of our attenuated strain, 05, which is utilized for the preparation of vaccine.

Etiology

Interrogation of the patient made it possible to establish the mode of infection. On 22 June 1946, prolonged repetition of the same notion while washing had caused a bruisé on the right index finger. On the 23rd of June a blister formed which opened on the 24th. Mr. X. D. removed the skin and lightly touched the wound with mercuriochrome. The same day he assayed - over a period of several hours - an anthrax vaccine, and he admits to contaminating his fingers without cleaning them. By the 25th of June the appearance of the lesion disturbed him and he verified the presence of \textit{B. anthracis}. Therefore, the incubation period could not have exceeded 24 hours.

Evolution

On the 26th of June (3rd day of illness) the lesion had a necrotic center surrounded by a purple zone. The finger was markedly swollen but not painful. Temperature was normal. The patient was placed under medical surveillance and, with his permission, treatment was limited to a dry dressing.

On the 29th of June (8th day of illness) the patient, who was aware that his anthrax lesion concerned, pretended that his arm injured him and refused to be treated. He was given 10 c.c. of Liopholic solution intravenously. On the 30th of June and the following days, the lesion remained unaltered, the edema minimal, general state of health normal. Mercurochrome dressings were applied.
On 2 July it was easily possible to detach with forceps the center of the necrotic tissue. On 15 July the lesion was well on the way to healing.

The total evolution had therefore lasted 15 days though the treatment, limited to a single injection of Linsal's solution could not have had a notable influence.

**Observation 2**

A., a laboratory boy responsible for holding animals in laboratory number 3, came for medical examination on 13 February 1946 because of a lesion on his face. He had a necrotic lesion, dry, depressed, about 3 millimeters in diameter, surrounded by an area of small vesicles in an early stage of formation.

Microscopic examination revealed the presence of *B. anthracis* and the cultures were identified in 24 hours as the attenuated strain, C5. This determination has been confirmed by inoculation of two quinea pigs and two rabbits with 0.1 c.c. of broth culture. The quinea pigs died in 3 days and the rabbits did not die.

**Etiology**

On the 11th of February the boy A. confirmed the presence of a small pimple above his left eye.

On the 10th and 11th of February he had handled the autopsied bodies of quinea pigs which had been infected with strain C5 in the titration of anthrax antiserum. It is very likely that he scratched his face before decontaminating himself.

**Evolution**

On 13 February the lesion showed the characteristics described above which allowed us to suspect anthrax. There was no edema nor fever. By 11th February we knew that he was infected with the attenuated strain and with the agreement of the patient decided to withhold treatment.

On 17 February (7th day of illness) the necrotic focus had attained a diameter of 8 millimeters and was surrounded by small vesicles and a slight zone of edema. The upper eyelid was painful. Though his temperature was normal, the patient requested treatment and was taken to the hospital.

The attending physician, disturbed because of the site of the lesion, injected the patient over a four day period with 160 c.c. of anthrax antiserum. On 26 February (15th day of illness) the lesion was completely healed. At no time did the patient have any fever or generalized symptoms.

On the other hand, on 27 February there were reactions from the serum which lasted until 2 March.
Inoculate first test tubes with a small amount of culture material and an equal volume of control fluid. Place the tubes in the refrigerator and observe every six hours for signs of growth. If no growth has occurred after 24 hours, the culture may be considered negative. If growth occurs, the culture should be examined further to determine the type of growth and the virulence of the organism.

On agar, the colonies are flat, whitish and are separated easily.

Inoculation represents a less rapid and less certain method of differentiation.

The guinea pig should not be used. L. P. Delap and H. Koch (1916) have shown that the 100% fatal dose of the attenuated strain is 10 spores.

The rabbit can yield fairly rapid indications. If at least 5 rabbits are inoculated with 0.5 c.c. of 24 hour culture, an attenuated strain should not kill more than one of the five animals while a virulent strain would be 100% fatal.

Comparison of Pathogenesis in Man

The classical descriptions of malignant pustule in man or those which have been recorded by L. P. Delap and H. Koch (1916) indicate that virulent strains always cause serious local lesions with spreading adenitis and central reactions which are often very disturbing.

The overall mortality in Man has been estimated as 1% and in serious cases requiring hospitalization, 14%.

Treatment with specific serum or with pleural solution is slow. However, if therapy is not initiated until the pustule is well developed, the number of infections of therapeutic agents must be increased and recovery is always slow.

The two cases we have presented above that the attenuated strain results in a much less serious disease.
In the first case (pustule of the finger) treatment was limited to a single injection of 10% of Dralls solution which evidently had only a negligible effect on the evolution of the disease. Despite the fact that the inoculation could have been heavy since the deceased girl was contaminated over an area of about 1 square centimeter, the local lesion was very benign and there was no general reaction.

In the second case, the site of the pustule close to the eye-ridge have been expected to result in extensive spreading edema and very serious lesions (see J. P. Dolphy and W. Kauz 1946, photographs 5, 9, 10). Instead, on the seventh day of disease i.e., at a time when the infection would be expected to be most severe, there was only a small necrotic focus, a very limited edema and no generalized reaction.

It is certain that in those cases the serum was more detrimental than helpful since it caused reactions more disagreeable than the illness being treated.

Conclusions

1. Laboratory personnel who prepare anthrax spore vaccines as well as individuals the use such products are exposed to infection if the vaccine is placed in contact with a wound or bruise.

2. The resulting infection such as we have observed in the cases is quite benign with formation of only a small necrotic focus at the site of inoculation, very limited edema, no general reaction — recovery in two weeks.

The treatment which had been initiated tardily and without any real necessity would not have resulted in such a rapid recovery if the infection had been caused by a virulent strain.

3. In the country where anthrax in animals is common, certain categories of workers are continually exposed to this infection. The mal-aimed pustules which result are always serious. If early treatment is not instituted they develop extensive lesions and sometimes die.

The observations that we have just presented allow one to envisage the possibility of prophylactic vaccination of individuals who may be exposed to this disease and particularly those who may not have the benefit of early medical intervention.

It would probably be easy to select avirulent vaccine strains and a mode of inoculation that would result in mild vaccination reactions but nonetheless would confer a solid immunity.

Bibliography