

The cultures were carried back to the naval hospital and transplants made from each tube used and also from the remainder of the broth suspension. All transplants gave abundant growths of Pfeiffer's bacillus.

All cultures used were identified morphologically and culturally immediately before and after the experiment.

Results.—About six hours after the inoculation volunteer No. 28 had an attack of vomiting and complained of malaise which, however, had begun before the inoculation. His temperature did not rise above normal and he appeared well the next day and remained so.

About 48 hours after the inoculation volunteer No. 38 complained of headache and sore throat and his temperature rose to 38° C. The next day his temperature was normal and he appeared well, and remained so throughout the remainder of the period of close observation of seven days.

Aside from the foregoing developments all of the volunteers remained in good health; none showed any evidence of influenza.

SUMMARY.

Subjects.—Sixty-two volunteers, varying in age from 15 to 34 years, were the subjects of experiment. Of these 39 were without history of an attack of influenza at any time; 14 gave a history of this disease; and 9 had a history of attacks of a doubtful nature. All, however, had been exposed in varying degrees to the epidemic at Deer Island or at a previous station or place.

Experiments.—Eight experiments were made: In two, pure cultures of Pfeiffer's bacillus were used, inoculations being respectively by instillations into the nose and spraying of the nose and throat.

In two, unfiltered secretions from the upper respiratory passage were sprayed into the nose and throat; in one of these some of the secretions were also instilled into the eyes.

In one, filtered secretions from the upper respiratory passage were sprayed into the nose and throat and instilled into the eyes and in another experiment such a filtrate was injected subcutaneously.

In one experiment direct transfers of secretions from nose to nose and from nasopharynx by means of swabs were made from nose to nose and from nasopharynx to nasopharynx.

In one experiment freshly drawn citrated blood was injected subcutaneously.

In one experiment there was exposure by close contact to expired breath and "droplet" infection.

Donors.—The experimental material was obtained from an exposure made to cases of influenza in various stages of the disease and of different grades of severity. The donors were selected from epidemic groups, thus minimizing the chance of mistake in selection of isolated cases. The crude secretions were obtained from

cases in the second, third, and fourth days of the disease. The secretions in one of the filtration experiments (inoculated subcutaneously) were from cases as early as the eighth and ninth hour after the onset. In the contact and droplet infection experiment the donors were from 10 to 84 hours after the onset of their respective attacks, and in the blood inoculation experiment the donors were from 11 to 77 hours after the beginning of their sickness.

Results.—In only one instance (Experiment 2 (a)) was any reaction observed in which a diagnosis of influenza could not be excluded, and here a mildly inflamed throat seemed the more probable cause of the fever and other symptoms. Nothing like influenza developed in the other volunteers.

DISCUSSION OF RESULTS.

The results of our experiments do not warrant positive conclusions. The negative character of our results is surprising when we call to mind the very high communicability of the disease and the fact that the incidence rate in the recent epidemic was usually 20 per cent, often 30 per cent or more of the population. The incidence of the disease on the U. S. S. *Yacona*, from which we took a number of donors, was 84.2 per cent.

In explanation of our failure to reproduce the disease, many factors naturally suggest themselves for consideration. Among these, the susceptibility of the volunteers and the stage of the disease at which the secretions from the upper respiratory passage were secured stand out as perhaps of the first order.

It is possible that all our volunteers resisted infection because of a natural or an acquired immunity. If this be true, then we have an indication of a much higher degree of immunity to this disease than is generally assumed. The fact that our colleagues in the San Francisco studies (q. v. p. 53) failed to reproduce the disease in volunteers who had not been exposed in the recent pandemic suggests that the immunity of our volunteers was at least not the sole controlling factor.

Epidemiological evidence points to the likelihood that influenza is most communicable during its early stages. Most of our material was obtained during the first, second, or third days of the disease, sometimes as early as the eighth or tenth hour after the beginning of symptoms. In no case, however, did we obtain material during the period of incubation. If our volunteers were susceptible, then it could be argued that the material used did not contain the virus.

Despite our negative results, it is nevertheless probable that the disease is transmitted by the discharges from the mouth and nose. Our failure, however, to reproduce the disease with these discharges suggests that there may be unknown factors involved, either in the discharge of the virus from the body, or its entrance into the victim, or both.