162 (2394)

Ionic nature of botulinus toxin.

By J. BRONFENBRENNER.

[*From the Laboratories of the Rockefeller Institute for Medical Research, New York City.*]

In a recent paper Northrop[1] suggested a method which makes it possible to inquire into the ionic nature of such substances as cannot be obtained in a state of chemical purity. The results obtained by Northrop in the study of the behavior of trypsin agreed with the prediction which could be made on the basis of the Donnan equilibrium theory if trypsin is considered as a positive monovalent ion in the zone of hydrogen ion concentration at which the tests were performed.

In view of the peculiar behavior of botulinus toxin under the influence of various conditions, and particularly of changes in hydrogen ion concentration, we suspected for some time that this toxin may be ionic in nature. The method of Northrop offered the means for ascertaining such a possibility.

It was found that toxin is distributed between the gelatin and the fluid in approximately the same ratio as chlorine ion, and inversely as hydrogen ion. This suggests that botulinus toxin is a monovalent, negatively charged ion, at least between pH 2 and pH 8. It was found that at the hydrogen ion concentration of iso-electric gelatin the ratio of distribution of toxin between the gelatin and fluid was about 1; at pH 2 it was about 3; at pH 7.8 it was about 0.5. Excess of salts depressed the ratio to 1 in all instances.

Incidentally it was found that at the hydrogen ion concentration of iso-electric gelatin, about 60 per cent of toxin was lost. At the pH of 7.8 about 90 per cent of toxin was lost. At pH 2 to 3, the potency of the toxin increased over 100 per cent.

I wish to thank Doctor Northrop for his helpful suggestions.

[1] Northrop, J. H., *J. Gen. Physiol.*, 1924, vi, 337.