

## XXXVII.—BORACIC ACID AS A PRESERVATIVE.

BY H. ENDEMANN.

Boracic acid has, for the last ten years, held a place amongst our antiseptics, and has frequently been recommended for the preservation of meats and vegetable substances. The original discoverer, Gahn, sold in Europe two mixtures.

The one was a mixture of one part of boracic acid with one part of alum; the other, one part of boracic acid with two parts of alum. These were called respectively "aseptine" and "double aseptine."

Provisions, in part preserved by boracic acid, are generally within the time of from one to two months, covered with a black crust, provided they are kept in the ordinary oak provision barrels. Alum prevents this.

This observation, long ago published, I found verified in my own investigations. It was, at first, my intention not to preserve without salt, but to limit the quantity of the salt to be used by the addition of certain antiseptics. In the following, without going into the details of the numerous experiments, I shall give the results of those which are directly of interest to the question discussed in this paper.

It was found that fresh beef, packed with 1 per cent. of boracic acid and a salt pickle of 50 per cent., remained sweet and wholesome for several months, even if kept at an average temperature above 80° F. It was likewise found that previously salted beef could not be preserved by the addition of boracic acid. From this it was evident that the process of salting removed from the beef certain substances, in the absence of which preservation became impossible. These substances proved, on further investigation, to be the phosphates. It was, therefore, not the boracic acid which had been the cause of the preservation, but, rather, substances which are produced by the action of the boracic acid—the *acid* phosphates.

I could cite a long list of materials which cannot be preserved with boracic acid, owing to the want of phosphates. In all these cases, however, preservation would be possible if, with the boracic acid, a phosphate were to be added; a somewhat roundabout way, which can be improved, as I shall explain further on.

During my investigations regarding the disinfecting properties of various substances, I had found that it is very difficult to develop bacteria in a fluid containing acid phosphates, and also that many acids are powerful disinfectants, destroying the life of bacteria completely,

even if present only in small quantities. One part of HCl in sixty-four parts of Cohn's fluid, well stocked with bacteria, destroyed these completely.

I was led, therefore, to make experiments in which boracic acid was replaced by equivalent quantities of other inorganic acids, and thus ascertained that exactly the same results could be reached as with the use of boracic acid.

The best results were reached by the use of phosphoric acid, and mixtures of phosphoric acid and hydrochloric acid.

Phosphoric acid, even in dilute solution, acts powerfully on fresh meat, covering it with a white layer of coagulated albumen which, however, on standing, gradually disappears. Mixtures, however, where the  $\text{PO}_3$  is partly replaced by HCl, do not act in a like manner; and, even if some precipitation should take place, will soon allow the meat to recover its original appearance.

Meats thus treated keep exceedingly well, and at least fully as well as when preserved, under similar circumstances, with an equivalent quantity of boracic acid.

Less favorable results were obtained by the use of sulphuric, nitric and acetic acids, which is easily explained by the instability of these acids.

The preservation by means of boracic acid cannot, therefore, be considered as involving a new principle; it is merely a variation of, but by no means an improvement on, the time-honored vinegar pickling. The insipid taste of free boracic acid and the acid phosphates prevents its easy detection, and brings consumers to the belief that the meat is fresh.

This peculiarity is the only one recommending the use of boracic acid.

A French commission, appointed to investigate the influence of boracic acid on the human system, found that it could be taken for a considerable time without producing any injurious effects. Yet, it is certainly neither a regular constituent of the body nor is it contained in our food, and it is, therefore, doubtful whether the results reached by the commission must be considered as conclusive, as, in the course of time, constitutional difficulties may supervene, if such preserved provisions are taken for a considerable period.