

# Food Preservatives, and the Sodium Benzoate Question\*

By J. H. Long

In the last few years the question of the use of "preservatives" in foods has been actively discussed in the general press and also in a number of medical journals. For a time the term preservative was used without qualification, but now, apparently to make a disparaging comparison, we hear of "chemical preservatives" as distinguished from "natural preservatives," and notice, also, an attempt to foster the notion that the bodies of the first group are wholly bad, while those of the second group are good, or, at any rate, allowable in foods.

The public has come to look upon "preservatives" with distrust, if not with fear, since most of the discussion has been waged by those who, for one reason or another, *appear* to be opposed to their use. It is my intention to present some facts bearing on the case.

Our ordinary foods consist of proteins, carbohydrates or fats, or mixtures of these compounds, and some of them are prone to spontaneous decay or decomposition, especially in moist condition. The term "spontaneous" is used here to include the action of natural agents, whether organisms or enzymes. An apple or a potato rots, milk turns sour, a piece of meat putrefies, and the time required for this depends largely on the conditions under which the substances are kept. At a sufficiently low temperature *apparent* changes are not rapid, and many articles of food may be held in good condition by *cold storage* through a long period. But even there certain so-called autolytic changes take place.

Cooking arrests decay in all cases, as a high temperature is destructive of the ferments or organisms on which decay depends, and fortunately most of our foods are prepared from the fresh or natural condition by aid of heat and are served on the table without great delay. But, on the other hand, there are some foods which are not cooked, or if cooked, are not used at once. It is a question what to do in such cases. To illustrate, let us consider the apple. In the natural condition it is pretty well protected by the skin which prevents the action of ferments from the outside; but even so it spoils in time. If the apple is pared and is cut into pieces certain fermentation changes begin very speedily, under ordinary conditions. If these pieces are cooked into a sauce this will keep for a time, but some fermentation will later appear. To go a step further, if the sauce in the hot condition is put into a can, and this is hermetically sealed while at a high temperature the contents will keep a long time, perhaps indefinitely, and this whether the sauce has been sweetened or not. The canning of fruit depends on this principle. When, however, the can is opened the contents must be used very soon, except in the case where a large excess of sugar had been added in the process.

But there are cases where it is not desirable to use the whole of the can at once and where great sweetening is objectionable. It may be desirable to use the sauce as a so-called apple butter, consuming it through days or weeks, rather than at one meal. This is a very natural consideration and the question is how may this end be secured. What is known as apple butter is commonly made by boiling down apples in sweet cider. A mass is secured in this way which is richer than ordinary apple sauce in extractives, and poorer in cellulose. But it is an ideal material for ferment changes, and will not "keep" without some addition. The simplest thing to add to prevent fermentation is an excess of cane sugar, but the very great sweetness which results is to many an objection and the custom therefore prevails of using in place of part of the sugar a considerable amount of spice, generally cloves and cinnamon. This is in every way legitimate, but it must not be forgotten that in using these substances we are adding *preservatives*, as it is mainly for this purpose, and not alone for flavor, that they are needed in the case in point. There is no possible objection to the use of spices for this purpose, but would the same be true if the active principles on which the value of the spices depends were employed instead? The bulk of the spice is cellulose or related material, and absolutely inert as far as preserving or flavoring action is concerned, but with the cellulose there are certain essential oils present which are the valuable and active constituents. In the clove we have, for example, eugenol, and in the cinnamon cinnamic aldehyde, with other compounds in smaller quantity. These active principles are called "natural" substances, but are they not "chemicals" at the same time? They certainly are, and further, they may be made by laboratory methods from substances foreign to the spices and with the same properties

found in the spice extractives. If there is no objection to the spice products why should there be to the same active principles made in an artificial way?

Indeed there should be no objection, yet there are thousands of well-meaning people who object to the products of the chemical laboratory which take the place of the less pure and often more expensive products of what they style "nature's" laboratory. These are the people who maintain that the vanillin, the salicylic acid, the benzoic acid and aldehyde of the laboratory are different from and, of course, inferior to the products, "natural" products they call them, from the bean, the oil of wintergreen, willow bark, gum benzoin or the bitter almond. And they are the same people who still object to the wholesomeness of glucose as a food product because it is made in a laboratory way from starch. And there are some physicians in this list. How many of them can tell why they object?

As intimated above, there is little objection to the use of spices on account of physiological action, but when used in amount sufficient to behave as preservatives there may be some objection on the ground of excess of flavor. Many fruits and vegetables have a flavor of their own which it is desirable to conserve, but this may be lost or covered up if in the preparation for the table enough spice is employed to act as a real preservative. By the aid of spicing, pumpkin has been made to take the place of more expensive raw materials in certain canned and bottled condiments, and in the same way other sophistications are made possible. Food manufacturers have, therefore, sought to replace the highly flavored spices by other substances of the same physiological behavior, but which have much less taste or odor. At first sight this would appear to be a perfectly proper course, but, strange to say, a very considerable opposition has arisen in the carrying out of the idea. Any one who is familiar with the advances of modern synthetic organic chemistry must be able to recognize that there should be no inherent difficulty in thus replacing the active principles of the aromatics with compounds no more harmful than they are, but without marked taste or odor. It must be admitted, of course, that such replacing compounds will have *some* physiological action; without this they would have no value, and without the same action the spices would have little value, or no value in some cases. It is a well-known fact that the spices themselves, in large doses, might prove highly injurious, but practically we are not concerned with such large doses, and for the same reason we are not concerned with the large doses of artificial substances which may come into use as preservatives.

Sodium benzoate is one of the compounds introduced by manufacturers in the preparation of a number of condimental foods, but its use has been met by a storm of protest on the part of certain food officials which is almost without precedent. The Bureau of Chemistry of the Department of Agriculture issued a bulletin on the subject in which the results of experiments on a so-called poison squad were detailed, and in which the conclusion was reached that the benzoate is a very dangerous substance and liable to produce a long train of ills in the person using it with food. To many people this conclusion seemed so far removed from anything probably true that numerous protests were soon lodged with President Roosevelt and Secretary Wilson against the findings in this bulletin as well as against the findings of others from the same bureau. These protests were so vigorous and repeated so often by men of good standing, that the President finally decided to appoint a commission to reinvestigate the whole question thoroughly. Accordingly, at the President's request, Secretary Wilson appointed the Referee Board of Consulting Scientific Experts to study certain phases of this question, and especially to determine whether or not sodium benzoate and certain other "chemicals" are in reality injurious to health in the manner in which they are employed in the preparation of foods. As a member of this so-called Referee Board, of which President Remsen of Johns Hopkins University is chairman, I have had occasion to carry out some lengthy experiments on the benzoate question, and with my colleagues have reached conclusions differing decidedly from those advanced by the Bureau of Chemistry. Our conclusions have been published in Report No. 88 of the United States Department of Agriculture.

It is not my intention to discuss the details of that report, as it is readily accessible, but it is proper to state that a considerable mass of evidence is presented to show that sodium benzoate is a comparatively mild

substance, which when used in the relatively small quantities called for in catsups and similar articles must be quite harmless. In the Northwestern laboratories a squad of six men was under observation through a period of four months on a diet far richer in benzoate than they could find in any of the foods on the market which the consumer would be likely to reach. In these squad experiments and through subsequent studies I have become thoroughly convinced of the relative harmlessness of the benzoate as used in the condimental foods. That is, I believe it is far less harmful than are the other acid and aromatic bodies used for the same purposes. The experimental work of our board was painstaking and was carried out through a period long enough to satisfy any reasonable demand. The peculiar conditions described in the "poison squad" bulletin of the Bureau of Chemistry were not observed by us, and I believe under proper methods of experimentation they should not be in any case. Our men were not fed with capsules, they were not told that they were eating poison, or that they were engaged on a very dangerous experiment. The "poison squad" notion was not kept constantly before them through newspaper interviews. I am willing to believe that with the probable psychic disturbances from the causes suggested always present, our men, also, might have become ill occasionally, perhaps frequently. The psychic factor is very important in such work, and I am inclined to think that it may have played a very prominent part in the Bureau of Chemistry results.

I do not care to be made to appear as an apologist or champion for sodium benzoate; personally I do not care whether manufacturers use it or not, but I do object, and strongly, to the false statements made concerning its behavior and to the unscientific experiments which have been cited to show its danger. Some of our people seem to be losing their heads over a very simple matter; they seem to forget to use that physiological good sense which my colleague, Dr. Chittenden, reminds us is essential in all such discussions. Chemically sodium benzoate is a mild substance and in its ultimate behavior and fate not unlike the aromatic principles of cinnamon and cloves. Indeed, cinnamic aldehyde seems to follow exactly the same course in metabolism, and both are doubtless much weaker physiologically than is the eugenol of cloves.

As industry advances we shall hear a great deal of *artificial* substances as foods or in foods. The objection to them on this ground is certainly fallacious and undoubtedly will have to be abandoned. It is quite within reason to believe that many foods will be made synthetically; the air contains the elements of our natural foods in unlimited quantities and there are those who believe that the time is not far distant when, to feed the race, the synthesis of compounds from the air must be materially hastened. Recall for a moment the great strides already made in the synthesis of the proteins, and in the condensation of atmospheric nitrogen. These are questions in which the physician is naturally interested and on which he should be enlightened. But, unfortunately, the problems involved are somewhat intricate, and advantage has been taken of this fact to excite the fears of some of our medical men and lead them to make statements and pass resolutions on the matter of "preservatives," and especially on the question of benzoate, for which there is no scientific justification. To say the least, these resolutions are hasty and ill-timed, and not warranted by any situation which obtains. A great deal has been said about the activity of the "interests" in favoring sodium benzoate. It should be apparent to any one who can read that other, and certainly much noisier "interests," are violently fighting it. Medical men should not be fooled by the situation, or influenced by the silly assertion that the members of the Referee Board are prejudiced, or that they are working in favor of any interest except that of the scientific truth. Constant misrepresentation of our aims, or of the attitude of the Secretary of Agriculture in appointing the board, will not accomplish much in the long run.

Along with many other things which are described as artificial it is likely that some preservatives of chemical origin may find a legitimate place in the commercial preparation of certain foods. It is also possible that proper uses may be abused in some cases. Such situations arise even with the common foods, and the right course for the food official is investigation and regulation, rather than wholesale prohibition. Except for the rich, factory-made foods will become the rule, and progress there as elsewhere must be encouraged.

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