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ON THE USE OF FOOD PRESERVATIVES.

BY OTTO HEHNER.

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A FEW weeks ago a milk-seller was summoned before one of the Metropolitan police magistrates for selling milk which was partially deprived of cream, and which, in the

words of the summons, contained a poisonous ingredient, namely, boracic acid. The vendor was substantially fined.

This, as far as I am aware, the first case under the Sale of Food Acts in which the use of a food preservative is condemned as an adulteration, opens a question of such importance, that it may well be thought worthy of careful consideration by this Society. We should, as a matter of policy, arrive at some sort of an agreement, and an expression of an opinion, whether we as a body approve of, or condemn, the use of preservatives; and we owe it as public officers to the public and the vendors of articles of food, to let them plainly know what attitude we occupy in reference to a practice which has for years past been allowed without the least objection on our part, and which has become almost universal. It is well known that in summer many milk dealers add some preparation of boric acid in order to retard coagulation of milk. Such preparations are, and have been, openly advertised in numerous forms, and have been recommended by scientific men. Less well known is the fact that boric acid and its soda salt is most frequently to be met with in butter, especially Normandy and Belgian butters. Norwegian and other foreign fish is cured with salt and boric acid; meat is preserved with it, and it is even found in preparations intended for invalids, such as in so-called sterilised peptones.

In beer, especially foreign imported beer, in wines, preserved fruit, and, perhaps, in milk, salicylic acid or salicylate has been used for preservation, whilst sulphurous acid or bisulphite of lime is of common use by the brewer, the manufacturer of lime-juice, and the butcher. And, lastly, it appears that benzoic acid or benzoates are gradually taking the place of salicylic acid, for reasons to which I shall have to refer. Other antiseptics have been from time to time proposed and used, such as fluosilicates, nitrates, etc.

In reference to the quantity of boric acid which is necessary to produce any appreciable effect upon milk, I am not aware of any analytical results obtained by the analysis of actual trade samples. J. Mattern (Ber. der VII. Vers. d. Ver. Bayer. Chem. 36) finds that 1 gram. boric acid per litre retards the coagulation of milk at 15° C. for from twenty-four to thirty-six hours; .5 gram. only twenty-one hours, whilst at 35° C. .5 gram. is without effect, and 1 gram. retards the coagulation for ten hours. In summer, therefore, when the addition of boric acid is practised, not much less than 1 gram. per litre of milk would probably be employed.

Of borated butters I have made numerous analyses, and give some of my results in percentages:—

Boric acid	..	..	·09	·11	·09	·14	·26	·41
Borax	..	..	·19	·16	·15	·23	·33	·55

Both boric acid and borax being calculated as crystallised. The preparation always employed in the case of butter, as far as my experience goes, consists of a mixture of boric acid or borax, in widely varying proportions, freed from a part of the water of crystallisation by heating. As typical the following analysis may find a place:—

Water	..	..	..	..	..	..	..	36·8
Borax (anhydrous)	..	..	..	..	..	..	..	24·0
Boric acid (anhydrous)	..	..	..	..	..	..	..	39·2

To preserve fresh fish about 2 grams. of boric acid are used to each kilo of fish.

Salicylic acid has not, I believe, ever been largely used in this country as a food preserver. It answers but very badly in the case of milk and butter, and its use is now chiefly confined to foreign fermented beverages. As to the quantity one gram. per litre was frequently used when salicylic acid had reached its height of popularity. When in course of time objections against its use were not only heard, but resulted in prohibitive legislation in many countries, 5 grams. were declared to be sufficient by its advocates to keep 100 litres of Bavarian beer for home consumption, and 20 grams. for export (E. Prior, *Deutsche Mediz. Wochenschrift*, vol. 13, p. 38).

If we now enter into the question as to the physiological effect of the preservatives mentioned, we at once meet with the most diametrically expressed opinions. Whilst inventors introduce every antiseptic as absolutely harmless, and quote experiments by which it is shown that large and continued doses of antiseptic were administered without evil effects, other enquirers come to absolutely different conclusions. Literature teems with arguments in favour of and against some of these substances, and it must, I think, be conceded that direct and palpably injurious effects on healthy individuals have not been traced to any of the antiseptics herein considered. But when so much is conceded, a wide field for discussion yet remains.

On the one hand it must be recognised that to prevent waste of good human food by avoiding or retarding, its decomposition is a meritorious achievement, and one upon which the thought of the scientific man cannot be too much concentrated. Yet it must be allowed that the indiscriminate addition of chemical substances which exert a poisonous action on bacterial and other organisms cannot be safely left in the hands of more or less ignorant vendors of articles of food, even if no directly poisonous or injurious action can be traced upon an healthy adult by their use. It is evident that substances which interfere with the growth of fungoid organisms like bacteria or yeast cells, must have some action upon the complicated human animal; and even if exuberant health and abundant gastric secretions may be capable many times to overwhelm the effect of the antiseptic, the effect itself must remain and detract from the efficiency of the human organism. It is inconceivable that the protoplasm of a bacteria be vitally affected by a substance which at the same time be utterly inert upon human protoplasm. The effect is evidently a question of quantity. The absolute quantity may not be sufficient to show itself palpably upon a body weighing, say, $1\frac{1}{2}$ cwt., but it must be there all the same.

Well does the Comité Consultatif d'Hygiène Publique of France report in reference to the use of benzoic acid in articles of food that all antiseptics are injurious to natural digestion, because the addition of antiseptics of any kind is irrational as far as assimilation is concerned, and may be injurious to the normal action of the organs of digestion.

In times gone by, when the causes of the decomposition of food were not understood, the discovery of a preservative was doubtless an achievement; but now, when we not only know these causes, but can prevent decomposition indefinitely by exclusion of germs, or by cold, without the addition of any kind of foreign material, we surely should make an attempt to discriminate between processes of preservation. If preservation could not be effected without the addition of some foreign material, the benefit to

mankind of preventing good food substance from decomposition would doubtless be greater than the slight physiological evil effect of the antiseptic itself. But as preservation of any article of food is possible without addition of chemicals, it seems to me that the time has come for public analysts generally to set their faces against the present practice of allowing the addition of any antiseptic which the dealer in food may choose to make.

Isolated action, such as was undertaken by the public analyst to whom I referred in the opening of this paper, appears to me to be most inadvisable, as we would surely have to witness the deplorable spectacle of seeing one analyst giving his opinion against his fellow analyst in a perfectly contrary sense to the destruction of all chance of future legal definition. Of course, it may be that the policy of *laissez-faire* which has hitherto been adopted may commend itself, but if we consider that almost every country in the world has taken this matter up and restricted or prohibited the use of antiseptics in food, whilst England, the country in which food laws were first passed, has done absolutely nothing, it will be admitted that the time is at least ripe for discussion of the subject.

France was the first to raise objections against the use of preservatives. Most of the beer consumed in France used to be imported from Germany. When it was discovered that such beer almost invariably contained salicylic acid, a vigorous agitation, in the interest of French home brewers, commenced. Finally, the Paris Court of Appeal decided that the addition of salicylic acid was to be considered an adulteration, and to the prejudice of the purchaser. The addition was declared to be not harmless, it having been shown that salicylated ales were a source of danger to the community, that salicylic acid was a drug, the use of which had to be ordered by a medical man, and could not be left with the trader. This judgment was based upon a Report of the Commission of the Academie de Medicine of Paris on the Action of Salicylic Acid on Food. The Commission reported on numerous cases in which the preservation of articles of food by salicylic acid has produced serious results, and is of opinion that it is proved that small but continued doses of salicylic acid or salicylates, may produce serious gastric disturbances, especially with old persons and such who suffer from affections of the liver or organs of digestion. For these reasons the addition of salicylic acid, or salts, should not be allowed to articles of food.

What was originally probably a trade protectionist movement soon became a general opinion. The indiscriminate use of antiseptics should not be allowed, and one State after another passed laws forbidding the addition of preservatives to food, in some cases antiseptics generally, in others specified substances only.

Thus, by order of the Municipal Council of Buenos Ayres of January 5th, 1887, the sale of beer containing salicylic acid was prohibited after March 31st, 1888. Between these two dates the quantity of salicylic acid had to be stated, and was not to exceed .05 grm. per litre. Other South American States followed. On July 1st, 1887, the town of Milan passed a similar law, referring to the prohibition of salicylic acid in beer, wine, and other articles of food; whilst from July 6th, 1887, the police of Berlin prohibited the addition of any kind of preservative whatever to milk. The town of Schwerin (Mecklenburg) followed suit.

In 1888 the Dutch Government caused an enquiry to be made into the use of salicylic acid in beer, and, as a result, all addition of salicylic acid to food was prohibited. The Italian Ministry, by order of November 29th, 1887, declared the addition of all substances to wine, which were not naturally contained in wine, to be an adulteration; on January 30th, 1888, the Spanish Government followed with an absolute prohibition of antiseptics in wine, and the Austrian with that of salicylic acid.

In Germany, lastly, a distinction is made between salicylic acid added during mashing, to check the growth of the acid-producing organisms, such an addition at that stage of brewing being allowed, not any of the acid, or only traces of it, being said to remain in the beer, and between the subsequent addition of salicylic and fully fermented beer, which is prohibited.

When salicylic acid had thus been virtually suppressed, other antiseptics came into vogue. Thus, in France, the use of benzoates became frequent, partly on account of the greater power of these compounds, partly because they are more difficult to trace and detect than salicylic acid. In Germany sulphites and borates were more largely employed, and numerous preparations containing these as active ingredients were thrown upon the public. Thus, according to Polenske (*Arbeiten des Kais. Gesundheitsamts*, 1870, VI., 119), the following articles have been advertised in Germany:—

Szololith, containing 39·7 per cent. sulphurous acid, as sodium salt.

Australian Meat Preservative, consisting of sulphites.

Berlinite, borax, with a little boric acid and nitrate of potash.

Chinese Preservative Powder, boric acid, with sodium chloride and sulphate.

Brockmann's Salt, borax, boric acid, sodium chloride, and potassium nitrate.

Australian Salt, borax.

Barmenite, boric acid and salt.

Magdeburg Preservative Salt, borax, boric acid, and salt.

Heydrich's Salt, sodium chloride, potassium nitrate, and boric acid.

Again, as in the case of salicylic acid in previous years, long discussions arose as to the physiological activity of these substances. Liebreich contended that boric acid was perfectly harmless, but others have been able to trace distinct physiological effects to its administration; whilst, at their meeting at Speier, on Sept. 10th, 1889, the Society of Bavarian Analytical Chemists discussed the use of boric acid as an antiseptic, and came to the conclusion that it was objectionable from a sanitary point of view.

In England we have done nothing, absolutely nothing. On the contrary, the use of antiseptics has been virtually sanctioned in brewing. The law 48 and 49 Vict., Cap. 51, declares that a brewer of beer shall not add any matter or thing thereto *except* finings, or other matter or thing sanctioned by the Commissioners of Inland Revenue.

The use of antiseptics, notably bi-sulphite of lime, which is here chiefly used in beer, is therefore distinctly conditional upon the sanction of the Inland Revenue Commissioners; and the same would be the case in other articles of food, since the chemists of the Inland Revenue Commissioners are referees for cases under the Food and Drugs Act. Bi-sulphite of lime being freely used in breweries, with the knowledge of Excise officers, a gentleman wrote to the Board to know if the employment of bi-sulphite of lime and salicylic acid were sanctioned. The reply, which I have seen myself, was that "The

Board do not sanction their use unless they interfere with the Revenue, leaving the responsibility for their use with the brewers."

Surely a remarkable and undignified position to take up. The Act of Parliament says: You shall add nothing to beer, except with the sanction of certain authorities. These authorities say, we leave these matters to the brewers. If the authorities of Buenos Ayres, or of Mecklenburg-Schwerin, were capable of coming to a conclusion, surely it might be reasonably hoped and expected, that the authorities of Somerset House would not remain behind. We public analysts have done no better. The Sale of Food and Drugs Act, par. 6, allows to be added to food any matter or ingredient not injurious to health, if the same is required for the production or preparation thereof as an article of commerce in a state fit for carriage or consumption. No one, surely, can contend that preservatives are necessary for the production or preparation of milk, butter, beer, wine, etc., in a state fit for carriage or consumption, for the great majority of the samples analysed are free from antiseptics. Good milk, fresh butter, sound beer, can be made and sold without antiseptics. As a matter of fact, they have been so sold for centuries, until sham science came in and taught the dirty and the careless producer how to evade the natural punishment of dirt and mismanagement. Antiseptics are convenient to such producers, but they are not *required*. Hence we have no option but to consider them as adulterations.

We might, no doubt, some time longer, as in the past, wink at the use of all preservatives without restriction as to quality or quantity; but we shall, sooner or later, have to answer for our apathy to the public. We might agree between ourselves what limits we would allow, beyond which the quantity of the various antiseptics should not be permitted to rise in food. But the difficulty of exact determination is very great, and, besides, this course would involve the concession of the whole principle, that a dealer in food has no right to add anything whatever to any article of food without due notice, and new antiseptics would be continually introduced, as they have been elsewhere, to circumvent any such partial restrictions. We might further, as another alternative, require that due notice be given by the vendor at the time of the sale that a preservative has been added to the article sold. Here, again, we know from experience how easy it is to circumvent such notice, and how ignorant the public are, and incapable to comprehend the notice. What use, for instance, would it be to inform a servant girl, at the time of sale, that a certain article contains a little boracic acid, or other substance, added from benevolent motives?

Our duty seems plain; we should work for entire prohibition of all kinds of preservatives. It is time that we went back to natural food. I object to be physicked indiscriminately by persons not qualified to administer medicine whilst I am in health; I object still more when I am ill. I object still more strongly to have my children physicked in their milk, or their bread and butter. It is no consolation to me to know that the physic is not immediately fatal, or not even violently injurious.

The practice is utterly unjustifiable except from the point of view of a dealer, who wants to make an extra profit, who wants to palm off a stale or ill-prepared article upon the public.

We owe our very existence, as public analysts, to the desire of the public to have a guarantee of the absolute purity of their food supply, and we would only be doing our duty if we did suppress the large and growing use of these objectionable chemicals called food preservatives.