

THE PRESERVATION
of
FOODS

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The Preservation of Foods.

The preservation of articles of food against decay, and a change in digestibility at the same time, is a matter of no small importance, and we were considerably surprised to find that comparatively little attention has been paid to the relative hygienic value of the various methods of food preservation. The above subject being a wide one, however, it was thought best to limit the discussion, as far as possible, to the effectiveness of the various methods, considered from a hygienic stand-point, describing the methods themselves only when essential to clearness, and using by way of illustration only representative foods.

Decay of food takes place by the growth of living germs. From experiment and observation, it is proven that three concurrent conditions are necessary to active putrefaction; the presence of plenty of moisture, exposure to the air and a favorable temperature. The various methods of preservation therefore aim (I) to make conditions unfavorable for the growth of the germs (a) by depriving the foods of their moisture; (b) by lowering the temperature; and (c) by excluding the food from the air or (II) they aim to destroy the germs and ferments by

the agency of some chemical compound or germicide.

Under "a" of division I, comes the methods of getting rid of the moisture known, as desiccation, evaporation, condensing or drying. This plan has grown into popular use with great rapidity and includes a wide and varied range of food.

In fruit and vegetable drying, two methods are followed in our large evaporating establishments; the "hot air blast" and the "cold air blast". To the first process these objections are offered. The application of heat causes a partial destruction of the flavor and allows more or less fermentative change to take place. Between the limits of 32° and 60° F. fruit and vegetable substances retain their flavor, give up their moisture and undergo no fermentative change. To the "cold air blast" as it is called no objection then, can be made unless, as is sometimes the case in both methods another element is introduced into the drying process - namely that of bleaching or sulphuring. This, so far as we have been able to find out, is applied only to fruits and the causes of the procedure and its consequences

are as follows: Green and immature fruit is sometimes used and to conceal this fact the color of the fruit is changed by exposing it to the fumes of burning sulphur. This proceeding also secures the fruit against the attacks of insects, and destroys any eggs that may have been laid on the fruit during the process of drying and for this latter object alone, the process is sometimes used. If the latter object alone is in view, it involves, of course, the sulphuring of the dried fruit; the former object is to a greater or less extent accomplished by sulphuring before drying. When freshly sliced fruit is sulphured for a short time, the gas penetrates only "skin deep", and when the fruit is afterwards dried, most of the gas escapes, leaving but a "slight trace of its presence in the taste, of which few people would take note and possibly having no harmful effect on the digestion" says one author. But we are inclined to believe the effect upon digestion sufficient to warrant our disapproval of the custom. But when the fruit is dried and then sulphured as is the case when the fruit is "bleached" the effect is serious enough to be unmistakable. The gas then penetrates

the entire mass and fruit that is for any cause too dark to be marketable is made a yellow white and thus more inviting to the uninformed eye.

Fruit treated in this way is dangerous to health. The sulphurous acid is rapidly changed in the fruit to sulphuric acid which is very injurious to the digestive organs.

Some fruits, as apples, when pared and exposed to the air acquire a brown color that is not lost by drying, no matter how carefully done nor by what legitimate method. It will be noticed that all of the evaporated apples offered for sale are of a pale yellow color. The color has nothing to do with the quality of properly dried fruit, but its sale depending on its appearance the apples are bleached before evaporating and it is a common belief that the pale color is due to a more perfect method of drying. The use of sulphur for this purpose deserves severe censure, and the consumer should know of its effects and prefer naturally colored evaporated fruits to the bleached

article, which is readily recognized by its color.

Fruits and vegetables that are preserved by drying may become detrimental to health in still another way. The acid of the fruit may enter into combination with the metal of the tray on which the food is spread out to dry and in this way the fruit become charged with a dangerous poison. Instances of zinc poisoning have been known to occur in this way. It is obvious that tin, zinc, and trays of like character should never be used for drying fruit.

Milk is another article that is subject to the dessication process, the product in this case being known as "condensed milk." Milk is condensed only under great difficulties. There is much danger of decomposition of the caseine and loss of the fatty constituents, so that the result is not entirely satisfactory for general use, and may even be the cause of serious illness if given as food to very young children. It may be said, however, that milk properly condensed is far preferable to poor, unwhole-

some milk.

Meat when subjected to the drying process is found to lose its flavor and become tough and indigestible. The fat is apt to become rancid and in damp weather the meat absorbs moisture, turns moldy and sour. The latter tendencies may be overcome by coating the meat with something to exclude the air but it will still have the first mentioned faults - lack of flavor and digestibility.

The ideal method of preserving food so far as retaining all its properties intact is concerned, is by the use of cold. All forms of food may be preserved in this way. A serious objection to the method is found in the rapidity with which foods undergo decay when brought out of the cold into a warmer temperature.

"C". One of the most common ways of preserving food of all kinds is by the process known as canning. Whether this be done in the home or in the factory, the general plan is the same - to heat the food killing all germs present and

to exclude the air by immediate sealing while the can is freshly filled and hot.

Milk may be "canned" in two ways - by the process known sterilizing or by that known as pasturization. In both methods the germs that may be present are killed by the high temperature and the entrance of others prevented by sealing; but some of the products of these germs, the ptomaines of tuberculous organisms or whatever it may be, may not be destroyed. In sterilization the milk, being boiled, acquires a certain "cooked" taste that is very disagreeable to some people and the albumen is coagulated. These latter difficulties are avoided, and the aforementioned advantages secured if the milk be preserved by the second process, pasturization. This is done by taking fresh milk, excluding the air from it and heating it rapidly to 155°F at least and not above 160°F . After 20 minutes exposure to the heat, cool the milk with equal rapidity to below 50°F . It might be well to state that milk preserved in either of these ways will keep but

a few days longer than milk not treated.

There is a danger to which factory canned food is especially liable, and that is lead poisoning. The cause may be the same as that of zinc poisoning mentioned under "evaporation of fruits" or it may come from particles of the lead that get into the can in careless soldering.

Factory canned food is often rendered unfit for food by the use of chemicals, but the discussion of their use coming more properly under the second division of our subject will be taken up there.

II In regard to the use of germicides or chemicals to destroy the germs present in the food and to prevent the entrance and growth of others we find that salicylic acid, boric acid, borax, formaldehyde and other chemical substances are frequently used.

Milk dealers use borax and formaline to prevent the souring of milk. Boric acid is often added to condensed milk to prevent decomposition of the caseine. Boracic

acid and borax, both being strong antiseptics, it is easily seen that in the same way in which preservatives of this nature prevent natural changes of milk they may prevent its digestion in the stomach, the process of digestion being similar in some respects to the fermentative changes.

Formaldehyde, also known as formaline and formic aldehyde, is a comparatively new antiseptic and chemists seem to be somewhat divided in their opinion as to its effects on digestion. It is claimed that it is more effective as a preserving agent than boracic acid, borax, salicylic or benzoic acid and since, as already stated, processes of digestion are allied to processes of decomposition in so far that the latter are frequently preceded by transformation under the influence of ferments, we may infer that whatever chemical preservative prevents putrefaction at least delays digestion. In proof of this, digestion experiments made upon milk with and without the presence of formaline required a longer time for digestion than that which contained no formaline. Furthermore the behavior

in the Babcock test of milk which had been preserved with formaline shows that its composition is in some way affected. Ordinarily the curd of milk is dissolved by the sulphuric acid used in this test, but when the milk contains formaline the curd often fails to dissolve, forming instead a compact mass. If this formaline can so alter milk that sulphuric acid may fail to dissolve its curd, is it not at least probable that the action of the gastric juice may be rendered less effective?

Factory canned food is especially liable to be preserved by the aid of chemicals, though housewives are sometimes guilty of the atrocity of serving their families food preserved by the use of "patent preservers", offered for sale by unscrupulous dealers. Salicylic acid is the chemical most commonly used by factories, and it is also likely to be the chief ingredient of most of the "food preservers" advertised for use in private families. It is true salicylic acid hinders and prevents fermentation, souring,

and putrefaction of milk and other foods, retarding the action of all organized ferments such as the yeast plant and putrefactive bacteria; but its action on unorganized ferments is even more powerful. It arrests the conversion of starch into grape sugar by the pancreatic juice and since this action is directly opposed to the process of digestion the use of salicylic acid should be universally condemned.

There is a pernicious custom of adding borax to fruit to strengthen the skin of soft fruits, and prevent its bursting. And alkaline earths are added to prevent loss of color by heat. All these substances have a very injurious effect upon the digestion and entirely destroy the properties for which the food is valued.

The use of salt, vinegar, sugar and spices in excess as in the case of "preserves" and "pickles" has a similar effect upon digestion to that of the more powerful antiseptics. Salt extracts the nourishing juices and leaves only the hard and indigestible residue.

Vinegar coagulates and renders indigestible the albumen and is beside too acid for ordinary stomachs.

Fruit and other food preserved in sugar loses all its desirable properties, and the excess of sugar imposes a heavy task on the digestive organs. Canned meats are often so highly seasoned as to conceal altogether the taste of the meat and are very injurious because, of the irritation given to the sensitive mucous membrane by the stimulating spices and peppers.

To sum up the various methods, the use of germicides prevents the digestion of food even if it is not actually detrimental to the digestive system itself, and therefore can be neither recommended nor commended.

No fault can be found with cold storage, provided the food is used immediately on being removed from under the influence of the cold.

Dessication is a permissible method especially with fruits and vegetables when properly done.

But of all the methods, by far the most satisfactory carrying out as it does the best principles of both preservation and hygiene, is simple canning in connection with heat.