BREAD AND—*

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The accumulated literature of the nutritive properties of the cereal grains, especially wheat, is more extensive than that of any one class of foods, with the possible exception of milk and its products. The facts are now well established and the role of cereal foods in the diet is well understood by nutrition authorities, if not by others.

Contemporary investigations in nutrition have added much to this knowledge, and most of this group of chemists are familiar with the general results of recent investigations, particularly in the field of proteins, vitamins, and the inorganic elements as they relate to cereals and bread.

It is not our intention to review or summarize all of these recent contributions to the knowledge of cereal nutrition, but rather to interest you in various innovations in bread making that find their origin, perhaps, in attempts to apply the results of scientific research or to other influences not so apparent.

In earlier and more ingenuous times, the traditional "bread ands" were milk, cheese, butter, vegetables, and other familiar food combinations. Long before there was any scientific study of nutrition, these "bread ands" existed as food traditions among many peoples in many lands. Apparently most of these "bread and" combinations are nutritionally sound and nutrition experts had no quarrel with them as "supplementing" methods.

After all, the practical problem of normal and economical human nutrition is the selection or proper combination of foods, so that deficiencies in their individual nutritive properties may be corrected, or supplemented. It is a problem of balanced diet, that complex idea difficult to define; of energy, quantitative intake levels, and also of food economy. The quantitative levels at which bread or any other food of the diet may be used without disturbing this hypothetical balance is a "poser," but according to the experimental evidence, it is probable that the average American diet might include a more liberal proportion of bread as an economical source of energy and protein, without upsetting the required intake of "protective foods.

All of us engaged in the technical end of food manufacture have come to realize that the consumer is becoming more and more interested in the results of contemporary nutrition studies. The advertising man, eager for new ideas, is well convinced that the public is even now at that stage of mental development that he calls "nutrition conscious." This is an admirable popular interest, but, unfortunately, sweeping generalizations about foods have led to an over emphasis of some of these new ideas, and the complete picture is often over shadowed by some one's strong obsessions about vitamins or other substances, with consequent damage to facts, and the formation of food "complexes."

It is indeed difficult for some of us to maintain a sense of proportion in the midst of the present rapid development of popular complexes in nutrition. Apparently all of our food products are being studied from the standpoint of how they fit into the popular picture created by the commercial exploitation of the new nutrition.

Foods are being subjected to critical study, which might be classified in purpose, as either defensive research or offensive research. The results of these studies are often startling when translated into terms and phrases intended to catch the eye of the "nutrition conscious" public. In some instances, the newly discovered virtues of a food are found to transcend those of all others. What a consolation to realize that after eating such a food for many years without thought of its wonderful properties, it has made us what we are today.

Since bread is a food resulting from the conversion of flour and other ingredients into a baked product, its nutritive properties depend upon the ingredients used in the formula as modified by the influence of the baking process. While the chief value of bread in the diet is that of an energy food and a source of proteins, there are no technical difficulties in the way of making a bread of any special nutritive properties that may be wanted. Historically, the production of many different kinds of bread by bakers the world over dates from early times. Bread with claimed therapeutic properties has been known for years. You will find many examples of these products in the literature of medical patents. Bread pills made from ordinary bread have a remarkable record of cure.

Not until recently, however, has there been an opportunity for the baker to make bread scientifically with special nutritive properties to order. While the traditional use of bread as a food seemed to be in "bread and" combinations at the table, the "nutrititon conscious" public, or at least some of them, now want the "and" in the bread.

It is probably well known to you that a nutritionally complete bread has been made, and is available to those who want it, and it is not an exaggeration to state that such a product has a high potential value in emergencies where the variety of food supply is restricted.

Since the general use of a complete food under ordinary conditions of food supply is not demanded, with some possible exceptions that might also be taken care of by a more satisfactory selection and combination of foods and bread, the modern idea of directly supplementing certain nutritive properties has led to interesting developments in baking as well as in other lines of food production.

The importance of the so-called vitamins is now universally recognized, and it is startling to realize how rapidly ideas about them diffused from the laboratory into the minds of the many who had no previous special interest in nutrition. Nowadays, every mother knows something about vitamins, and school children talk glibly about what vitamins do and where they are to be found.

Bread was one of the first foods to become involved in vitamin discussions, and as a result, it was soon found possible to increase the vitamin level of bread by the use of various ingredients, preparations and concentrates. Anyone who has a predilection for vitamins will have no difficulty in finding them in standardized bread made to meet this demand.

As knowledge of the constitution and synthesis of these alphabetical complexes is advanced by the organic chemist, it will be quite easy to vitaminize foods to any required level, if this meets with popular approval, for despite any consensus of scientific opinion for such practices, either pro or con, the public usually gets what it wants in the long run. Examples of this are common in popular therapy as any medical man or pharmacist will gladly testify.

If one feels that his intake of calcium, phosphorus, iron, or other elements should be increased, there are various inorganic salt mixtures that may be used in bread without any technical difficulties in production.

One of the popular obsessions of the nutrition conscious public is called "acidosis." Whatever this may be or mean to the medical man or the biochemist, it is evidently clear cut to the laity. The "acidosis" complex is greatly overworked in the interests of certain foods, and is really becoming quite competitive in its implications. Of course, "alkalosis" is worse, but this idea has not yet filtered into modern advertising as a buffer to the acidosis fiends.

It is quite easy to make a bread with a preponderance of base over acid elements by merely adding a certain proportion of a legume flour to the dough. In the old days of "bread and," one could eat his bread and butter with lima beans and have no fear of impending acidosis.

Protein quality worries a great many of our citizens who have not had time to investigate the number of food proteins that they have consumed at the end of three meals per day.

If we feel badly about this problem, a liberal helping of milk bread of standardized composition will dispel all forebodings, though it is just as easy to drink a glass of milk with any kind of bread, and people who don't like milk can obtain it in bread, and those who prefer to drink it can do so and still find room for more bread. In any case the baker can satisfy the public with either the "and" in or the "and" out.

These examples of variations on the theme of bread might be extended, but they will serve to indicate that the baker can readily endow his product with any special nutritive property that may seem to be needed.

Federal definitions and standards exact compliance from food producers for many well-known articles of the diet, including a specific definition of bread, white bread, whole wheat bread, milk bread, raisin bread and brown bread.

The term bread unqualified "is a product made by baking a dough consisting of a leavened or unleavened mixture of ground grain and/or other edible farinaceous substance, with potable water, and

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with or without the addition of other edible substances." Thus it is possible to make many different kinds of bread to meet many objectives in nutrition.

At the present time there is hardly a food product that has not been the subject of experiment for use in bread. New and improved processes for dehydrating foods, advances in starch hydrolysis, hydrogenation, vitamin concentrates, to mention only a few, have made possible new products that are eagerly brought to the attention of the baker.

Many of these products die an early death with the expiration of the advertising budget. Some are valuable and find a place in the bakery. The claims of others are confusing and it is difficult to disentangle the truth from the skein of fiction, whether one be merely a chemist or a man of law.

The recent tendency to vary the nutritive properties of foods in order to conform to the enthusiasm of the moment cannot be disregarded or evaded. It is here and speculations as to its future permanence are of much interest and importance to the food industry. Lacking the gift of prophecy, one guess is as good as another, but the chemist in the food industries cannot ignore the nutrition problem, in relation to his own products.

However, it is just possible that in course of time, we may revise some of our ideas of what foods lack or their nutritive deficiencies, also of balanced and normal diets, the inter relations of vitamins, inorganic constituents, quantitative levels of intake, and the question of normal nutrition. If this happens, the various components of the diet will be suitably combined on the basis of their own merits, and among other things, the impending acidosis of the nation will be averted.

Nevertheless, there is another tendency in progress now as a result of nutrition studies that may have important and enduring results. As our knowledge of cell chemistry develops, it may lead the way to methods of influencing the composition of cells and thereby the products of both animals and plants. In regions and localities, where certain foods are produced that are deficient because, for example, of soil conditions, it may be possible to correct some of these deficiencies at their source. Recent experiments in animal feeding also have indicated important possibilities of improvement in the nutritive properties of certain products.

However, the chief inference which we hope will be drawn from this very simple discussion of "bread and" is, that the baker can provide you with any variety of bread that your nutritional conscience desires, and that any discussion of the merits of bread should refer, like a laboratory report, only to the sample submitted.

CONTINUOUS DISTILLATION

OF FATTY ACIDS*

By L. M. TOLMAN and STANLEY GORANFLO

(Wilson and Company)

There has been up to the last ten years very little development or change in the method of distilling fatty acids, over that which has been employed for the last hundred years. The method employed, as you all doubtless know, has been the use of the large pot still heated by direct fire, and distilling under a vacuum, with live steam being used to agitate fatty acids during the process. In recent years considerable study has been given to the improvement of these methods, some attempts being directed towards refining and improving the batch method of operation as is illustrated by the new Lurgi Still, to which have been adapted high modern vacuum equipment as well as improved methods of heating. This, however, is still a batch type of operation and inherently has certain definite objections.

The Wecker process type of still which was described to you by Mr. R. W. Perry, and published in OIL AND SOAP, January, 1933, was an attempt to get away from the batch type into the continuous type of operation, and a number of units of this kind have been erected for the practical application of this method.

This paper will describe the development of a new type of continuous apparatus for distillation of fatty acids developed in the Wilson-Martin Company at Philadelphia, the patents and rights being controlled by the New Process Fat Refining Corporation, and covered by American Patent No. 1,951,241, pending patent applications, English Patents Nos. 498,117 and 408.184, Belgian Patent No. 397,713. Canadian Patents Nos. 340,785 and 344,747, and French Patent No. 773,635.

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History of This Development

Several years ago the authors of this paper in considering the distillation of fatty acids and possible improvements, decided to develop a continuous system, if possible. The development of this was carried through in a regular development method. First, a number of small laboratory units were built to determine the difficulties as regards temperature, times, metals and other factors, which could be determined on a small scale. After several years of experimentation on this basis where many difficulties as regards valves, piping and heating were encountered and overcome, a small semi-manufacturing unit was designed capable of distilling from one to two barrels of fatty acids per day, and from the figures obtained upon this semi-manufacturing unit as to the temperature, vapor velocities, and capacity, the first plant scale unit was designed with a capacity of thirty-five to forty thousand pounds per day finished distillate. This first commercial unit was built and put into operation a little over two years ago and was so successful in increasing the yields and quality of product, that a second unit has been built by the Wilson-Martin Company and is now in operation with equal success to the first unit. As a matter of fact, in some ways the results as to quality and yields have been improved in the new unit so that the descriptions of this still are based upon a finished commercial unit successfully operated.

The results obtained in the first plant unit were considerably better than any of the results which have been obtained in the semi plant scale equipment both as to quality of product and yields, and the general results indicate that a flash heating of the fatty acids as they are accom-

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