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Flour Considered from the Standpoint of
Nutrition.

LUCIEN M. UNDERWOOD.

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FLOUR CONSIDERED FROM THE STANDPOINT OF NUTRITION.

LUCIEN M. UNDERWOOD.

There is a German proverb involving a play of words in similar sounds which says: "*Was ein Mann isst, er ist,*" This is translatable into our tongue as, *What a man eats he is.* Without entering into the philosophic consequences that would result from a complete acceptance of such a doctrine, we can content ourselves with learning a few lessons that are suggested by the large germ of truth that is involved in the proverb. The question of "what shall we eat and what shall we drink and [with what clothes] shall we be clothed" is perhaps the most important personal question that can be considered by the American people. Although it might not be so considered at first thought, it is a question of *biology*, and moreover one of the most important practical questions biology has to consider, for it involves directly the welfare, happiness and productiveness of all of our people, as dependent upon the biological principle of nutrition. There can be no question but that the amount and quality of food directly affects man's actions; courage, disposition, mental activity are more or less directly dependent on what and how much food a man eats and the time and manner in which he eats it. There is much more wisdom than humor in the answer to the question: "Is life worth living?" that was asked in the funny column of the newspaper; and answered: "It depends upon the liver."

The customs of a people regarding food, change from time to time and ought to change, for people ought to take advantage as soon as possible of any discovery of science, or of any improvement in the method of the production or manufacture of articles of domestic use. The man who

lives as his grandfather did, works as his grandfather worked, and eats only the kind of food that his grandfather ate, is out of place in these closing years of the nineteenth century—he is a worm crawling in a rut with no ideas of the possibilities outside it. We are so much the creatures of custom and do things because they have been done, that unless we are rudely interrupted, we are sometimes likely to keep on doing the same old things in the same old way.

One or two illustrations will show how the habits of the American people change with regard to food. Thirty years ago if a resident of a town of 5000 or less wished for some oat-meal he would call at the drug-store instead of the grocery. The druggist would hand down from among his jars and packages of drugs a can containing some stale, granular, often mouldy oat-meal imported from across the sea. This with all its mouldiness and taints resulting from standing among vile-smelling drugs, would be weighed out by apothecaries' weight as a prescription for invalids or for some one whose delicate appetite needed something tempting. This was the relative position of oat-meal as a food supply only a generation ago. None of the nutritious and appetizing cereal preparations that are now so abundantly manufactured in this country and so universally used for food, were even known or thought of in those days. And I might add a remark that so soon as people learn the simple art of properly cooking these breakfast cereals and give us the light appetizing dishes that are possible where now we often have only the soggy, sloppy, flavorless preparations that are far from inviting—the favor of these healthful breakfast cereals will still more rapidly extend.

Thirty years ago bananas were rarely seen outside the large cities and they were scarcely more than an occasional luxury even there, within the means of the better classes. Only now with the largest port of entry for bananas within our own State, and with special trains loaded with that fruit alone moving northward from Mobile every day to be distributed from Chicago and St. Louis into every little

town and hamlet in the upper Mississippi Valley, we see a vast change in the use of fruit as an article of diet compared with the custom of a generation ago. Right here let me interpose another protest that more of this fruit should be stopped before it leaves the borders of Alabama, for of all peoples that need fruit as a considerable article of diet, those who live in a warm climate need the most, and more fruit could well replace much of the fatty foods that are in common use throughout our State in city, town, and country homes.

We must, therefore, outgrow the customs of our fathers in regard to our food just as we have replaced the horse of our grandfathers by steam and electricity, and the blaze of the pine knot by the electric light. We owe it especially to the children of the rising generation that we give them the best food that science can discover, and give it to them in that form, that their dispositions, which are none too good by inheritance, may be improved, their mental capacity, which depends far more than we realize on what they eat, may be largely increased, and their happiness and long life which depend on their state of health and proper nutrition and these in turn on what they eat and how they eat it, may be conserved in the best possible way.

Since wheat is one of the commonest and most widely used food plants in America, it is strange that the question of its nutritive properties have so long given way to questions of color and appearance. The object among most manufacturers seems to have been to produce the whitest and finest flours possible, regardless of the nutritious qualities involved in the food product itself, thus depending for sales on *looks* rather than on *life giving function*—another pernicious custom far too prevalent in America. The purpose of this bulletin is to call attention to the constituents of wheat flour that have resulted not only from a study of the structure and composition of the wheat kernel itself but from a long series of practical experiments respecting the bread produced from various flours.

The kernel of wheat as nature produces it is covered with a tough, almost horny outer layer which in portions of the kernel, especially at its upper end and often within the groove is fringed with hairs. This outer covering, which forms the greater part of the bran when ground, is composed of cellulose with more or less hardening elements all of which are indigestible and consequently not suitable for food. Underneath the outer husk is an inner husk that contains considerable gluten and a large part of the phosphates and other mineral elements of the kernel. Under these two coverings is a layer rich in the gluten and other nitrogenous elements of the wheat, and usually of a darker color than the interior which contains principally starch, with a much less proportion of gluten. The nutritive food elements of the kernel, therefore, increase from the interior outward. In the ordinary process of making flour, in which whiteness is regarded as a mark of the greatest purity, all the inner covering and much of the nutritive outer layer of the kernel is bolted out and only the inner, whiter portion containing more starch and less proteids is left. In other words the finer and whiter a grade of flour is, the less likely is it to contain the most nourishing elements of the wheat.*

A knowledge of these facts led, many years ago, to the introduction of "Graham" flour, which, for the most part, is either an unbolted flour or one in which only the very coarsest part of the bran or outer husk is removed after the wheat is ground. Graham is an improvement on ordinary white flour, so far as the question of nutritious constituents is concerned, but it contains the indigestible outer coat of the grain which is not only indigestible but irritating to the mucous membrane which lines the alimentary canal. Graham flour, moreover, is usually ground without thorough cleaning of the wheat, and the flour often contains various particles of dust that accumulate in the groove of the kernel

*It should not be understood that a *dark* grade of *white* flour is necessarily better on that account. As a rule it is made of an inferior quality of wheat or from wheat improperly cleaned.

and in the hairs at the end of the kernel, and the finely broken fragments of the hairs themselves, all of which are a detriment to the flour.

The ideal flour, so prepared that all the objectionable elements of the kernel are removed while all the nutritious parts are left in, is prepared by subjecting it to a process which removes the husky outer coating of the kernel before the grinding takes place, and then grinding the flour without separating any of the proteid portions of the grain from the starch, thus conserving all the nutrition in the grain; the product thus obtained is known as the "flour of the entire wheat." The bread made from this flour is of a light brown color, is more moist, richer in flavor and lacks the dry and unsubstantial character so common in white bread, especially that made by bakers. Having personally used bread made from this flour for the past fourteen years, and having compared it with many other kinds, I am prepared to say that I cannot find its equal in nutrition or flavor. It must be said, however, that something depends on the method by which it is made, and for that reason I have appended the most approved method followed in its preparation. It will be seen that it is more easily made than any other kind of bread. Unlike most bread it does not deteriorate with age if properly kept, up to a reasonable limit of time. I have taken it on camping expeditions and had it keep for a week with no necessity for renewal and no loss of flavor. In 1891 I met a gentleman at Lake Worth, who had spent three weeks in Florida. He was a chronic dyspeptic and could eat no other bread than this. He had brought a supply of it with him and had used from it during the three weeks of his stay, and was then obliged to go home because his supply was exhausted. If the bread becomes dry it is only necessary to wrap it in a moist cloth and place it in the oven for fifteen minutes, when it resumes its usual condition. It also makes the most delicious form of toast imaginable.

It should also say that this bread is not so palatable when

perfectly fresh as when at least a day or two old. In fact from a hygienic standpoint no bread when first baked is suitable for food. There is no question but that the wide spread dyspepsia that is common throughout the country is largely due to the excessive use of fatty foods, strong coffee and hot bread.

The peculiarities of bread made from the flour of the entire wheat as a food, are, of course, due to its flour containing all the nutritious elements of the wheat. It thus adapts itself to the needs of the system and builds brawn, bone and brain. It is, therefore, specially valuable for young people whose bodies are growing, or for those whose brains are in the process of growth and expansion. It is a pitiable sight to see so many children and young people robbed of the food elements necessary to their proper development by the use of those forms of food from which the chief good has been thrown away, for in the preparation of white flour, the middlings or *canaille* is bolted out and is used in the preparation of various food stuffs for our domestic animals. In this way we treat our domestic animals better than we do our children by giving the children the flour from which the best and most nutritious elements have been separated, and then giving these same nutritious portions to pigs and cattle.

Another special advantage of this bread is its regulative action on the human system. Probably the largest number of chronic disorders of the human system can be traced to the matter of indigestion and the attendant constipation that follows as a natural result. The most ordinary method employed for this difficulty is the one that is most unreasonable from the standpoint of either biology or common sense. When the system has become overcharged by unsuitable food or by too much of it, it is manifestly folly to follow this up by an additional load in the form of drugs of any kind. It would be considered insane to load a beast of burden, already staggering with its pack, with an additional weight of merchandise, and yet we do this same

thing with our poor overloaded digestive system, when we follow the ordinary plan of dispensing physic. Shakspeare uttered a sublime command when he caused Macbeth to utter the words, "Throw physic to the dogs." The simple and rational method of treating such conditions is through the proper use of food. There are sufficient forms of food supplies among our standards so that any one by a proper selection and combination can secure that which will at once supply proper nourishment to the body and at the same time act as a regulative that will render unnecessary either drugs or doctors. Perseverance will be necessary in obstinate cases, *but they can be overcome by this treatment.* In the list of foods that stand high in regulating the system against a tendency to constipation is this flour of the entire wheat.*

It should be said that several other forms of hygienic flours are made which claim to be equal to this, but so far as I have tested them they lack both in nutritive qualities and flavor, the high character of the preparations above described. The cereal foods prepared at Battle Creek, Michigan, and recommended by its well known sanitarium, are valuable additions to the list of useful foods.

In order to verify the results of microscopic examination and experience, samples of the "flour of the entire wheat" manufactured by the Franklin Mills Company of Lockport, New York, together with samples of the best grades of white

*CONSTIPATING FOODS.—Hot bread, bread and rolls made with baking powder, cake, custards, salted, dried and smoked meats, poultry, potatoes and starchy foods generally, blackberries, raspberries, tea, coffee and chocolate.

LAXATIVE FOODS.—Rolled and cracked wheat, all forms of bread made from the entire wheat, fresh acid fruits like the orange or lemon, tropical fruits like bananas, stewed dried fruits, especially peaches, prunes and apricots, tomatoes, oysters, raw cabbage, and most green vegetables, wild game, etc.

FOODS OF NEUTRAL CHARACTER.—Lean, fresh meats, fresh fish, eggs, uncooked milk, oat-meal and sweet potatoes.

flour offered for sale in Alabama, were submitted to Prof. B. B. Ross, State Chemist of Alabama, with the following results :

CONSTITUENTS.	Flour of the Entire Wheat.	Best white flour. Sample I.	Best white flour. Sample II.
Water.....	6.36	11.07	10.74
Fats.....	1.51	0.88	0.79
Protein.....	14.19	9.94	9.22
Carbohydrates.....	77.03	77.73	78.91
Ash.....	0.91	0.38	0.34
	100.00	100.00	100.00

The greater percent of ash in the first column is largely due to excess of phosphates, the percent of phosphoric acid being 0.50 for the flour of the entire wheat and only 0.23 for the white flour.

It will be noted that while the percent of water is less in the flour of the entire wheat, the percents of proteids (gluten), fats and phosphates are larger than in the best white flour, while the percent of carbohydrates (mainly starch) remains very nearly the same.

After the first analysis of the flour of the entire wheat, made from the barrel, two additional tests were made from samples of flour furnished by the Franklin Mills Company direct to the chemist. These samples did not materially differ from the first analysis except that the percent of protein was a trifle higher, the ratio being 228 and 229 as against 227 in the first analysis.

To show more forcibly the comparative values, we present the ingredients of a standard barrel of flour (196 pounds) in actual weights; we use the average of the two samples of white flour for this comparison:

INGREDIENTS.	Flour of the entire Wheat.	Average of two Sam- ples of White Flour.
Water.....	12.47 pounds.	21.36 pounds.
Fats.....	2.96 “	1.64 “
Protein.....	27.81 “	18.68 “
Carbohydrates.....	150.98 “	153.61 “
Ash.....	1.78* “	0.71† “
Totals.....	196.00 pounds.	196.00 pounds.

* Of this 0.98 pounds is phosphoric acid.

† Of this 0.45 pounds is phosphoric acid.

It will thus be seen that Dr. Cutter of Harvard University, was not very wide of the mark when he used the following language with reference to the flour we commonly eat. We quote from the *American Medical Weekly*, and use his italics: “The gluten of cereal foods is their nitrogenized element, the element on which depends their life-sustaining value, and this element is, in the white and *foolishly fashionable* flour, almost entirely removed, while the starch, the inferior element, is left behind and constitutes the entire bulk and inferior nutriment of such flours. To use flour from which the gluten has been removed, is *almost criminal*.”

The flour of the entire wheat is recommended by a large number of prominent physicians who have made a study of nutritive foods; and either this or similar grades of flour are used at all first-class sanitariums where invalids are built up in accordance with the most advanced ideas of nourishment.

In order to make this bulletin as practical as possible, we add a recipe for using the flour of the entire wheat, since the process is somewhat different from that followed in ordinary bread making:

“For making bread from the flour of the entire wheat, take two quarts of unsifted entire wheat flour, a little less than a quart of warm water, one-half cup of sugar (or less if desired), one-half cake of compressed or ordinary dry yeast, and a little salt. Dissolve the yeast in part of the water, mix sugar, flour and salt and add the yeast and the remain-

der of the water. Stir well and set in a warm place. When the dough has risen to twice the original amount, stir down and put in tins for baking, allowing it to rise a second time. This bread requires longer and slower baking than ordinary white bread. This quantity makes two loaves of bread of ordinary size."

It will be seen from the above that this bread requires no kneading and its preparation is consequently much simpler than that of ordinary white bread. All forms of cake made with molasses, all fruit cakes and steamed breads are much better made of this flour and keep moist for a much longer time. The flour also makes most excellent gems and griddle-cakes, so that those who will persist in using hot breads can find this flour adapted to their purpose and can at least take advantage of its added nutriment.

It is proper to acknowledge, with thanks, the assistance rendered by the Chemical Department through Prof. B. B. Ross, under whose direction the analyses were made, and to the Franklin Mills Company for kindly furnishing samples of their flour for analysis.