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Bread

White Enriched Bread vs. Whole Wheat Bread



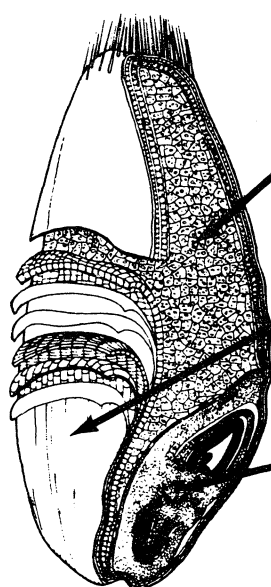
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Grains and cereals make up 25 percent to 28 percent of our diet. Wheat, the most abundant and widely used grain in the United States, is consumed most often as bread. Interest in natural whole grain products, including whole wheat bread is increasing. Many people consider white enriched bread inferior when compared to whole wheat bread and are asking questions about bread's nutritional quality: Just how nutritious are modern refined breads? How does white enriched bread compare to whole wheat bread? What is the fiber content of these breads? Does an increased nutrient and fiber content warrant a change to whole wheat bread? Why are only four nutrients added to enriched white bread when several more nutrients are removed from whole grains? To answer these questions, an understanding of how white bread evolved is needed.

History of White Bread

Before the industrial revolution, white flour was available only to the rich. With the invention of steam-powered mills in the late 1800's, everyone could afford white flour and bread. There were many reasons, including great demand, which prompted millers to develop white flour. The baking characteristics of white flour improved with aging, bleaching and refining. Removing the wheat germ decreased rancidity and improved the baking quality of the flour. Refined flour attracted fewer insects and other contaminants than the stored grain. White bread was cleaner and, to some people, it was a symbol of higher economic status.

Figure 1: Wheat Kernel



Endosperm

Source of white flour
70-75% of the protein
43% of the pantothenic acid
32% of the riboflavin
12% of the niacin
6% of the pyridoxine
3% of the thiamine

Bran

Used in whole wheat, graham flours
86% of the niacin
73% of the pyridoxine
50% of the pantothenic acid
42% of the riboflavin
33% of the thiamine
19% of the protein

Germ

Used in whole wheat, graham flours
64% of the thiamine
26% of the riboflavin
21% of the pyridoxine
8% of the protein
7% of the pantothenic acid
2% of the niacin

White flour is milled by finely grinding the endosperm of wheat after the bran and germ have been removed.

Dark flours (Whole Wheat, Graham) are made by grinding the entire kernel.

Milling Flour

Milling flour to provide better keeping and baking qualities also removed several nutrients from the whole grain. Each kernel of wheat consists of (1) the outer husks, or bran, (2) the inner portion, or endosperm, and (3) the small germ at one end of the kernel. In its natural form the wheat kernel contains many vitamins, minerals, and protein, as well as carbohydrates which are not evenly distributed throughout the grain (See Fig. 1). The bran and germ contain most of the vitamins, minerals, and protein although large percentages of a few nutrients are found in the endosperm. Milling of the wheat grain to make white flour removes most of the bran and germ leaving only the endosperm. Removing the bran improves digestibility. Removing the germ improves the keeping quality of the product because the germ consists of fat which can easily oxidize and turn rancid.

During milling, wheat loses 84% of the original fiber, more than 50% of the phosphorous and calcium, 66% of the iron, 50-75% of the thiamin, 80% of the niacin and 33% of the vitamin E content of whole wheat. The percentage of protein remaining after milling varies greatly, depending on the amount of bran removed.

Enrichment of Bread

Tables I and II compare some nutrients in unenriched, enriched, and whole wheat breads. Thiamin, riboflavin, niacin and iron are added to enriched bread to the levels approximately equal to those found in whole wheat bread. Other nutrients lost in milling are not replaced. Bread also contains nutrients from ingredients used to make bread such as salt, yeast, and non-fat dry milk. Bread contains more sodium and calcium than that in the whole grain. Other minerals are lower.

Table 1. Comparison of 3 B-vitamins and iron in pound loaves in wheat bread.

Wheat bread	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Iron (mg.)
Unenriched	0.40	0.36	5.6	3.2
Enriched	1.1 - 1.8	0.7 - 1.6	10 - 15	8.0 - 12.5
Whole wheat	1.17	0.56	12.9	10.4

Table II. Amount of minerals in enriched white bread expressed as a percentage of the mineral content of whole grain.

Mineral	%
Cobalt	85
Iron	65
Molybdenum	65
Potassium	40-45
Phosphorus	40-45
Copper	40-45
Zinc	28
Magnesium	19
Manganese	13

Even though enriched white bread contains added iron, the iron may not be readily absorbed by the body because various iron compounds are absorbed differently. The ones added to bread and cereal products are only fairly or poorly utilized. The iron compound, ferrous sulfate, is utilized more efficiently; but it is not added to flour because it changes the color, odor and baking performance of the flour during storage, and products baked with the flour may have a grey appearance. Scientists are trying to develop a method to use more biologically available iron and still maintain an acceptable product.

It seems reasonable to add all nutrients removed during milling. The obvious question is: "Why are only a few nutrients added to enriched white flour?"

To understand why more nutrients are not added, an understanding of national policies for enriching food is needed. During the 1930's, nutritional surveys disclosed that more than one-third of the population had "poor diets." Instances of nutri-

tional deficiency diseases were alarming. These reports prompted medical, public health, and nutrition specialists to investigate corrective measures.

It was known that white flour lost many vitamins and minerals during the milling process and that these nutrients were needed for good nutrition. Since bread was and is a staple food of the American diet, public health nutritionists encouraged manufacturers to add riboflavin, niacin, thiamin, and iron to flour in order to decrease specific nutritional deficiencies caused from inadequate intakes of these nutrients. Other nutrients were not restored to flour because they were and still are readily available from other food in the diet. Scientists reasoned that if other nutrients could be obtained readily from other food, adding nutrients to flour only increases the cost of flour products.

Initially, enrichment of bread was voluntary. During World War II it became mandatory under a wartime order. Later, enrichment of flour and bread became mandatory in twenty-nine states including Indiana; enrichment with calcium and vitamin D remained optional.

It has recently been proposed that the levels of the four nutrients originally added to white flour be raised and that calcium, zinc, magnesium, folic acid, vitamin B₆ and vitamin A be added. This proposal was dropped because scientists believed that additional iron would be detrimental to certain segments of the population who might store too much iron over a lifetime.

Although most white flour and bread, corn meal and grits, macaroni products and rice are enriched, certain bread and cereal products may not be enriched, especially those baked locally. Therefore, read the label or ask the baker or manager if enriched flour is used.

Many people assume that dark breads contain all the vitamins and minerals of whole wheat bread. This is not necessarily true. Dark bread is often made from a combination of whole wheat flour and white flour. White flour may or may not be enriched. For this reason, dark bread may contain less nutrients than enriched white bread. If the label on the bread reads "whole wheat," the bread must be made from 100 percent whole wheat flour which contains all parts of the grain.

Conclusion: Whole Wheat vs. White Enriched Bread

Whole wheat bread, compared to white bread, has a larger amount of several minerals and vitamins. Higher quantities of nutrients, however, do not always make whole wheat bread better because the body is unable to absorb and utilize all the nutrients from whole wheat bread. Certain chemicals, such as phytate in whole wheat bread, bind a number of minerals such as zinc, calcium and possibly magnesium, rendering them unavailable to the body.

Whole wheat bread has a higher fiber content, which is important in the diet. During milling of wheat, 80% of the fiber is removed. Part of the fiber component, however, is responsible for the binding of certain minerals. Although whole wheat bread is a good source of fiber, fiber also is available from vegetables, fruits, rolled oats and some ready-to-eat cereals.

Definitions

Enrichment - The addition of nutrients to foods—usually cereal products.

Fortification - the addition of one or more nutrients to a food in amounts larger than naturally found in that food. Milk is fortified with Vitamin D.

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