Some Thoughts on Real Bread

Bread seems to be under attack these days from certain dietary circles. Assertions are made that foods made from wheat are likely contributors to weight gain, diabetes, even arteriosclerosis or arthritis. If we consider the modern, factory-made loaf of bread, such assertions may well have merit. Let’s not forget, however, that humankind has been farming and consuming cereal grains for roughly 10,000 years. For all these millennia, cereals have played a truly supportive nutritional role in peoples’ diets, often comprising upwards of 70% of the daily energy requirements, yet without giving rise to epidemics of obesity or diabetes. So what has changed?

Today’s bread is an industrial product through and through. It bears little resemblance to the peasant breads of old. A number of factors, some would call them innovations, occurred during the last few decades of the 19th century, which contributed to radical changes in the daily bread of the 20th and now 21st centuries. Let’s look at a few of them, and then consider some alternatives.

The steel roller mill. Since the dawn of agriculture, cereal grains were ground into flour using stone devices. Animal-powered rotary grindstones appeared during the 3rd century BC. Stone-ground flour was the norm right up until the introduction of the roller mill in Hungary around 1872, a process that revolutionized flour making and quickly spread across Europe and then North America. Prior to this invention, flour was generally coarsely ground, the bran, germ and oil were interspersed throughout the flour, and it was impossible to separate out a true white flour for lighter baked goods. With the advent of the steel roller mill, however, the wheat berry could be rapidly stripped of its outermost layers, then separated out to yield “products” such as patent flour, clear flour, bran, middlings and wheat germ. The wheat kernel contains the entire B-complex, save for vitamin B-12. Modern white flour contains none of these precious nutrients from the outer layer of the wheat berry, nor the germ oil, and while shelf stable for long periods, it is seriously lacking in nutrition. With the roller mill, we get whiter flour but the heat generated in the milling process destroys thiamine and the enzyme phytase (more on this below) among other things. To make “whole wheat” flour, the milling company recombines the various milled parts of the wheat, in the approximate proportions of the original
kernel, but sometimes leaving out the wheat germ, to prevent rancidity. (I began my baking career making whole wheat bread in a boarding school kitchen 51 years ago, and I can still recall the sour, acrid smell of rancidity when I tore open those 100 lb. sacks of government commodity flour. It took a generous measure of honey to make the bread palatable. In those days, organic stone-ground flour was virtually impossible to find.)

The invention of baker’s yeast. For millennia, bakers relied on natural leavening, or sourdough, to transform their flour into a food capable of nourishing the body. But amassing enough sourdough to make bread takes time and makes for a long day for the baker. So in the 1860s French biochemists figured out how to isolate and then grow Saccharomyces cerevisiae, which is our modern baker’s yeast, such that the baker could quickly raise bread and cut hours from the production cycle. But there are problems with baker’s yeast, particularly in conjunction with whole-grain bread. All cereal grains contain phytates, or phytic acid, in the outer layers of the kernel, organic acids that tightly bind phosphorus, preserving it as a nutrient for the growing plant. However, in our gut, phytates act as a mineral blocker, preventing the absorption of calcium, magnesium, iron, copper and zinc. Phytates will even combine with these minerals present in other foods being consumed with the grain, and render them unavailable to our digestion. Up to 80% of the phosphorus in grain is unavailable when bound with phytic acid. Too, phytates inhibit a number of enzymes needed for various digestive processes.

So what has all this got to do with baker’s yeast? It turns out that grains also contain a phytate-breaking enzyme, phytase, which occurs in wheat and at the highest levels in rye. High phytase activity will get rid of nearly all of the phytate. Unfortunately, a yeasted bread dough, with its pH of around 5.4, and its short fermentation time, does not present a favorable environment for phytase to do its work. In the most extreme case, factory bread dough made by the Chorleywood Bread Process, a continuous system used in many countries (less common in the US due to higher protein domestic wheat), is developed with massive amounts of yeast in less than five minutes, allowing for virtually no phytase activity. (Curiously, because phytase is known to be destroyed by modern milling, livestock feed manufacturers today routinely add a bio-engineered form of phytase to their rations to improve nutrient uptake.)

Carrying our century-old baker’s yeast forward into the modern era, scientists are now inserting a bacterial phytase gene, and development work has been done using recombinant DNA technology with yeast to reduce rising times for dough, improve dough stability, and to make the yeast resistant to freezing, for application in ready-to-bake frozen dough. In the US, it is impossible to know if the yeast on the supermarket shelf is a GMO version.

The invention of chemical fertilizers. The brilliant German chemist Justus von Liebig (1803-1873) is generally credited with figuring out how to feed plants with artificial fertilizers for optimum growth, and how to make artificial nitrogen fertilizer. He
established that plants require nutrients in a water-soluble form for assimilation. At the dawn of the 20th century, artificial fertilizers began to see widespread use. Over time we have learned that these substances are destructive to soil life and affect plants in novel ways. In a natural soil system, the water-soluble elements are tightly bound within the humus colloid. When a plant feeds, it sends its fine, white feeder roots into the humus fraction to draw nutrients as required. The soil water remains essentially plain water. As it transpires water to the atmosphere, the plant draws in more water through its larger, darker water-bearing roots. Now if we add a bag of sulphate of ammonium to the soil surface, the nitrogen salts dissolve into the soil water, and the plant is force-fed when it draws in water through these larger roots. The water/salt balance is upset at the cellular level, the plant takes in more water to compensate, and the result can be seen as huge, dark cabbages, thick wheat stalks, etc. At the same time, these salt fertilizers cause changes to proteins, enzymes, phytochemicals and other substances, which in combination cause the fertilized plant to become more susceptible to pest and disease attack. At which point the farmer applies pesticides and fungicides to save the crop.

The aims and results of modern wheat breeding. Of all the cereal grains, wheat—Triticum aestivum—has been subjected to the most extensive breeding efforts. Particularly since the late 1950s as the “Green Revolution” in agriculture spread, breeders have sought to make wheat higher yielding, with shorter straw to support heaver heads of grain, resistant to a myriad of ever-changing diseases, and now to resist herbicides as well. One example is Clearfield® wheat, a product developed by BASF Corp. currently available in 20 varieties and grown on roughly one million acres in the US and Canada. Clearfield, though not a GMO (no GMO wheats have been released yet), was engineered to resist BASF’s herbicide Beyond® through novel breeding techniques including the crossing of wheat with non-wheat grasses, and mutagenesis, a process whereby wheat embryos are exposed to the toxic chemical sodium azide, or to gamma rays and x-rays, in order to induce mutations. From subsequent generations, a mutation was eventually found that appeared to be wheat for all intents and purposes, but which was unaffected when sprayed with Beyond. The intensive breeding of wheat cultivars over the past half-century has resulted in significant changes to the amino acids in the gluten proteins. This shift in chemistry may well account for the 400% increase in celiac disease over the same time period. Additionally, the protein gliadin found in modern wheat appears to be a potent appetite stimulant and may be linked to the rapid rise in inflammatory and autoimmune diseases.

Stone-grinding as an alternative to the roller mill. When wheat berries are ground into flour in a stone mill, the grain is crushed, and particles of bran, germ and oil are evenly distributed throughout the resultant product. Stone ground flour remains cool during milling, so that thiamine and other vitamins and enzymes such as phytase and glutamic acid decarboxylase are preserved. Though antioxidants vitamin E and lecithin will help prevent oxidation of the oil and resultant rancidity for a time, it is best to obtain fresh flour. For home use, small stone mills are
available, but the home baker can also make satisfactory fresh flour with an inexpensive hand-cranked steel burr mill. Incidentally, commercially available “stone ground” flour may not be the real thing: US government regulations allow such a label if (presumably roller-milled) flour makes one pass through a stone mill! A better alternative is to support your local miller. Happily, regional gristmills are seeing a resurgence. New facilities have opened, for example, in Maine, Vermont and North Carolina.

*Natural leavening as an alternative to baker’s yeast.* Modern baker’s yeast creates a monoculture in the bread dough with exactly one species of yeast, and virtually no bacteria. A sourdough leaven, by contrast, may contain four or more strains of wild yeasts and ten to fifteen different kinds of bacteria. These organisms live in a symbiotic relationship, and the culture, once established and then well cared-for, remains stable for years if not centuries. The yeasts contribute primarily to the rising of the dough. The bacteria produce a variety of acids, the most notable ones being acetic and lactic, which contribute to the flavor profile of the finished loaf. When incorporated into whole-grain bread dough, the sourdough culture brings the pH down to around 4.2. Because of its lower pH, myriad of organic acids, and longer development time, a naturally leavened dough will contain far lower levels of phytate than a yeasted dough. For the consumer of bread, this means greater absorption of minerals such as phosphorus, calcium, zinc, iron and magnesium as well as a higher level of the B vitamins. Many people find the flavor of a sourdough loaf more compelling than that of a yeasted bread. The only disadvantage I can think of with sourdough is that it takes more time to make the bread!

*Organic or Biodynamic practice in the growing of cereal grains as an alternative to “conventional” chemical agriculture.* 150 years ago, many regions of the US and Canada supported a cereal grain agriculture. The Champlain Valley was known as the “breadbasket” of New England, and one of the most important wheat varieties at the time was developed by breeder Cyrus Pringle in Charlotte, Vermont. Through economics, the opening of the west via the railroads, the invention of the reaper-binder and other factors, wheat growing eventually became concentrated in the prairies, and died out elsewhere. Bulk commodity wheat has to this day remained a cornerstone of agricultural production in Kansas (“The Wheat State”), and neighboring states and provinces of Canada. But wheat can be successfully grown in many places! Today we are seeing a resurgence of cereal production from the San Juan Islands and the Skagit Valley all the way to the Eastern Townships of Québec and Aroostook County, Maine. The supply of organic bread grains continues to grow.

*Finding alternative grains for our daily bread.* It is primarily the modern semi-dwarf varieties of *Triticum aestivum*, developed through mutagenesis and other radical breeding methods that may pose health risks. Older varieties of wheat, such as Red Fife and Turkey Red, developed during the 19th century, do not appear to carry the same risks. In fact there are many cultivars of wheat pre-dating the Green
Revolution era that continue to perform well in the field, in the bakery and in our bodies.

Aside from wheat there are a number of other grains we can use to make delicious bread. Grain rye is considered a very minor crop in the US and Canada today, however it has been a staple of northern Europe for centuries and there is a long tradition of rye baking there. A 100% whole rye loaf is a particularly nutritious bread. It requires a careful sourdough process, and cannot be successfully made with baker’s yeast alone. Spelt (T. spelta) is an ancient member of the wheat tribe that contains gluten and makes a lovely, nutritious bread. Many people with wheat intolerance report no ill effects from consuming spelt. Looking even further back in time, we encounter einkorn (T. monococcum) harvested as a wild grain in 16,000 BC in what is present-day Syria and Iraq, and as a cultivated crop from around 10,000 BC. Einkorn is very high in protein and richer in minerals than modern wheat. There is evidence that its gluten is non-toxic to people suffering from celiac disease. Emmer (T. dicoccum) is another ancient grain that is well suited for bread. Kamut® is the registered trade name of Khorasan wheat (T. turanicum), named for a region spanning parts of Afghanistan and Iran. Bread made from Kamut has a high level of protein and other nutrients and a delectable taste. By registering this grain, the proponents intended to protect its quality, to prevent crossbreeding, and even required that it be grown only as a certified organic grain. Of the afore-mentioned ancient grains, spelt and Kamut are relatively easy to obtain, whilst emmer and einkorn remain rare and expensive.

Making whole-grain sourdough bread is not difficult. There are many excellent resources available on this subject, and if you’re not already a home baker, I would encourage you to get started! At the same time, when you’re not in the mood for baking yourself, it’s important to support those local bakers who make good bread that you like.

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February 2014