

## Good-For-You Baked Goods



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I have been asked what is the next big thing in baking. Looking into my crystal ball and lurking around the national Institute of Food Technologists (IFT) meeting this summer gave me some idea. Both last year and more so at this year's IFT, there seemed to be a growing interest in ingredients that make your product more healthy for the consumer.

These ingredients are various sources of whole grains and fibers, specialty oils like those containing omega-3s, low trans fats with low saturates, many different sources of various antioxidants, and protein sources. Adding these ingredients to baked products can be challenging. I will try to address some of these challenges and how to get around them.

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### Whole Grains

The popularity of whole grains has been growing. There is mounting evidence that there are many undefined phytochemicals in whole grains that are typically discarded when grains are refined. Some of the more common grains are wheat, oats, corn, barley, triticale, buckwheat, rye, rice, sorghum, flax, spelt, and kamut. Less known grains are Indian rice grass, quinoa, and teff. The challenge of incorporating these different whole grains into baked products is maintaining some kind of structure in the product. Some, like wheat, of course, and its ancient ancestors, spelt and kamut, contain gluten that help with structure. Others can add their own flavor notes, some good and some bad. Some flours absorb excessive amounts of water, which can decrease volumes and keeping quality in both breads and chemically leavened products. When too much water is needed to hydrate a dough or batter, it drives up the water activity, making the product more susceptible to mold growth. It is also dead weight, not contributing to the structure of the product, but rather diluting it.

An interesting grain is teff. The grain itself is very small, about a tenth the size of a kernel of canola or rapeseed. When milled, it does not do well, resulting in a pasty dough and green flavor. When it is used in its whole grain form, it gives cookies an interesting crisp texture and pleasant flavor.

### Fiber

Traditionally fiber is thought to come from grains. This notion has changed greatly in the past few years, and as a result the definition of fiber has also changed to better encompass the various sources and kinds of fiber. AACC International was instrumental in developing a better definition for fiber that would encompass these various kinds of fiber.

The definition they arrived at is "Dietary fiber is the remnants

of the edible part of plants and analogous carbohydrates that are resistant to digestion and absorption in the human small intestine. It includes polysaccharides, oligosaccharides, lignin and associated plant substances. Dietary fiber exhibits one or more of either laxation (fecal bulking and softening; increased frequency; and/or regularity), blood cholesterol attenuation and/or blood glucose attenuation" (1).

The fibers we eat come from many different sources. Some of those sources include trees, citrus, grains, by-products of processing like milling or fermentation, bacteria, and legumes. They are divided into soluble and insoluble types and the potential benefits include reduced cholesterol, improved digestion, and improved calcium absorption. The way they behave in water determines how user-friendly they are in baked products for the same reasons as the whole grains. They go beyond whole grains in what effects they have on the products they are incorporated into.

Hydrocolloids, gums, and very long-chained polysaccharides are typically sources of fiber that have other functional effects on finished products. Gums provide a particularly interesting opportunity to explore their interactions with other ingredients like emulsifiers and proteins to see what textural and shelf-life benefits can be found. A good example is xanthan gum, which is made from bacteria in a fermentation process. In some applications it seems to help form a structural network with milk and egg protein, giving the product more height and body. At a usage level of only 0.3% it gives chemically leavened products, such as cakes, better moisture retention when they go through freeze and thaw cycles. At levels higher than 0.30%, batters will begin to lose their flow qualities.

Other fibers, such as oligofructose, are short-chained carbohydrates that behave a lot like sugar but are not as sweet. They can be used as a replacement for sugar in high sugar products where the sugar is not needed for fermentation, such as in yeast-raised products.

### Antioxidants

The other big buzz word being bantered about the past couple of years is antioxidants. Antioxidants are thought to work by scavenging oxygen in the body to keep it from reacting with other compounds in the body to form free radicals that can play a roll in causing cancers. Cocoa, fruits, teas, nuts, whole grains, and legumes are a few of the good sources of antioxidants. The challenge and unknown is how many antioxidants survive the baking process. Many are sensitive to heat, light, and pH. However, some research indicates that baking actually increases the antioxidant value of baked goods.

The trick to incorporating fruit into baked goods is taking into account the moisture level in the fruit. If the fruit is stirred into the batter, such as blueberries into a muffin batter, where the fruit is still intact, no water adjustment is needed for the batter. This process is the same for any other inclusions added to a batter, such as nuts. If, however, the fruit is not intact, the moisture most

be accounted for. The typical moisture content of most fruits is between 80 and 90%. A good starting point for figuring in the moisture is to take 75% of the weight of the fruit and subtract this amount from the amount of water called for in the formula (see example 1 below). If the formula does not call for that much water, then the amount of fruit will need to be reduced in the formula or something must be added to help absorb the additional moisture, such as starch or gum. You want to maintain a similar viscosity to the original product. When putting fruit into baked products, the water activity ( $A_w$ ) may go up in the finished product, which could shorten the shelf life.

Chocolate is a major source of antioxidant value. For making a light-colored cake or cookie type of product into a “chocolate” (to be called chocolate the product must contain chocolate) or devil’s food (containing only cocoa) product you need to adjust the flour, sugar, and fat and add soda (see example 2 below). To start, reduce the amount of flour in the product by the same amount of cocoa you are adding to the product. Cocoa added at 6% is a good starting point in both types of products. Sugar can be increased 3–6% for both applications. Further adjustment will likely need to be done to get the product you want. The fat component can also be increased 2–4%, but this is not absolutely necessary.

Example 1—Incorporating fruit into loaf cake formula.  
Add 12 oz of fresh peeled bananas. Reduce water by 9 oz.

Example 2—Changing a yellow cake into a devil’s food cake.  
Cake formula calls for:

<u>Yellow cake</u>	<u>Devils Food Cake</u>
20 oz cake flour	16 oz cake flour
	4 oz cocoa
24 oz granulated sugar	26 oz granulated sugar
12 oz cake shortening	13 oz cake shortening
	1/4 oz soda

### Trans Fatty Acids

Ever since the implementation of the labeling law a couple of years ago that requires the labeling of trans fats, everyone has been working on removing them. There are several options that will work for most baked products. The bigger challenge is in fried products. One challenge is the mouthfeel of the fried product coming out of the fryer and after cooling. If the shortening is high in saturated fats, the melt point is high and thus the fat sets up more quickly as the product cools. In products like donuts, highly saturated fats can cause the glaze to run off and powdered sugar not to stick. On the other hand, the fry-life of such fats is usually good, making such shortening economically appealing.

The other common strategy for making a low trans shortening is using a blend of nonhydrogenated oils. The downside of these shortenings is that they may be very soft or liquid at room temperature. This consistency makes such shortenings less functional when creaming cakes and icings. For fry applications, they tend to break down faster because they are higher in polyunsaturates. The fried products will also have a more greasy appearance because the oil does not set up as readily. Again, glaze could have trouble adhering to the donuts and powdered sugar will become grease soaked, which does not look very appealing.

The third common option for making low trans shortenings is to interesterify blends of oils. That means stripping the fatty acids off the glycerin backbone and reattaching them in new combina-

tions. These shortenings can be low in saturates, typical of your traditional hydrogenated all purpose shortenings, and functional. Unfortunately the added step in the process does add cost to the product, a hurdle some users have trouble getting over.

### Omega-3s

Omega-3s are a big deal as well. There is a growing body of research indicating that they help lower blood pressure and cholesterol. The three most common sources are from fish, flax, and algae. There are three common types of omega-3s, EPA, DHA, and ALA. The EPA and DHA come from fish oil sources. The challenge in baked products is to not have the fish flavor come through. The flax has a nice flavor but has only ALA omega-3s. However, these convert to EPA and DHA through human metabolism. I have not used a product made from algae so I cannot comment on how it performs.

For fish oils, the level of addition is not that high, thus there is not a need to make major adjustments to a formula. If you are adding flax as a whole grain, it will take approximately 1.3 grams per serving for it to qualify as an excellent source of omega-3s. This can be a significant part of the serving, so you typically need to reduce your flour by about half the amount of flax added and your fat source by the same amount of flax added.

### Protein Fortification

There are a lot more proteins on the market today than there used to be. Twelve years ago I could only get soy isolate from two companies in the world, one in the United States and one in Brazil. Today it seems like everyone offers soy isolate and concentrate. Whey protein is more readily available now as well. Wheat protein is also out there. This is different from the typical vital wheat gluten that is used to increase the strength of your flour. Another common source is dried egg whites.

Incorporating proteins, like whole grains and fibers, comes down to how they absorb water in the formula. Soy and wheat protein absorb a lot of water, which makes them difficult to work with when adding large amounts. The whey and egg whites do not absorb as much water, and thus are easier to work with at higher levels.

The other aspect of adding proteins is that they can change the texture of a product. In my experience, whey protein has the least amount of impact on texture. However, at higher levels it can add a mouthfeel best described as powdery. Soy and wheat proteins at higher levels tend to make the products gummy because of the large amounts of water they absorb and hold on to after baking. At lower levels they can add structure, which given the application can come in handy. Egg whites also contribute structure to a product. This structural contribution can be negated with the addition of fat to the product to reach an ideal balance. When using proteins, be aware of food labeling considerations.

Hopefully this has given you some ideas on how to incorporate these ingredients into your products, making them healthier for your customers.

### References

1. Report of the Dietary Fiber Definition Committee to the Board of Directors of the American Association of Cereal Chemists, Submitted January 10, 2001.

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