The Whole Grain Connection Newsletter #43
January 2026

Whole wheat polyphenols and GLP-1mimics

These days we have another very good reason to eat grain foods whole every time. Ferulic acid is one of the many polyphenols in the bran of all grains especially wheat. According to recent research, ferulic acid stabilizes the incretin hormone GLP-1 so making more of it available for preventing metabolic disease.

At least since the 1970s we've known that eating grain foods whole, reduced the risk of a wide range of chronic metabolic diseases and colon cancer.

Before that in the early 1900s the B-vitamins and minerals normally in wheat bran and germ were found to be absent in refined flour. People basing their diet on refined flour and little else, at that time, became sick or died from the B-vitamin deficiency diseases beriberi and pellagra.

Since the 1940s, adding back or *enriching* refined flour with some of the bran and germ B-vitamins and minerals has largely prevented both beriberi and pellagra. The result has been silent complacency among millers, bakers and consumers that refined flour once enriched, is safe to eat as the base of the diet. However, this seemingly simple way to compensate for the lacking bran and germ has proved to be inadequate. The chronic metabolic diseases and colon cancer are now recognized as due to the lack in refined flour of much more than just the B-vitamins and minerals found in wheat bran and germ.

What else is there in wheat bran and germ that could protect us from chronic metabolic disease?

Since the 1970s, dietary fiber from wheat bran has been known for encouraging healthy microorganism growth in the intestinal microbiome, but this is still just a part of the story of protection from chronic metabolic disease and colon cancer by whole wheat.

Only recently have the colorful and flavorful *polyphenolics,* such as *ferulic acid* in wheat bran, been recognized for their ability to increase the effect of natural gut hormones GLP-1 and GIP known as *incretins.*

Incretins are hormones secreted by the gut, that regulate the production of insulin by pushing the release of insulin in the pancreas. The *polyphenolics* effectively stabilize the incretin hormones against early breakdown. Increased stability of *incretins* in the presence of wheat bran polyphenolics is significant in preventing type-2 diabetes and chronic metabolic disease. At last, we can explain the observation that basing the diet on whole grain foods can help prevent chronic metabolic disease (obesity, fatty liver, cardiovascular disease and type-2 diabetes).

Similarly, the new GLP-1 mimic drugs for diabetes have also been found to reduce obesity and cardiovascular disease risk and so reduce metabolic disease. However, these GLP-1 mimics are only effective in preventing some of the complications of advanced diabetes. Eye damage, cardiovascular disease and Alzheimer's disease that

have been seen to be prevented by various plant polyphenolics are lately being seen as only imperfectly prevented by these GLP-1 mimics. We are far better served by basing the diet on grain foods that are whole and plenty of whole fruit, vegetables, seeds, and nuts. These are the sources of protective phytochemicals - plant compounds including polyphenolics.

All whole plant foods are rich in polyphenolics with a variety of activities against metabolic disease. Taking the logic one step further we have an explanation for the recommendation to eat a plant-based diet including whole grains, seeds, legumes, leafy greens and whole fruits and vegetables, to prevent chronic metabolic diseases.

About Incretins

Incretins are hormones secreted by the gut, that regulate the production of insulin by pushing the release of insulin by the pancreas.
Examples of *incretins* are:
GLP-1 (glucagon-like peptide-1)
GIP (Glucose-dependent insulinotropic polypeptide)

The newest antidiabetic drugs are GLP-1 or GIP mimics such as *Ozempic, Wegovy, Mounjaro* and others. The intended effect of these drugs is to reduce obesity as well as counteracting type-2 diabetes.

DPP-4 (dipeptidyl peptide-4) is a natural enzyme that breaks down *incretins*. Various polyphenolics and other phytochemicals reduce the activity of DPP-4 and in this way enhance the activity of the natural incretins.

Further reading: Ferulic acid is a major polyphenol in wheat and other whole grains. Thus, searching on **www.pubmed.gov** for "ferulic acid and incretins" will lead to research journal articles with more detail.

Recent articles about new dietary guidelines

Baking & Snack
NY Times

A whole wheat pasta odyssey

Pasta is perhaps the most popular form of grain food, apart from bread, enjoyed by children and adults alike. With very few exceptions, available pasta is imported from Italy and made with semolina, which is refined durum wheat flour.

Recently I had a request to make whole wheat pasta with a stone ground whole Khorasan wheat flour and gladly agreed to the experiment. Khorasan wheat is closely related to durum wheat and ideal for pasta. The idea of producing pasta from freshly ground whole grain flour was very appealing. Besides, one of my goals was to learn how to produce whole durum wheat pasta economically for school meals. Especially, I wanted to make short pasta that is made only by extrusion. I've made whole wheat pasta before, but it was by sheeting the dough and then cutting it into fettucine and similar long pasta. It soon appeared that the extrusion process would be much more efficient than sheeting and cutting, even for long pasta.

With the aid of a home pasta extruding machine (Philips) I made whole Khorasan wheat pasta for immediate use and dried it for the future, in a home food dehydrator. However, production was not immediately easy. Recipes were provided with the machine, but the proportion of water suggested to use with whole wheat flour (46%) was unworkable. The macaroni had closed ends, and the fettucine were too sticky to keep separated due to the dough being too wet. Lower hydration was evidently needed, but the machine mixer could not make a successful dough at the lower hydration with whole Khorasan flour.

The Philips pasta machine has the same classic design as perhaps all the commercial pasta extruding machines on the market; most are made in Italy. The Philips machine was thus a perfect tool for pilot scale research and development. The machine consists of an electric motorized mixing bowl beside an extruder, such that the dough mixing element is continuously attached to the extrusion screw. In the automatic setting, mixing of the dough is just 3 minutes before the motor stops and then starts the extrusion.

Extruding dies included with the home machine are food compatible POM plastic. These are relatively inexpensive compared with the bronze or brass dies normally in commercial machines. Shaping dies included were for macaroni, several types

of spaghetti, fettucine and more. A shell pasta die made with POM plastic, was purchased separately.

Macaroni extrudes as a long tube that must be cut every inch or so. Similarly, shells need to be cut from the curling strips that extrude. A cutting tool is provided, but the pasta extrudes quite fast and so demands quite an intensity of attention to make the requisite cuts frequently enough. Some advice from the manufacturer was needed before the pasta could be cut effectively with the tool. *The cutting tool is held parallel with and pressed against the die and is rapidly dragged from top to bottom of the die.* Cutting long spaghetti and fettucine is less frequent and therefore less demanding. Commercial machines generally have an automatic cutter installed.

The pasta extruding machine is very evidently designed for the mixing of refined semolina flour rather than whole durum wheat flour with water. Refined semolina flour consists of endosperm only and is practically homogeneous, with a relatively narrow range of particle size. Mixing semolina with water is a smooth single stage process, presumably easily achieved during the 3-minute machine mix time. Instead, whole Khorasan wheat flour contains bran, germ and endosperm each with its own range of particle size and water absorption speed and capacity. For making pasta, the whole wheat flour and water mix has the consistency of fine breadcrumbs. Continuous dough is formed only when the mixture is squeezed and pressed. In practice for extruded pasta, the whole Khorasan wheat flour needed to be hydrated just to 38% and for the finest spaghetti perhaps as low as 35% hydration. Instead of using the pasta machine mixer, I knew that a food processor could be used to mix whole wheat flour and small amounts of water homogeneously to a breadcrumb texture. *The whole grain flour is set in motion in the food processor and water is added slowly through the funnel. Just a few pulses are needed after that to produce the requisite fine breadcrumb texture.* Along the way I tried using a paddle in a planetary mixer, but it inevitably produced lumps that could not be broken up by the pasta machine mixer.

Once the barrier of making the whole wheat flour and water mix at very low hydration was overcome by using the food processor, the full range of pasta shapes could be achieved.

Considerable time elapses between mixing the flour and water, producing fresh pasta and drying it. There is enough time for the whole wheat pasta to start to ferment in a warm environment, given the rich concentration of nutrients in the bran and germ. Hence the idea came to include some sourdough starter with the whole grain flour and water, while still maintaining the requisite hydration. This means that the fermentation will be chosen to both acidify the dough and maintain good flavor in the finished pasta. However, if indeed the pasta is acidified it is no longer appropriate to extrude it through a commercial brass (copper and zinc alloy) or bronze (copper and tin alloy) die. There is a risk that the metals will leach into the pasta. Thus, for whole wheat pasta I recommend that

stainless steel dies should be chosen, despite the greater expense. However, on enquiry stainless steel dies are a rarity. Instead, there is now a possibility to obtain brass or bronze dies that have been surface treated with PVD, which hardens the surface and makes it resistant to corrosion by acids such as those in sourdough. I have more to learn about this.

Oh! And the clean-up is easy since the dough is not sticky. Residual dough can be completely pulled out of the machine before washing.

Cooking the pasta? Well, how about aiming to cook pasta in a minimum amount of water and using all the pasta water in a sauce. Commercial kitchen steaming methods are less wasteful of water and energy, than boiling pasta in a large volume of water. An alternative home method is to just cover the pasta with water in a deep pan with a lid and simmer for 15 minutes or so to desired texture. Having made the effort to make whole wheat pasta I did not want to discard all those valuable water-soluble nutrients!

Now I'm looking for a bench top commercial pasta machine with a cutter and sourdough compatible dies. To complete the set-up a commercial food processor and pasta drying system will be needed. My take is that extruded whole wheat pasta-making could be set up usefully in a bakery or food service kitchen, such as for school meals. Freshly made pasta can of course be cooked and served right away, so saving the need for drying and storing.

Having tasted pasta made this way with freshly stone milled Khorasan flour, with its creamy nutty flavor, light color and smooth texture I'm enthusiastically suggesting that bakeries and food service kitchens could make extruded whole wheat pasta the new go-to whole wheat product. The one proviso is finding machine with acidic food compatible extrusion dies. The search is ongoing!

Recipe: Whole durum wheat extruded pasta

Message from the author: ***Monica Spiller***

We now have TWO websites.

www.wholegrainconnection.org is still live, with all items available by searching on the site, but it cannot receive new material.

Our second site: **www.barmbaker.org** is where items published after December 2025 can be found. The plan is to gradually move relevant items from the old site to the new. The mission of the *Whole Grain Connection* remains as it has been since founding in 2000. Thank you for your interest.