

The

WHOLE GRAIN CONNECTION

Aiming to enhance the desirability and availability of 100% whole grain breads, and other 100% whole grain products, from organically and sustainably grown grains, and thereby connecting farmers and bakers

Newsletter Number 7
August 2004

Atkins and all that...

We have been living with the Atkins phenomenon long enough. Long enough to know that “lo-carb” is an expression that is best avoided as lacking in consistent meaning. Strange as it may seem, Atkins and his diet cult has helped the whole grain cause. It is hard to imagine, but true that Ornish and Atkins as well as Jane Brody of the New York Times, David Jenkins of Glycemic Index fame, and most academic nutritionists are actually in agreement that grains should be eaten in the whole grain form. They all agree that the endosperm center of the grain in the form of refined flour, is used by the body quite differently when it is eaten together with bran and germ i.e. as the whole grain. This is in sharp contrast to some of the processed foods labelled with the Atkins “A”. For example a packet of ingredients for making bread in a bread machine contained gluten flour as the main ingredient and cornstarch. These are highly refined ingredients, that certainly are devoid of germ and bran from either wheat or corn.

Why should we eat the bran and germ together with endosperm flour? Well the endosperm middle of the grain, is highly concentrated in starch and protein and the B-vitamins that are needed to utilize the starch, are distributed around the outside of the endosperm, in the aleurone layer, just under the bran. The plant needs these vitamins to make use of the starch and so do we. The germ where the sprout emerges, is also loaded with B-vitamins including folic

acid which is necessary for the production of healthy offspring, both young plants and babies. Wheat germ also contains oily lecithin, vitamin E, and related compounds that are powerful antioxidant preservers of oils and are needed for healthy cell membranes, in plants and in people.
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The bran seed coat* is quite thin and tender and is mostly cellulose, which can swell greatly when it moistened.

Cellulose is not attacked by our digestive enzymes, but serves as a valuable carrier of food all the way through our digestive system. In the colon it also serves as a carrier of beneficial lactic bacteria. Cellulose is known as dietary fiber because it is not attacked by the digestive enzymes. Some other layers just under the seed coat of grains, are built from so-called soluble dietary fiber compounds. These soluble fiber compounds are not attacked by digestive enzymes, but on arrival in the colon they are attacked by the lactic bacteria and they produce acids that can be absorbed and used as energy, and give us a healthy cholesterol profile as well. Soluble dietary fiber yields about half the calories of starch, sugar or protein, per unit weight. Another benefit from soluble dietary fiber in the colon, is that the colon is made healthily acidic and the chances of developing colon cancer are very much reduced by this acidity. The phytates and betaine present are mentioned elsewhere in this newsletter.

**Note: The bran seed coat from wheat is definitely edible. The husk which encloses the seed, and is shed as chaff is straw textured, and is not edible by people.*

Whole grains stop us from getting fat.

If whole grain flour is used then at least 10% of it is dietary fiber and will not be digested; it also dilutes the endosperm starch. Just a small part of this fiber will generate a few calories, maybe. Also by eating the B-vitamins together with the starch, we have a better chance that the starch is optimally used in the body. Quite recently, in the last decade, nutritionists have been paying attention to the polyphenolics associated with the bran. These are the compounds that give the bran its tan color and its tangy flavor. Polyphenolics used to be classified as tannins and were avoided if possible, because they prevented weight gain, when fed to

animals. How about that? Now they are recognized as incredible antioxidants, anticancer, and antidiabetic compounds, for people. We need these polyphenolics that are mostly in the bran, to moderate our weight.

What are carbohydrates?

If you answer starch, sugars, and dietary fiber you are right of course. But perhaps you've seen that the carbohydrates and calories on Nutrition Facts labels in the store, don't always add up! So what's missing in the carbohydrate story? To begin at the beginning, the sun is our energy source. This energy is miraculously trapped by plants when they make starch, sugar, cellulose and other structural polymers from carbon dioxide and water. All plants are rich in carbohydrates! Starch and sugars are examples of carbohydrates stored in plants, that we can digest almost completely, so gaining all the available calories. Less digestible are the structural and gummy parts of plants, and these therefore give us very few calories. Broadly speaking these very low calorie carbohydrates are all dietary fiber. In terms of energy supplied to us when we eat, starch and sugar are worth 4 Calories per gram, because they are practically completely absorbed after attack by the digestive enzymes; this is approximately the same energy value as protein. Fats have an energy value equivalent to 9 Calories per gram. For starch and sugar the energy value is calculated on the expectation that a little may reach the colon, undigested. But cellulose is not digested at all. A trace of the cellulose may be attacked by bacteria in the colon, but not enough to give us any significant amount of energy. By definition the carbohydrates that cannot be broken down by our normal digestive enzymes are called dietary fiber. Some of the more soluble dietary fiber yields us calories as a result of bacterial action in the colon. The energy value for soluble dietary fiber is 2 Calories per gram. The huge variety in dietary fiber in all plant foods: roots, stems, leaves, flowers and seeds, is very valuable to us as a source of nutrition for the

lactic bacteria in the colon. Plenty of dietary fiber in the colon, translates into improved immunity, and freedom from constipation immediately. A lifetime of eating enough of the right kind of dietary fiber gives protection from diverticular disease, colon cancer, cardiovascular disease, obesity and diabetes. A variety of dietary fiber is important for the necessary variety of healthy bacteria in the colon. Also we should never forget that we do not yet know the nature of all the compounds in plant foods. There are only a few compounds represented in the endosperm, many more are present in the germ and outer layers. Grain fiber, such as wheat bran and rye bran from the whole grains is a mix of insoluble fiber such as cellulose and soluble dietary fiber, and is unique in its ability to promote a healthy colon. "Eating lots of fruits and vegetables" is only part of the way to robust colon health. Whole grains are needed too. It is a tragedy to eat refined flours and sugars, because in so doing, the health of the colon is neglected. ❀

Editorial Meanderings

Obesity, Atkins and lo-carb

Obesity, Atkins and lo-carb have been at the top of the news during the last year, right there beside President Bush's Iraq war. Increased obesity has a cause rooted in the food that we choose to eat, and the food that we choose to overeat. Lack of activity plays a role, but poorly chosen food also decreases the sense of well-being that encourages physical activity. The needed statistics are provided in the August 2004 issue of National Geographic: Since 1970, per person average consumption of the basic nutrients, proteins, fats and carbohydrates, have all increased. The carbohydrates include refined sugar, grains which are mostly refined, fruits and vegetables which are mostly potatoes. But while the fats and proteins have dropped in proportion, the carbohydrates, including potatoes and especially refined grains have increased in proportion dramatically, since 1970. Atkin's diet had its day because this

happened, but the lo-carb bandwagon has already backfired. Lo-carb prepared grain foods are on the shelves, they are still refined but they often contain more calories than the regular version that they are intended to replace. Nobody can loose weight with such products. The most valuable way to eat grains is in the whole grain form, and not just because any single person simply said so. The literature is full of research results that confirm many times over, the advantages of eating whole grains in preference to refined grain products. Julie Miller-Jones, who is well known among cereal scientists, has written an informative review of recent research on whole grains and health, in *Cereal Foods World* (May/June 2004), that is worth finding through your library.

The focus of this edition of the *Whole Grain Connection* newsletter is on whole grain benefits, and is offered as an antidote to the lo-carb blitz. The industry producing refined grain products is colossal. What's to be done about supplying organic whole grain foods? The market is wide open for healthy whole grain products, that do not contain hydrogenated fats, refined sugars or any other additive that would spoil the benefits of the whole grains.

No GMO wheat

People have manipulated plants since agriculture began, but modern gene insertion is outside the play of nature, that can rectify mistakes, especially when it is for the production of a drug substance in a plant that we eat. Whatever the plant breeding method that is used, it is essential that we are still able to choose to stay with the old, while we dare with the new. Proprietary products such as genetically modified grains, that are not clearly labelled with their true content are a real danger to our ability to make such choices. Organic growers choose their seeds carefully and avoid those that have been genetically modified, by the insertion of genes from other species; they do not grow genetically modified plants, and they see no need to do so.

Our ability to choose the food that we eat is compromised too easily. Refined flour is from wheat and such huge amounts of it are produced that it appears that it must be the safe and good choice. In reality it is the rare organic whole grain products that serve us the best, and very few people can choose to eat them. For many people living away from major population centers, the choice to eat organic whole grains is just not there, except perhaps by mail order.

The easy choice to grow old fashioned wheat, that will grow tall enough to shade out weeds, without excessive irrigation, has been taken away from organic farmers. Widely available short varieties developed since the 1960s for greater yields, do not grow tall enough in drier years under organic conditions. And now the observation is made by commodity wheat traders, that wheat production is too high! This is because, if we indeed choose to eat whole grain wheat, 15 –25% more of the harvest will be eaten by people, and this means that much less will need to be grown. Choosing varieties that can be grown organically in a local microclimate, which have superior flavor and end product properties, rather than a particularly high yield, will assure farmers of a sale. This is a far more sustainable situation than always breeding and growing wheat for ever higher yield, regardless of the input or suitability of the variety for a locality, or end product. We do not need the intrusion of genetically engineered wheat, with whimsical properties, to jeopardize our commodity wheat supply. Jennifer Lapidus, who bakes whole grain breads in a wood fired oven, for sale at Farmers Markets, in North Carolina, has similar thinking about genetically modified organisms (GMOs). She wrote “A Greener Revolution: a baker’s perspective on genetically engineered wheat”. This article can be found on the web by searching Jennifer Lapidus on www.google.com . The web page for the publisher is www.newlifejournal.com, but the article was hard to find there when I looked. The web is the place to look for information and

support these days, and on the topic of GMOs two websites to visit are www.thecampaign.org and www.calgefrees.org

Status of the Whole Grain Connection

Since our last newsletter in October 2003, we have been recognized as a non-profit corporation by the IRS and by the state of California. As of December 2003, we have 501 (c) (3) status and we can now apply for grants to cover our research and educational activities, as well as accept donations, knowing that donors will not be taxed on those donations. ❁❁

The Whole Grain Loaf - a Basic Necessity

Perfection is an impossible achievement, but a fabulous goal. Where would we be if we did not pursue such illustrious illusion? Perhaps you did not realize this about bakers but they are constantly in pursuit of perfection in their artistry, and they call upon millers to join them in their quest. The miller is therefore the constant scapegoat for the perfectionist baker, and for centuries millers were hounded to produce perfectly white flour. Ancient style bolting or sieving the flour, was just not quite enough for exacting bakers, because inevitably there would be some fine particles of bran and germ that would pass through the bolting cloths and mix with the white endosperm flour. Then it seemed that a miracle happened in the 1880s, and perfection was achieved in the form of vast quantities of perfectly fleck free, white flour from dark red Prairie wheat, that produced the perfect bread texture. Roller milling had been invented and brought into use. From then onwards, the millers were so adulated that it seemed that they could never again err in their ways. Their followers prepared fleck free yeast without the acid producing lactic bacteria, and perfectly white crystalline sugar. The bakers rejoiced and the folly of thinking that indeed perfection had been achieved has continued now for more

than 120 years. Nobody alive now remembers bread as it was made before roller milling was introduced. Also, ever mindful that the rich could have everything good if they so chose, and that the rich ate white bread, white cake, white pastries and white pasta, the poor felt rich too because this amazing refined flour was so abundantly available for them as well.

But there were stirrings all around this perfect bakers realm, that had begun even before the 1880s. Constipation became a Victorian obsession, an operation for appendicitis became almost fashionable, and among the poor the diseases beri-beri and pellagra became endemic where they had been rare before. Sylvester Graham writing in 1837 even before roller milling, knew the connection and preached the eating of the whole grain of wheat in breads, along with his sermons. British Soldiers at the end of the 1800s also knew the connection when they were compelled to eat whole wheat bread after they were conscripted, and discovered with glee that they no longer had constipation to worry about. Roller milling so successfully produced refined flour that local stone mills were dismantled, and in an instant in history they were all gone and in their place arose colossal buildings filled with roller mills and separators. So large were these mills that only a few were needed. The new railroads could carry wheat to them and flour from them, so why should it matter that this became the only way that flour was made for the teeming masses? And bakers forgot how they ever baked bread with anything but roller milled white flour, purified yeast and white sugar.

The popular idea existed, and seems still to exist, that food was for filling the stomach, and once that was achieved there was nothing to worry about until the next meal when the stomach would simply be filled again. Even the vitamin deficiency diseases, beri-beri and pellagra, were originally thought to be infectious diseases, that could not

possibly be caused by defective food. Then came some thinking people who saw that some foods were especially nutritious, while others were highly deficient, and developed the new science of nutrition. The deficiency of nutrients in white flour was finally acknowledged by the US Government in the 1940s, when beri-beri and pellagra were raging in the South especially. The nutritionists could even isolate the vitamins that were present in the wheat germ and wheat bran that were routinely removed from wheat to make a white flour. But the stone mills had all been destroyed and the only way flour could be made for the teeming masses was by roller milling to refined white endosperm flour in the few colossal mills. (Continued below)

There was no suggestion that perhaps there were other nutrients left out with the bran and germ, and that whole wheat flour mills could be re-built at small cost, and locally, all over the country. Instead millers and bakers

were called upon to simply add the missing vitamins to their flour and this was done. The masses felt safe again by eating the new enriched or fortified white flour, that now had added vitamins.

This perspective of history continues with the desire for white flour still engraved in the mind of bakers. But perfection is only an illusion and the bakers wanted fluffier bread now that it was white. And the millers resorted to bleach to make the bread fluffier and to make the flour even whiter. But the bleach was drastic stuff that was definitely not meant for the stomach or any other part of our body and there arose a band of anti-additive activists. These people banded together with the organic people and said we do not want any additives in our bread, we want pure white organic flour. So the bakers agreed and now it is possible to buy pure white organic flour without any additives, neither in the form of bleach, or in the form of added vitamins. Many are the white organic breads that contain no compensating vitamins.

Millers are indeed the bakers' scapegoat but there were and are other suppliers for the baker. There are those who promised cheap fat and cheap sugar. Cheap fat could be made by hydrogenating oils from corn, cotton and soy and a cheap replacement for refined cane sugar can be made from corn starch. The hydrogenating process to make fats was invented in 1902. The incredibly cheap high fructose corn syrup, is even more modern having been introduced only in the 1970s. And the bakers for the masses added these to their white breads, white cakes, white pastries and white cookies. And the teeming masses find that they can fill their stomachs very well with these foods.

It is time to regain our instincts and common sense and to see that the whole grain foods that keep us well, are the foods to choose, and that the bakers desire for perfection is to be found in whole grain products. Bakers need to provide us with

whole grain breads, leavened with a mix of compatible yeasts and lactic bacteria, and without any refined grain products, synthetic fats, or refined sugars. For this the millers need to provide truly whole grain flour containing all of the original parts of the grain. To be able to eat wholegrain breads is a basic necessity! That basic necessity was taken away from the teeming masses, when all the major mills became roller mills for the production of white flour.

Whole grain flours should be provided for all. Then, and only then, can individuals decide whether they want to sift away the beneficial bran and germ.

*Note:

Our bodies were not designed to eat refined grains, refined sugar, hydrogenated fats (the catalytic hydrogenating system produces by-products with unknown effects on health), refined corn syrup, or refined high fructose corn syrup. Yet these are staples for the many who eat commercially prepared foods, and beverages. ❀

Out of the Fog of Flour

The following is intended for artisan bakers of white breads.

White flour is the endosperm of the wheat grain, so what could possibly be bad about that? Wheat flour has been sifted for as long as people have been eating wheat, and we are still populating the Earth. White flour has starch and protein; starch for energy and protein to build muscle. What's wrong with that? Bread is an ancient food so how can it suddenly be unacceptable? Modern Artisan bakers shun bread adulterants, especially bleaching agents such as potassium bromate, hydrogenated fats, and a host of un-natural enzymes and softening agents, and they use organic white flour. Many artisan bakers use an old fashioned natural sourdough, instead of modern purified yeast. Isn't that really good?

As a white flour miller, or a white bread baker, or in any of the associated jobs of making and selling white bread ingredients, these are indeed the catch phrases that make

it possible to still be practicing the crafts of milling and baking white bread with pride intact, amid the rising cacophony. But there really is more to wheat than endosperm and there is more to consider about bread than white flour, purified yeast, white sugar, and water. There is also more to consider even than looks, taste, aroma and freshness in a bread. Bread is above all, food. There is therefore a moral obligation to pay attention to the food value of the bread that is made. And here are the difficulties. Having invested all their energy in the art of making white flour or white bread to sell, many bakers have little energy left for the study of the science of nutrition, which by it's nature is an ever changing story. So what is to be done? Well I would like to suggest that new questions should be asked by millers and bakers, such as: Is it true that white flour from roller mills is more highly refined, than white flour from old fashioned stone mills and sifters? What is the food value of the whole wheat kernel versus just the endosperm? What is the food value of unrefined sugar versus white sugar? How is the food value of whole wheat bread affected when the leavening is a natural sourdough rather than purified yeast? Is it true that white bread is constipating? Is it true that whole grain breads can protect against heart disease, cancer, diabetes, obesity and Alzheimer's disease?

The Web is an incredible new tool. Try www.pubmed.org and insert search words to match these questions and see for yourself the work that real people have already done to try to answer these questions. Clicking on the abstract logo will usually give you the basic research story, without the need to delve into the article details. 🐞

Fear of Phytates — is it justified?

Phytic acid and its salts known as phytates are the most frequently mentioned, as an undesirable part of whole grains. The

reasoning is usually that phytate binds valuable trace minerals such as zinc, and prevents absorption. The following is my understanding of phytic acid and why I think it is actually a good nutrient!

Phytic acid, more usually mentioned as phytate or inositol hexaphosphate, is the phosphate storage compound in all seeds. Inositol is a sugar and is considered to be a necessary part of the B-complex of vitamins; inositol also has the reputation for preventing fatty deposits in the liver when eaten by people. All whole seeds that we use as food, contain phytate: legumes, grains, nuts, flax, sesame, poppy, etc.

The natural breakdown of phytate is by the corresponding enzyme phytase, which sequentially removes the phosphate units from the inositol. Seeds possess this enzyme so that they can release the needed phosphate when they sprout. When whole seeds are moistened they begin the activity of sprouting, and this includes the activation of phytase. The phytate in seeds and whole seed flours, begins to break down as soon as moisture is present.

In whole wheat bread and bread containing other whole seeds, the phytase is activated as soon as breadmaking is begun, with the addition of water. Then, especially in the case of barm breads, enzyme active malt (sprouted wheat) is present and this provides an increased quantity of phytase because it has been sprouted for several days. Also the yeast and the lactic bacteria have their own phytase and even more breakdown occurs. Use of a sourdough or barm means that at least a portion of the whole wheat flour has been fermented for a much longer time than the main dough, so allowing time for even greater breakdown of phytate.

Another very important observation about phytates is that they have been shown to protect against colon cancer. Part of this is probably due to the lactic bacteria in the colon that there produce inositol and

phosphate from the phytate; inositol is likely absorbed and the phosphate is helpful to the bacteria, and favorably acidifies the colon, before being absorbed.

Phytates are indeed capable of binding minerals such as zinc, iron and calcium, if there is no natural phytase to moderate the effect. In the case of wheat the phytase is concentrated in the bran, and if bran is served by itself, it may have been heat treated so that the enzyme phytase is inactivated. Another way in which the phytase can be inactivated is by baking soda, which is alkaline. The study that has caused most of the fear of phytates, involved Iranian men who ate whole wheat bread leavened with baking soda, as a very high percentage of their diet. They were found to be very deficient in zinc and this reduced their fertility. It should be noted that their source of zinc was almost entirely the bread itself, and their diet was also generally lacking in necessary variety.

Phytate is an example of a natural substance often studied outside the context of the whole plant food, and then being found to be detrimental. But in the whole naturally prepared food, phytate is a source of inositol and phosphate, and is protective against cancer of the colon, it is antioxidant and lowers cholesterol favorably.

Notes:

A useful way to find out the current research on nutritional topics is to use the web:

www.pubmed.org

A reference that contains a list of phytate content in foods as well as research reviews on phytate, is: CRC Handbook of Dietary Fiber in Human Nutrition, Third Edition, edited by Gene A. Spiller, CRC Press, Boca Raton, 2001. It should be available at UC Berkeley and UC Davis. ✨

Betaine in wheat germ & bran

Betaine is in beets isn't it? Yes, but it is also hugely present in wheat germ and wheat

bran, and may be at least part of the explanation for the special ability of whole wheat to ward off heart attacks. Apparently, folic acid is not the only substance that can lower homocysteine in the blood. Betaine and choline can bring homocysteine down too. Low homocysteine is just as desirable as a good low cholesterol profile, and the two are probably linked in predicting a low risk for heart and artery disease. Low homocysteine is also associated with a low incidence of Alzheimer's disease. So here we have yet another reason to eat whole wheat in preference to just the middle of the endosperm. ✨

How hot is hot for whole wheat flour?

Electrically driven stone mills and micronizing mills for whole wheat flour production on a small scale, can produce hot flour. In the case of stone mills it is usually possible to adjust the distance between the stones by a tiny amount, and to send the grain through the mill at a reduced rate, as means of producing cooler flour.

Micronizing mills do not appear to be adjustable, except that the coarsest flour setting may result in slightly cooler flour. So the question arises often: *How hot can the flour come off the mill without ruining the quality of the flour?*

First here are some temperatures, in degrees Fahrenheit, when things happen in the flour. The starch starts to swell at about 104. Fats are rapidly oxidized beginning at 104, and the oxidized fats can give the flour a rancid taste, and spoil the long term storage ability. Important enzymes, vitamins and proteins are damaged or destroyed beginning at about 130, although some enzymes (e.g. alpha-amylase) remain active up to 150. Wheat starch gelatinizes at about 140. All of these temperatures are below the boiling point of water at 212, which is the maximum temperature encountered in the middle of a loaf during baking, for comparison.

Other observations comes to mind: There is a company that sells proprietary “heat treated flour”, and wheat germ and oat flakes are heat treated to stabilize them. Such heat treatments can produce requisite amounts of damaged or swollen starch with useful properties, such as easier attack by the amylase enzymes. Leavening yeasts and lactic bacteria benefit from the products of enzyme attack on the damaged starch. In the case of stabilizing wheat germ and oat flakes, rapid deactivation by heat of the fat oxidizing enzymes reduces and prevents rancid fat flavors.

When millstones are touching or friction is very high between the stones then the temperature of the flour on the stones is enough to burn the fats, scorch the starch, and cook the proteins, and the result is flour that has a tainted flavor. Such drastic heating of flour can be smelled during a stone grind, and should of course be remedied, by setting the stones further apart.

My preference for the best tasting and most stable whole grain flour, is to use grains with very low in moisture, 9% if possible. To preserve the enzyme activity and the vitamins, the flour should be no hotter than 104 degrees F, when it first comes off the mill. ❀

Antioxidants in plant foods - a comparison

The antioxidant power of whole grain breads is greater than for the average of fruits or vegetables. Relatively, their antioxidant powers are: common vegetables 400, common fruits 1200, whole wheat bread 2000, and whole grain breakfast cereals 2800, per 100 grams of the food.

(Reference: *CRC Handbook of Dietary Fiber, 3rd Edition, p. 455*) ❀

Calories from whole wheat flour vs refined flour

Whole wheat flour supplies 310 Calories per 100 gram, compared with refined flour which gives 341 Calories per 100 gram. We eat 10% more calories than we need, with every refined grain food. This can be enough extra calories every day to explain an increase in weight over the years, to produce middle age spread.

(Reference: *The Composition of Foods, 4th Edition, Royal Society of Chemistry*) ❀

The Whole Grain Connection, Newsletter

Written contributions from members, are encouraged, in the form of original short articles (under 1000 words), and letters to the editor (under 300 words).

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Writer/ Editor: Monica Spiller

P O Box 696, Los Altos CA 94023-0696

Telephone: 650 - 941 - 8288

FAX: 650 - 948 - 8540

e-mail: barmbaker@aol.com

Advertisements

We would like to run advertisements from makers and suppliers of small scale farm, milling and baking equipment, from farmers who are growing and selling organic wheat, and from 100% whole organic wheat millers and bakers who would like to buy organic wheat.

Photo ready copy can be submitted, or we can design a simple ad. for you from your information. Prices will be \$20.00 for a quarter page, \$10.00 for an eighth page, and \$5.00 for a sixteenth page-size advertisement.

The Whole Grain Connection is a California non-profit corporation, registered with the IRS with 501 (c) 3 status, aiming to enhance by education and research, the desirability and availability of 100% whole grain breads, and other 100% whole grain products, from organically and sustainably grown grains, and thereby connecting farmers and bakers.

Your support with an annual contribution of \$25 or more, will help to further the goals of the *Whole Grain Connection* and offset the costs of producing and mailing this newsletter.

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Monica Spiller, Treasurer
Whole Grain Connection
P O Box 696
Los Altos
CA 94023-0696

