

Community Grains

26 April 2011 Meeting, 6:30 pm Oliveto Restaurant

Recorded by Alexis Leigh Krup, alexisleighkrup@gmail.com

In attendance:

Professor Bruce Ames, Senior Scientist at CHORI, Professor of Biochemistry and Molecular Biology at UC Berkeley

Professor Russell Jones, Professor of Plant and Microbial Biology at UC Berkeley

Dr. David Killilea, Director, CHORI Elemental Analysis Facility, Associate Staff Scientist, Nutrition and Metabolism Center at CHORI

Mr. Bob Klein, Co-owner/managing partner of Oliveto Café and Restaurant and Community Grains

Ms. Maggie Klein, Co-owner/managing partner of Oliveto Café and Restaurant

Ms. Alexis Leigh Krup, Undergraduate in Integrative Biology at UC Berkeley

Ms. Catherine Meng, Oliveto Community Journal

Professor Michael Pollan, Journalist, Knight Professor of Journalism at UC Berkeley's Graduate School of Journalism

Mr. Craig Ponsford, founder of Artisan Bakeries and Chairman of Bread Bakers Guild of America

Mr. Joseph Vanderliet, President of Certified Foods

Purpose: How to differentiate between "whole grain" and "whole wheat"?

- Interest for economic, political, nutritional, health, and social reasons
- Interest in defining authenticity, regulations, control of additives (molasses etc...)
- FDA guidelines in draft from 2006, not adopted yet
 - Defining whole grain, but not related to whole wheat
- Influence or redefine current definition of what is sold as whole grain
 - Current definition = 51%

Epidemiology:

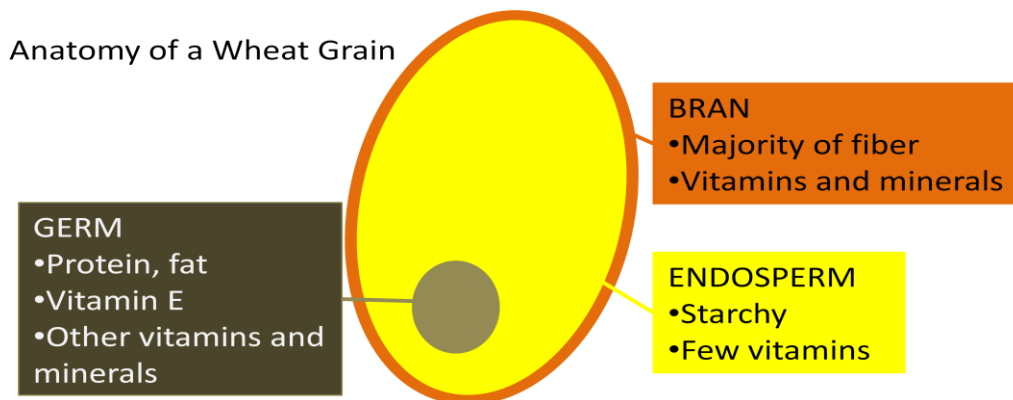
- whole grains are beneficial to reduce risk of cardiovascular disease, overall 'heart health' (Ames)
- literature supports use of whole grains in diet to promote better health
- Colon Health:
 - Gut barrier requires correct function of tight junctions between cells
 - Layer of cells to keep bacteria necessary in gut out of rest of body
 - Fructose in foods can eat through the gut lining → bacteria escapes → sick
 - Eating a peach gives body the same sugars but within natural coexisting environment and associated factors → not harmful
 - Compromise to gut barrier associated with obesity and type 2 diabetes
 - Diagnosed by measuring levels of plasma and gut bacteria
- A more nutrient-dense food → eat less
 - Increased nutrient density correlates with increased satiety
 - Connection between absorbing key nutrients and hormone signaling for fullness
 - Feel full after eating without the lethargic malaise from high glycemic foods

- Risk assessment in regards to phytochemicals:
 - Plants do not have an immune system, so use chemicals for protection
 - The phytochemicals used as industrial pesticides have the same carcinogenic potential as manufactured chemical pesticides (Jones)
- Risk assessment in regards to bran:
 - Bacteria present on outside of grain (on bran)
 - If bran is gone → bacteria are gone
 - Goes back to idea of 'white is clean'
- For interest of Community Grains should not become overly focused on 'risk assessment' argument because the benefits of a balanced diet will have higher value in public
- Wheat-free, gluten-intolerant, gluten-free, IBD/Crohn's, Celiac
 - Is gluten sensitivity a response to an incomplete grain being presented to the body?
 - If the body is presented with a complete whole grain with all nutrients intact → no reactive response → no immune/autoimmune/inflammatory response → better health
 - Gluten sensitivity as an insulin response?
 - Feel lethargic and ill because of sugar spike body not equipped to handle

Nutritional Value

- 40-50 micronutrients necessary for a balanced diet
- Shortage of any of these leads to faster aging because body systems don't function properly
- Lower-income populations are eating sugary, empty calories
- Obese people are fat but starving for micronutrients
- Individuals are hungry all the time because lacking micronutrient and body wants to eat in hopes of obtaining
- Pregnant women who have cravings and eat strange things
- Salt licks for animals because animals not getting enough sodium in grass
 - Elephants going into the backs of caves for sodium
- Humans can ingest a lot of vitamins and not be hurt
- Humans have a limit to how many minerals can be ingested before important enzymes are disabled from over-abundance
 - Minerals are balanced within the body in ratio with one another
 - Healthy mineral levels are contingent on ratios present rather than amounts present
- Nutrient dense foods are naturally providing key minerals in the correct ratios
 - Ca vs. Mg deficiencies in children
 - Calcium pills are violating the functional ratios of magnesium in the body → women's health may come to regret the calcium + vitamin D push

What constitutes a whole grain?



- Milled together in stone mill vs. reconstituted after passing through a roller mill?
- all purpose (white flour) only contains endosperm
- Current Industrial Process, “Reconstituted” whole grain:
 - Only contains bran and endosperm
 - Grains passed through roller mills
 - Germ, bran and endosperm are separated initially
 - Loss of micronutrients (vitamins and minerals)
 - Only bran added back into endosperm, not germ
 - Miller can add back only 10% whole grain and have a product be recognized as a whole grain
 - Can micronutrients be separated and put back together?
 - No germ in a reconstituted product (Vanderliet)
 - Germ cannot be added back in once separated because grain will go rancid in about <7 days after being taken off mill
 - Isolated germ will go rancid in about 72 hours
 - Could antioxidants be added into separated grain before being put back together in order to maintain the germ?
- Certified Foods “Stone-mill” process:
 - 100% of germ, bran and endosperm included in finished product
 - Process cannot be done in big industrialized mills
 - Milling germ, bran and endosperm together keeps the grain from spoiling as a result of the germ going rancid
- ConAgra created Ultragrain Flour = magic flour
 - Grain is separated during milling → endosperm is primary constituent added back in
 - Is there a heat process performed on bran before adding back into product to make the bran really fine

- Ultragrain doesn't feel or function like a stone-milled flour in bakery environment, although ConAgra markets the product that way (Ponsford)

Nutritional Markers?

- The Phytate Issue:
 - Phytate (phytic acid) is an antinutrient found in many plant tissues, and especially in bran
 - Not digestible by humans in a physiologically bad way (not necessarily a good roughage)
 - Strong metal keloid (spelling?) presents serious health problems
 - Chelates → makes minerals such as zinc, iron, calcium, and magnesium unabsorbable for humans
 - Is it dangerous for pregnant women to eat whole grains because of phytate?
 - Individuals in S. America with bowed legs b/c phytate has bonded to ingested calcium and iron → body hasn't absorbed for proper bone development
 - Long fermentation would worsen effects
 - Can easily measure by chelating iron with a standard assay
 - Making a mineral argument about whole grains will inspire this argument from opposing parties
- Ferritin = 1000-1500 iron inside package covered by protein
 - Protected because free iron is dangerous to body
 - Animals can take up ferritin package
 - Body possesses a tightly regulated system that cuts off ferritin absorption once threshold reached
 - Heme-iron (from animal products) can be taken up in excess → negative effects due to accumulation of unnecessary iron
- Possibility of doing a vitamin and mineral analysis of reconstituted vs. stone milled grains
- Vitamin E:
 - Ancient Chinese ate white rice (starchy, sugar) instead of brown rice (nutrient dense)
 - Brown rice would go rancid in a couple of weeks
 - White rice would keep for a long time
 - Vitamin E is fat-soluble antioxidant that keeps grains from going rancid when fat undergoes oxidation
 - Removing vitamin E → rancid
- Can we test the protein panel or test the fat content of whole grain flour (for authenticity)?
 - Can run on a 2D gel (electrophoresis) to see spread of specific proteins
 - Can do PCR (polymerase chain reaction) analysis
 - Look for genome specific proteins
 - ID a protein enriched in specific layer of grain → would need knowledge of ratios to understand
 - Look for absence of a specific gene

The Reductionist Approach

- What goes missing when reconstituted grain is put back together without the germ?
- A 'broken' vitamin profile cannot be put back together because vitamins are subject to oxidation → renders a reconstituted vitamin non-functional
- Minerals are resilient and can be put back together in reconstituted milling process
- Mineral analysis of white store bought bread vs. an organic whole grain bread highlights big differences in mineral content → inspires many questions
 - Authenticity of vitamins/minerals in "whole grain" breads can be questioned
- Analyzed "King Arthur" flour compared to Certified Foods whole wheat flour
 - Certified Foods' contained double magnesium content, double calcium content, double amounts of 3-4 different minerals, four times the amount of zinc, 8 times the amount of manganese
 - Overall showed a similar minerals density because majority of minerals in bran (which is added back in during a reconstituted milling process)
 - King Arthur might be stone-milled, but we don't know because that information is not provided to the consumer
- Could an experiment be devised where the ultimate negative control is Wonderbread and the ultimate experimental group is Certified Foods whole grain (with spectrum of different whole grain products in-between)?

The relationship of milling to grain physiology and biochemistry

- What is the quality and type of grain being reconstituted during current industrial milling process?
 - The miller decides what is going into the mill and what is coming out (Vanderliet)
- All grain's fat is in germ and bran
 - Lipid oxidation causes fats to go rancid
 - The milling process decides how quickly the grain goes rancid or not, and what storage life is
 - Natural dispersion of fat and distribution of antioxidants dictates how well the germ will keep
 - Correct ratios of micronutrients/vitamins/minerals (specifically Vitamin E) relates to longevity of germ
 - Do NOT want to mill germ and bran away → end result is NOT whole grain
- How does one minimize fat oxidation in flour?
 - All grain constituents must be together throughout entire milling process
 - Endosperm is a food resource for the germ to grow (if were to develop into a plant)
 - Keeping the grain whole maintains the integrity of the fat
 - Although the grain is being broken in milling, the stone milling technique keeps the germ, bran and endosperm together
- In a reconstitution milling process:

- Good grain is going in → ground very finely → well milled flour product
- What happens to the germ and bran? → Germ is commonly left out but have other millers found a way to leave it in?
- 90% of flour available to bakers is reconstituted (Ponsford)
- Stone Mill – details Vanderliet is willing to discuss at this time
 - Temperature control aspect to maintain integrity of germ
 - Have to have something (high antioxidant content) to prevent oxidation of fat (vitamin E?)
 - Is there an added reductant to interfere with lipid oxidation?
 - Oxidation occurs at different temperatures
 - Mill is kept at 90°-130°
 - Milling and putting grain in a refrigerated area is an incomplete milling process
- Combating oxidation in milling
 - Decrease oxygen?
 - Increase antioxidant?
 - Control temperature?
 - Enzymes are deactivated at specific temperatures
 - Enzymes deactivated → stabilizes germ so can be put back in/remains in the grain
 - Heat indiscriminately destroys proteins
 - Increase Vitamin E?
- “Six-break Mill”
 - All the germ is removed
 - All the bran is removed
 - Basically end product is just endosperm
 - Nutritional loss
 - Looking at why we have white rice (again)
 - Brown rice would get damaged during milling and go rancid
 - Is it possible to mill without damaging?

Baking with whole grains

- Bakers are concerned with 1) flavor 2) functionality 3) knowledge for consumer’s health
 - Noticeable difference in eating, touching and baking stone-milled grains (Ponsford)
- widely available whole wheat: bitter
- whole milled (stone-milled) Certified Foods grains: sweet, interesting flavor
- a “whole grain Wonderbread” does exist:
 - whole grain is listed very far down on the ingredients list, after white flour and after yeast (Pollan) → low status on ingredients list signifies a very small amount of whole grain is included in the bread and the product can still be marketed as whole grain under current FDA requirements
 - probably baked with Ultragrain flour (Ponsford)

- La Brea bread or Artisan bread at Costco
 - Sold as whole grain, but where is the flour farmed and milled?
 - How much of flour present is actually 'whole wheat'?
 - 72% white flour in a whole wheat bread (Ponsford)
 - Less bran in the flour → more volume in the dough and finished bread
 - Creating a full volume bread with a lot of bran in the flour is challenging
- Baker's Math based on flour weight in bread:
 - Flour weight = 100% → 3 types of flour in a bread = 300%
 - Oliveto pizza dough is 100 water + 100 flour (Ponsford)

State of the industry and necessary improvements

- grower → miller → baker → consumer
- in current industry we do not always know who the grower is
- currently an outside grower is needed for community grains because there isn't yet a way to clean and store the wheat economically
- Bread Bakers Guild and Harvard School of Public Health → is the whole grain movement honest for all parties involved?
- Truth: the current whole wheat isn't actually 100% whole wheat
 - The key is keeping the germ in and that is not being done
- Enriching flour?
 - Only adding back in a few things that industry requires (because we know about them)
 - E.g.) people learned about folic acid → put it in as many things possible
 - Wonderbread adds in fiber (from chicory, soy etc...)
 - Important differences between long chain and short chain fibers are not respected when artificially added in
- Wheat is a 'complete food' but lacking a few amino acids
 - Idea of complete wheat grain containing everything a plant needs to grown from a germ into a whole plant
 - Humans need the same nutrients to be healthy
 - But we can't just eat whole grain cereals because still lacking dietary necessities

Breaking with tradition

- How does an Italian restaurant go about offering whole grain pastas?
- New opportunities for taste: whole grain durum wheat penne with white truffle
- Traditionally Italian peasant populations would have had courser grains because they didn't have very advanced and mechanized mills to get the fine pastas commonly sold today
- Hypothesis that didn't get the white pastas until the introduction of roller mills in the 1860s
- The public sees white as "pure"
 - White is "clean"
 - At turn of century a lot of disease was associated with farming and agriculture

- People were advised to clean their food → white often means clean

Economic and Social Barriers

- Cost disparity: better food costs more
- Government policies currently subsidize the 'junk food'
- Research subsidizes super grains
- Produce not provided regularly in food banks
 - When it is, people don't know how to cook it
- Cooking could equalize the field → should a modern day version of "home economics" be introduced back into schools?
 - Schools already cutting funding for arts, are officials really going to start funding something with a future health benefit?
 - Need to introduce "ethnic cooking classes" (Pollan)

How can the public be better informed?

- Widespread public misconceptions about difference between a regular "whole wheat" bread and a "whole milled" bread
- The movement to switch from reconstituted grain to whole milled grain must be a local, grassroots effort (Vanderliet)
 - Can highlight nutritional importance
- Nutritional difference between reconstituted whole grain milled under current industry standards and the stone milling technique that all of grain together?
- Community Grains should take a position in definition of whole grain (Pollan)
 - E.g.) nothing less than 100% = whole grain
 - Create higher standards that redefine industry
 - Support claim with health studies
 - Create an image of Community Grains for the consumer
- Policy should require transparency on milling and manufacturing process
 - Could knowledge of missing nutritional content spark public demand for more accountability?
- Educational effort to show what current "state of the industry/art" is
 - Not all wheat berry being included in "whole grain"
 - Public will understand they are being cheated when realizing bread they eat is not in fact 100% whole wheat
- Educational effort gets complicated when trying to use science to show the distinction

Going Forth:

- Step 1: expose current state of the industry
- Step 2: offer scientific proof of what a whole grain really is