Exploring The Case Against GE Foods

Lori B. Taylor, MA, MS, RD, CD, CNSC

In 2000, I authored a Counterpoint against genetically engineered (GE) foods for the Nutrition in Complementary Care Dietetic Practice Group (now Dietitians in Integrative and Functional Medicine).¹ GE foods had been in use for a little over five years, and research was preliminary but worrisome. In the 14 years since, a greater body of evidence has emerged, and the results are still concerning.

Reviewing the literature, it is clear that there is a growing body of research to support the idea that continued use of GE foods has the potential to cause serious risks to human and environmental health, with minimal, if any benefit. I believe these risks are serious enough that dietetic professionals should strongly consider advising their clients to avoid GE foods as much as possible. This is a bold statement; however, compared to other types of food we recommend our patients avoid (trans-fats, highly processed foods, high fructose corn syrup), GE foods have the potential to cause systemic damage to both people and planet, and their continued use could endanger the biodiversity of whole, natural foods that are the basis of any healthy diet. This exploration describes potential risks of GE foods with the focus primarily on the use of GE plant foods in the United States. Dietetic professionals are encouraged to go beyond this article, as issues related to GE foods are global and complex—comprehensive coverage is not possible in the context of the present article. It is also vital that dietetic professionals become aware of the implications of corporate consolidation of our food supply,² as well as the influence of industry inside our own association, so that we may objectively assess the information routinely presented to us.³⁴

Evidence-based reasons to consider avoiding genetically engineered (GE) foods.

GE foods are assumed, not proven, to be safe and require no pre-market testing

GE foods were approved by the Food and Drug Administration (FDA) in 1992 on the basis of GE industry filings and a concept called “substantial equivalence” (SE).⁶ This term was formally defined in 1993 by a trade group, the Organization for Economic Cooperation and Development (OECD), as a concept “…which stresses the need to establish a conceptual framework that novel foods should be compared to non-GE varieties for toxicants, allergens, bioavailability of food proteins, distribution of macronutrients and safety of novel proteins.”⁷

Objectives

After reading this CPE article, the nutrition professional will be able to:

1. Define Substantial Equivalence and discuss why it is a problematic concept.
2. Discuss the factors limiting independent research on GE foods.
3. Identify at least four potential health risks associated with GE crops.
4. Explain how consumers can avoid GE foods.

In This Issue

CPE Article
Exploring The Case Against GE Foods........................................66
CPE Article
Genetically Modified/Genetically Engineered Foods..................................76
Cranberries and their Bioactive Compounds in Human Health...........81
News You Can Use.................................................................84
Chair’s Corner.................................................................90
Editor’s Corner.................................................................91
Executive Committee Members.................................93
While this sounds like a reasonable approach, SE is problematic. It is an economic concept, an assumption, with no scientific basis and no clear definition. There are no specifications for tests to establish SE, no generally accepted reference foods, nor is there a quantifiable definition of “substantial.”⁹,¹⁰ Comparative analyses of GE foods routinely performed are compositional in nature and do not include toxicological, immunological or biological testing. Predicting biological effects from chemical makeup alone is difficult, if not impossible.¹¹ Consider, for example, that prions and proteins differ little chemically, but that an organism with prions would be toxic to consume.¹² SE as practiced is not an effective tool for identifying unintended effects.⁹ Developers of GE foods can compare them to known allergens but have no way of predicting if new proteins will be allergenic.¹² Even current allergenic tests only look at the bacterially-produced transgenic proteins, not those produced in the target plant, ignoring species-specific gene expression and glycosylation, which alter the behavior of proteins.¹³ More accurate assessments of SE may come from genetic profiling of plant genomes, gene expression, protein translation and metabolic effects.⁹ This type of testing is still in the development stages.¹⁴

Consider also that SE is an oxymoron: it allows a GE food to be treated in the same regulatory manner as a conventional food, while allowing a patent to be granted for what is different about the food. SE status provides a tremendous financial benefit to the GE developer while transferring all the potential health risk to the consumer. Criticisms of SE have not been solely external to the FDA. Through court action (Alliance for Bio-Integrity vs. Shalala), it was revealed that FDA’s own scientists had significant safety concerns about SE, the lack of scientific information in the GE industry’s filings, and its dismissal of unintended effects.¹⁵ Given the number of internal concerns at the agency, it is unclear why FDA approved the policy, though it was likely due to anti-regulatory politics in 1992.¹⁶,¹⁷ Despite court action and concerns about the process since then, SE still stands as FDA regulation.¹⁸

Given that GE foods are deemed by the FDA to be SE, they are designated “Generally Recognized as Safe” (GRAS), requiring no pre-market testing or labeling.¹⁹ FDA’s consultation on GE foods is totally voluntary and based entirely on data submitted by the agro-chemical producers of the GE seed. In addition, many of the studies submitted by industry are considered “grey literature” not published in peer-reviewed journals.¹⁹ Studies that are published in the literature, but funded by industry, have been found to be strongly associated with favorable results.²⁰ No independent testing is required or performed.²¹ Negative results found by industry have been shielded from public view and dismissed or omitted from regulatory submissions. Full data for GE corn rat feeding trials in Europe (where pre-market testing is required) were only revealed through lawsuits.²² Independent analysis of released data found significant hepatorenal toxicity, bringing safety concerns into public view.²³,²⁴

Recently, the American Medical Association changed its stance on GE foods and now recommends pre-market testing to ensure the public’s safety.²⁵ Researchers conducting pre-market safety trials in Europe assert that even their 90-day trials are too short to assess chronic effects.²⁶

Years after GE food approval, independent post-market research is showing that approved GE corn and soy varieties are substantially non-equivalent to their conventional counterparts. Seeds of a GE corn variety altered to produce Bacillus thuringiensis (Bt) toxin were found to have significant differences from the conventional variety in nearly all nutrients, with lower levels of magnesium and significantly higher levels of phosphate and oleic acid that were outside the published nutrient ranges for corn. Of greater concern is the significant difference in amino acid content and distribution found in the Bt corn, which implies a profoundly different pattern of protein production.²⁷

Just-published research comparing conventional and organic soy to GE varieties altered to be resistant to the herbicide glyphosate (trade name RoundUp®) reported that “using 35 different nutritional and elemental variables to characterise each soy sample, we were able to discriminate GM, conventional and organic soybeans without exception, demonstrating ‘substantial non-equivalence’ in compositional characteristics for ‘ready-to-market’ soybeans.” This research also demonstrated high residues of glyphosate and its breakdown products in GE soy, further making the point for substantial non-equivalence of GE soy in its grown and herbicide-treated state.²⁸

Independent research on GE foods is limited by GE patent holders, some of whom have suppressed data

Each patent holder controls who can receive GE seed for study and so can effectively limit research.²⁹,³⁰ The industry has also required pre-publication approval of research studies, has suppressed publication of unfavorable study results and threatened legal action to those citing critical data obtained by Freedom of Information Act requests.²⁹ Some who have published unfavorable results have been denied use of further seed for study and have also been subject to harassment, as well as loss of data files, research funding and academic positions.³¹

Recently, a study showed tumor development in rats given GE feed.³² After much industry criticism, its publication was retracted, the journal’s publisher stating its results inconclusive due to small sample size.³³
The novel proteins and herbicide residues from GE foods may be detrimental to animal and human health

GE corn and soy are prevalent in the US food supply, representing 93% of soy crops and 90% of corn. The predominance of GE foods are made to be herbicide tolerant (HT), to produce biological insecticides, or both (known as “stacked traits”). Most HT plants (typically soy) are designed to be resistant to the herbicide glyphosate and are grown with frequent exposure to this chemical. Glyphosate and its breakdown products persist in food and are ingested. As glyphosate is sprayed on the outside of plants, it also contaminates soil, water, rain and air.

GE foods producing pesticides (typically corn) make a bacterial toxin from Bacillus thuringiensis (Bt). As a conventional insecticide, Bt is sprayed on the outside of plants and degrades with exposure to UV light and soil organisms. In GE foods however, Bt is produced throughout the plant and does not degrade in the field. Exposure comes from consumption of the GE food. Bt is known to be resistant to digestion and immunogenic at pH 2 or above, well within the normal range of human gastric pH.

Glyphosate exposure has been linked to the following:
- Endocrine disruption in human cells at levels 800 times lower than amounts allowed in food
- A tripling of birth defects and childhood cancers in humans living in areas with intense airborne spraying
- Malformations in vertebrate embryos
- Significantly increased toxicity to human hepatic, embryonic and placental cell lines when combined with typical adjuvants in RoundUp®
- Reduced beneficial and increased pathogenic GI bacteria, which may be associated with a rise in GI infections in cattle and poultry
- Liver and kidney damage in mice
- A possible association with chronic kidney disease of unknown origin in humans, newly prevalent in hard-water farming areas of the Global South, considered strong enough by the government of Sri Lanka to propose a ban of glyphosate.

Bt toxin in GE foods has been associated with:
- Severe histopathological changes to liver, kidney, testis, spleen and small intestines of rats
- GI tract damage, including necrosis and shortening of the microvilli in fish and mice
- Alterations in immune cells and increased inflammatory markers in mice
- Transfer to the human fetus–Bt was recently found in the blood of 93% of pregnant women studied, and in 80% of cord blood samples taken.

These results are nutritionally significant—if they translate in vivo to humans, liver and kidney damage could initiate or mediate a number of chronic diseases. Alterations to gut immune function may cause new food allergies. In utero exposure to endocrine disruptors could trigger lifelong problems with obesity. GI tract damage and dysbiosis could be responsible for increases in autism, food-borne illness, irritable bowel syndrome and Crohn’s disease. As Bt toxin works by lysing the enterocytes of insects, it has been postulated that its effect on humans is similar and could explain the stark rise in gluten disorders and food sensitivities. As GE foods are not labeled as such, prospective or retrospective testing to determine their effects on humans is impossible to conduct.

GE foods may lead to increased nutrient deficiency and disease

The predominance of GE foods are created for herbicide and pest tolerance, not improved nutrition. GE foods are often nutritionally inferior, with altered macro- and micronutrient profiles as well as fewer phytochemicals. As shown earlier, organic soy was found to be more nutritious than its GE or conventional counterparts.

There is one product under development engineered to increase beta-carotene levels: Golden Rice (GR). It is hailed as a panacea in the treatment of vitamin A deficiency (VAD) but is unlikely to fulfill its promise. VAD is caused by a complex set of cultural, political and economic factors leading to a lack of diverse animal and vegetable matter in the diet of mothers and young children in the Global South. Effective treatment requires a multi-pronged approach, including current low-cost strategies of supplementation, food fortification, breastfeeding and home gardens. GR cannot help the 25-35% of those with VAD who do not eat rice, and it does nothing to address the lack of other nutrients in those populations who consume predominantly rice and little else. It is also unclear whether malnourished children can assimilate the fat-soluble carotenoid in GR.

A study in healthy children free of parasites and eating a normal diet showed GR consumption to be comparable to supplementation and more effective than a one-ounce cooked portion of spinach.
However, this study was marred by ethics violations related to transparency.⁶⁶ A considerable amount of criticism has been leveled at GR as a public relations project for the GE industry, noting significant progress could have been made if its development funds had been invested in current successful approaches for treating VAD.⁶⁷

On a larger scale, critics blame the GE industry for the worldwide push towards mono-cropping and reliance on a handful of staple crops, primarily carbohydrates. This lack of dietary variety and genetic biodiversity may only lead to more nutrient deficiencies, as well as an epidemic of diabetes, as populations reduce the number of foods they grow and consume.⁶⁸

**GE crops do not deliver an overall improvement in yield**

In reviewing 15 years of data on the use of GE crops, the United States Department of Agriculture (USDA) recently stated, “GE seeds have not been shown to increase yield potentials of the varieties.”⁶⁹ The same report noted that depending on the crop, 60-79% of the farmers adopted GE crops to increase yield.⁶⁹ The addition of Bt traits to corn has reduced some loss to pests, though this benefit is decreasing over time as pests become resistant to Bt.⁷⁰ Other studies showed no yield benefit when comparing US GE crops to European non-GE crops. HT soy and corn both show lower yields.⁷¹ GE crops currently grown are not varieties that increase food production, and so far this technology has not been effective at addressing world hunger.⁷²,⁷³

**GE foods may cause more environmental damage and put the food supply at risk**

GE crops were forecast to decrease pesticide use and tillage, but this has not been the case. Less Bt is used on corn, but more of the toxin is produced internally⁷⁴ with demonstrated toxicity to several non-target beneficial organisms, including ladybugs and bees.⁷⁵-⁷⁷ Glyphosate use increased by 527 million pounds between 1996 and 2011 from frequent applications due to increased weed resistance.⁷⁴ Its widespread use has been linked to a severe decline in monarch butterflies; as glyphosate is lethal to their food source, milkweed, and monarchs now risk extinction.⁷⁸,⁷⁹ Twenty-two varieties of glyphosate-resistant super-weeds have been identified—with harsher chemicals

Think the only way to definitively avoid GMOs is to buy certified organic products? The Non-GMO Project (http://www.nongmoproject.org/) offers “North America’s only third party verification and labeling for non-GMO food and products,” as well as a growing database of verified GMO-free retailers and restaurants. On its website, you may easily search for Non-GMO verified products or browse by brand. To ensure you are avoiding GMOs, look for the Non-GMO Project logo (or the USDA certified organic seal). If buying conventionally grown products, avoid the following foods and derived ingredients:

<table>
<thead>
<tr>
<th>High-Risk Crops (Commercial production; GMOs likely)</th>
<th>Monitored Crops (Possible contamination with GMOs)</th>
<th>Common GMO-Derived Ingredients</th>
<th>Possible Future Concerns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa, Canola, Corn, Cotton, Papaya, Soy, Sugar beets, Zucchini, Yellow summer squash</td>
<td>Beta vulgaris (e.g., chard, table beets), Brassica napus (e.g., rutabaga, Siberian kale), Brassica rapa (e.g., bok choy, mizuna, Chinese cabbage, turnip, rapes, tatsoi), Cucurbita (e.g. acorn squash, delicata squash, patty pan), Flax, Rice, Wheat</td>
<td>Amino acids, Aspartame, Ascorbic acid, Sodium ascorbate, Vitamin C, Citric acid, Sodium citrate, Ethanol, Flavorings (“natural” and “artificial”), High-fructose corn syrup, Hydrolyzed vegetable protein, Lactic acid, Maltodextrins molasses, Monosodium Glutamate sucrose, Textured vegetable protein (TVP), Xanthan gum, vitamins, Yeast products</td>
<td>Salmon, Pigs, Tomatoes, Plums, Potato, Radicchio</td>
</tr>
</tbody>
</table>

Source: http://www.nongmoproject.org/learn-more/what-is-gmo/

Also helpful is Environmental Working Group’s 2014 Shopper’s Guide To Avoiding GE Food (http://www.ewg.org/research/shoppers-guide-to-avoiding-ge-food). This is a free guide full of practical tips to avoid GMOs in the grocery aisle.
and increased tillage used to control them.\textsuperscript{80,81} The industry is now looking for approval of plants resistant to the herbicide 2,4-D, an ingredient in Agent Orange,\textsuperscript{82} which is forecast to lead to additional weed resistance and to increase herbicide use by 50%.\textsuperscript{74,83} Cross-pollination from GE plants to non-GE varieties has been documented and risks the integrity of non-GE seed stock.\textsuperscript{84,85}

**The risks of GE foods appear to outweigh the benefits**

GE foods are unlikely to be safe and may not be substantially equivalent to their conventional counterparts. The approval process for GE food is flawed and laden with conflict of interest: it lacks objectivity and scientific rigor and values commerce over the safety of the consumer. Independent post-market research is hampered by industry, which should be of grave concern to those who value scientific integrity. Novel proteins and pesticide residues from GE foods show evidence of organ damage and developmental penetrance to humans, rodents, and aquatic organisms and may contribute to increases in chronic disease. GE foods generally provide less nutritive value, and the worldwide emphasis on growing a few GE staple crops may actually lead to more deficiency and disease in addition to reducing biodiversity. They generally have lower yields. GE foods continue to contribute to increased pesticide use, as well as increased tillage and toxicity to beneficial insects. Given this list of concerns and lack of benefits, the safety of GE foods is highly questionable.

**How to identify and reduce intake of GE foods**

There is no labeling of GE foods yet required in the US. Consumers can look for third-party labeling from the Non-GMO Project or use smartphone applications to determine if foods have GE ingredients.\textsuperscript{86,87} Organic certification rules prohibit the practice of genetic engineering, though cross-contamination with GE varieties is still possible. Therefore, organic foods represent the safest, and most clearly labeled choices at this time. Organic is not always affordable or available to all; therefore, harm reduction can be best achieved by decreasing consumption of major sources of GE foods: soy, corn, beet sugar and canola. This will double the benefit to consumers, as processed foods use the most GE ingredients: chips, cereals, high-fructose corn syrup (HFCS) and sugar-sweetened foods, soybean oil, mayonnaise, margarine, dressings and fried foods. Internet resources are available for recipe support and further education, as consumers may need to make healthier versions of foods from scratch in order to avoid GE ingredients.\textsuperscript{88}

As integrative dietetic professionals, your expertise and perspective are crucial in understanding the connections between health, nutrition and environment. How can you best take action?

- Reduce your own intake of GE foods
- Educate yourself, other health care professionals and the public on the issues of GE foods
- Weigh in on regulatory events as a citizen and health care professional
- Keep up to date through the following organizations:
  - Center for Food Safety: [http://www.centerforfoodsafety.org/](http://www.centerforfoodsafety.org/)
- Advocate for strong mandatory labeling of GE foods
- Grow your own food, save seed, support organic and non-GE farmers
- Consider divesting from companies who produce GE seed and accompanying chemical

Lori Taylor is a clinical dietitian practicing on Whidbey Island in Washington State. Trained as a biochemist, she worked as a molecular biologist and science educator before becoming a dietitian. She holds degrees from UC Berkeley, Stanford University and Bastyr University and is entering her fourteenth year in the practice of dietetics, specializing in digestive disorders. Contact Lori at ginutritionist@gmail.com.

**References**


FOR BOTH GE ARTICLES

Some references are now member password protected or available at alternate sights. Additional information is also available regarding retracted references. For more information contact the author, Lori Taylor at lb@taylor.me.com or the Newsletter Editor, Sarah Harding Laidlaw at peaknut70@gmail.com.

Continued on pg. 72
Make a Plan for Protein

Three steps to choosing protein: quality, versatility and timing

QUALITY
Not all proteins are equal for muscle protein synthesis – quality matters! For example, whey protein is a high-quality, complete protein containing all of the EAA* and high levels of BCAA.**

<table>
<thead>
<tr>
<th>BCAA Content of Foods</th>
<th>Leucine</th>
<th>Isoleucine</th>
<th>Valine</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 scoop (36 g) whey protein isolate†</td>
<td>4.7 g</td>
<td>2.1 g</td>
<td>1.9 g</td>
</tr>
<tr>
<td>1 scoop (36 g) soy protein isolate</td>
<td>2.4 g</td>
<td>1.5 g</td>
<td>1.5 g</td>
</tr>
<tr>
<td>3.5 oz sirloin steak</td>
<td>2.3 g</td>
<td>1.3 g</td>
<td>1.4 g</td>
</tr>
<tr>
<td>3.5 oz chicken breast</td>
<td>2.5 g</td>
<td>1.5 g</td>
<td>1.6 g</td>
</tr>
<tr>
<td>1 cup low-fat yogurt</td>
<td>1.3 g</td>
<td>0.7 g</td>
<td>1.1 g</td>
</tr>
<tr>
<td>1 cup skim milk</td>
<td>0.9 g</td>
<td>0.5 g</td>
<td>0.6 g</td>
</tr>
<tr>
<td>1 egg</td>
<td>0.5 g</td>
<td>0.3 g</td>
<td>0.4 g</td>
</tr>
<tr>
<td>2 tbsp peanut butter</td>
<td>0.5 g</td>
<td>0.2 g</td>
<td>0.2 g</td>
</tr>
</tbody>
</table>

†USDA National Nutrient Database for Standard Reference, Release 26
‡USDEC Reference Manual for U.S. Whey and Lactose Products

VERSATILITY
Whey protein can easily be added to a variety of foods and recipes. More whey recipes can be found at www.wheyprotein.nationaldairyCouncil.org/recipes.

- Stir into hot foods (not boiling), such as soups, pasta sauces and stews immediately after cooking
- Use as an ingredient in baked goods
- Include in savory or sweet dips
- Stir into hot cereal or creamy sauces
- Add to peanut or other nut butters

TIMING
Add high-quality protein, such as whey protein, to meals and snacks to boost protein intake. Some experts suggest 20-35 g at each meal to help maintain muscle. Here are a few ideas:

Breakfast
Berry Smoothie: Nonfat Greek yogurt, frozen berries, banana, ice + 3 tbsp vanilla whey protein powder

Lunch
Tomato soup + 2 tbsp whey protein powder, whole wheat toast with low-fat cheese, apple

Snack
Carrots and whole wheat pretzels, reduced fat ranch dressing + 2 tbsp whey protein powder

Dinner
Whole wheat pasta, marinara sauce + 3 tbsp whey protein powder, spinach salad with Italian dressing

Include protein after exercise to help with muscle recovery!

FREE Webinar – CEUs Offered
Aging and Muscle Loss: Too Young to Worry? Think Again!
July 23, 2014
Register at www.wheyprotein.nationaldairyCouncil.org

For more information and recipes, visit us at www.wheyprotein.nationaldairyCouncil.org. Refer to your registered dietitian or healthcare provider for specific meal and calorie recommendations.

* Essential amino acids
** Branched chain amino acids
© 2014 National Dairy Council
In seeking sponsors, DIFM has established product standards for products and services of value to the integrative and functional medicine field. We consider product quality, efficacy, manufacturing, and business practices among other criteria. We encourage all professionals and individuals to choose products aligned with their own specific standards.
engineered crops on pesticide use in the
74. Benbrook CM. Impacts of genetically


1. In practice, applying the concept of Substantial Equivalence is problematic because:
   A. it requires that a genetically engineered (GE) crop be tested to demonstrate that it is as safe as its non-GE counterpart
   B. it compares the macronutrient distribution, allergens and bioavailability of proteins of GE and non-GE crops
   C. it is not an effective tool for identifying unintended effects
   D. it encompasses toxicological, immunological and biological comparisons

2. Which of the following factors plays a role in limiting independent research on GE crops?
   A. Regulations on the use of Bacillus thuringiensis (Bt) toxin
   B. Patent holders control who can use GE seeds for research
   C. Pre-market testing is not required
   D. Scientific consensus that GE crops are safe

3. The reason given for the retraction of a recent study showing tumor development in rats fed a GE diet was
   A. The sample size was too small for the results to be conclusive
   B. Misconduct by the study investigators
   C. The study design was similar to that of industry studies
   D. The researchers failed to disclose industry ties

4. Exposure to glyphosate-based herbicides has been associated with all of the following health risks, except:
   A. Childhood cancers
   B. Endocrine disruption
   C. Birth defects
   D. Shortening of intestinal microvilli

5. Why might exposure to Bt toxin be greater from eating genetically engineered Bt corn than from eating non-GE corn treated with conventional Bt toxin insecticide?
   A. Bt toxin produced in corn does not degrade with exposure to UV light
   B. Sprayed Bt toxin insecticide is susceptible to digestion within the normal range of human gastric pH
   C. Interaction with soil organisms makes Bt produced in corn more toxic
   D. Bt corn accounts for 76% of all corn grown in the US

6. The best way for consumers to avoid genetically engineered foods/ingredients is by:
   A. Reading food labels
   B. Advocating for regulatory changes
   C. Purchasing only organic food
   D. Reducing their consumption of soy, corn, beet sugar, and canola oil

Instructions for Completing the CPE Activity for Credit

1) Read the Continuing Professional Education article and answer the associated quiz questions. For each question, select the one best response. Compare your answers to the answer key on this page.

2) Send your completed quiz and application for CPE credit by email, fax or mail to:

   Shari Pollack, MPH, RDN
   4500 Keeney Street, Skokie, IL 60076
   sbethp@gmail.com
   fax: 312-569-6118

3) Complete the CPE certificate online and retain it for your records. You will be notified only if your application for credit is not approved.

This activity has been approved for one and a half hours of CPE credit. You will be notified if hours are not approved.

Possible Learning Codes: 2040, 7100, and 8018
Objectives
After reading this CPE article, the nutrition professional will be able to:
1. Define the term genetically modified organism.
2. Describe the process behind genetic engineering of foods.
3. Discuss the laws surrounding the regulation and labeling of genetically engineered foods in the US, Europe, Australia and New Zealand.

The topic of genetically modified organisms (GMOs) is controversial and provides a challenge to those of us who are attempting to sort through both the science and the bias to determine what to tell our patients and consumers. The World Health Organization (WHO) defines GMOs as those organisms in which the genetic material has been altered in a way that does not occur naturally.¹ The general concept of genetic modification is to modify the genetic material of an organism’s genome through insertion, deletion or mutation of one or more genes in order to express traits, such as herbicide tolerance or resistance. This alteration does not occur in nature and allows selected individual genes to be transferred from one organism into another and between non-related species.²³

Plants, animals or other organisms that have been genetically engineered are commonly referred to as genetically modified organisms or GMOs. For the purpose of these discussions, the term bioengineered or genetically engineered (GE) food will be used to be consistent with the Food and Drug Administration (FDA) and American Medical Association (AMA) terminology regarding foods for consumption.⁴

Short History of Genetic Modification/Engineering
A form of genetic modification has occurred since humans began raising crops and animals for food, somewhere near 8500 BC.⁵ This traditional method of breeding plants and animals works with nature, transferring genes through mating or cross-breeding, hoping to obtain a desired combination of traits or to improve upon a specific trait. Half of the genes in the plant or animal come from each “parent.” This method of breeding effectively improves the traits of the plant or animal but is limited to the traits that already exist within that species. Those undesirable and desirable traits can be transmitted. To put in simple terms, the traditional method does not cross species, so a pig cannot be crossed with a chicken or a tomato with an ear of corn.⁶ The traditional method of breeding to select desired characteristics is not to be confused with genetically engineering, more commonly referred to as genetic modification of organisms.

In order to add one or more traits that are not already found in an organism or its species, genetic engineering techniques are utilized. Genetic engineering is the direct transfer of DNA that has been manipulated from one organism to another and was first completed in the 1970s. Advances in genetic engineering increased rapidly, and genetically engineered crops for commercial production were introduced in 1996.⁷ Genetic engineering differs from classical breeding techniques achieved through sexual crossing, which can take up to 15 years to result in a new variety.⁸ Genetic engineering accelerates the process in a highly targeted manner, overcomes the barrier of sexual incompatibility, and increases the size of the available gene pool.⁹ For example, introducing the gene for disease resistance into a transgene and then directly incorporating the gene into the genome of a high yielding plant avoids the potential limitations of sexual crosses that may occur in nature.⁸

How Genetic Engineering is Accomplished
Proteins are essential to life of the cell and provide structure, regulate reactions, or, as enzymes, speed up reactions. Within the nucleus of every cell, DNA provides the genetic code or instructions for making these proteins. Genes are small segments of DNA that provide the instructions for how to produce the proteins. These instructions making up the genetic code are written in the same language for all living organisms; this is crucial to the process of genetic engineering.⁶

In plain terms, genetic engineering can involve adding one or more genes and/or interfering with the expression of another. This gives the resultant organism, in most cases, the ability to express traits according to the new code. To simplify the process: an organism that has the desired trait is identified; the DNA from that organism is extracted; the desired gene is located from the thousands available in the DNA and is copied; the gene may be modified to work differently in the new organism if desired; the new gene, called a transgene if from another species or a cisgene if from the same species, is inserted into the recipient organism using bacteria that naturally genetically engineers the plants with its own DNA or by shooting microscopic particles coated with the transgene/cisgene into the organism. With the shotgun method there is no guarantee that the transgene/cisgene will be inserted where it is intended, so multiple attempts may be
needed to create the organism desired. Once the transgene/cisgene has been inserted, traditional breeding is used to improve characteristics of the final organism.⁶,⁸

Approximately one dozen bioengineered crops are currently marketed or being considered for market for human consumption in the US. Currently, the most common foods in the market place are soybeans, corn, sugar beets, and vegetable oils (soy, corn, rapeseed or canola and cottonseed oil).⁴,¹⁰ Some foods that may come from genetically engineered plants are papaya and squash. Other food stuffs in varying stages of approval or market readiness are tomatoes, rice and salmon.¹⁰

Plants have been modified to resist insects, herbicides, and viruses, to enhance their nutritional value, to improve tolerance to environmental pressures, and to provide human vaccines.¹¹ An example includes insect resistance, achieved through incorporating the gene for toxin production from the bacterium Bacillus thuringiensis into the gene of the food plant. This toxin is currently used as a conventional insecticide in agriculture. Another example is virus resistance, introduced through a gene from certain viruses that cause disease in plants, making them less susceptible to disease from the virus and resulting in higher crop yields. Herbicide tolerant plants have resulted from the introduction of a bacterium that passes on its resistance to herbicides.³

Regulation and Labeling of GE foods: United States, European Union, Australia, and New Zealand

United States – Regulation

Three regulatory agencies, the Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), and the U.S. Department of Agriculture (USDA) share the responsibility of regulating GE crops. Products are regulated according to their intended use, with some products being regulated under more than one agency. All of the regulatory agencies have a responsibility to certify that the implementation of regulatory decisions, including approval of field tests and eventual deregulation of approved biotech crops, does not adversely impact human health or the environment.¹²,¹³

The EPA regulates biopesticides, including Bt toxins, under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). If a crop is genetically engineered to carry a gene for a Bt toxin, the EPA requires the developer to verify that the toxin is safe for the environment and conduct a food-safety analysis to ensure that the foreign protein is not allergenic. The FDA is responsible for regulating the safety of GE crops that are eaten by humans or animals. Based on a policy established in 1992, FDA considers most GE crops to be “substantially equivalent” to non-GE crops. In such cases, GE crops are designated as “Generally Recognized as Safe” (GRAS) under the Federal Food, Drug, and Cosmetic Act (FFDCA), and pre-market approval is not required. However, if the insertion of a transgene into a food crop results in the expression of foreign proteins that differ significantly in structure, function, or quality from natural plant proteins and are potentially harmful to human health, the FDA reserves the authority to apply more stringent provisions of FFDCA, requiring the mandatory pre-market approval of food additives, whether or not they are the products of biotechnology. The USDA Animal and Plant Health Inspection Service (APHIS) implements procedures for obtaining a permit or for providing notification prior to “introducing” a regulated article in the US. The act of introducing includes any movement into or through the US, or release into the environment outside an area of physical confinement. Regulated articles are organisms and products altered or produced through genetic engineering that are plant pests or for which there is reason to believe they are plant pests. For simple field trials of a Bt crop, as with Bt corn, the notification process is used and is usually just a formality. The company gives APHIS notice of the trial, agrees to follow certain rules, and the USDA usually signs off. In contrast, field trials of GM crops that entail a higher risk, such as those that are highly out-crossing or that remain in the ground for a long time, require a permit. For field trials of GM crops that produce pharmaceuticals, a permit is always required.¹²,¹³

United States – Labeling

As of this writing in 2014, there are more than 60 active bills in 26 states that would require labeling or prohibit the sale of GE foods.¹⁴ Just this April, Vermont passed a bill that would make it the first state to require labeling of GE foods; the Governor has promised to sign it. Labeling laws have been passed in Connecticut and Maine, but they do not go into effect until similar laws are passed in neighboring states.¹⁵

The most common GE crops in the United States are soybean, corn, cotton, and canola. Because many processed food products contain ingredients derived from these crops, such as cottonseed and canola oil, high fructose corn syrup, soy protein and soy lecithin, it is estimated that 70 percent of processed foods in grocery stores include at least one GE ingredient. The FDA currently requires labeling of GE food if the food has a significantly different nutritional property; if a new food includes an allergen that consumers would not expect to be present (e.g., a peanut protein in a soybean product); or if a food contains a toxicant beyond acceptable limits.¹⁶ Processed fried and convenience foods are often fried in GE cottonseed oil. Everyday expo
sure may also occur from foods containing GE soy lecithin and from foods that are processed using enzymes produced from GE plants.

**European Union – Regulation**

Safety assessments of GE foods are carried out by the European Food Safety Authority (EFSA) according to their published guidelines. Each application requesting authorization to sell GE foods is reviewed on a case-by-case basis, including detailed attention to the potential for toxic, nutritional and allergenic effects. GM foods may only be authorized for sale if they are judged not to present a risk to health, not to mislead consumers, and not to be of less nutritional value than the foods they are intended to replace.¹⁷

**European Union – Labeling**

In the European Union (EU), if a food contains or consists of genetically modified organisms, or contains ingredients produced from GMOs, this must be shown on the label. For products sold in bulk, information must be displayed immediately next to the food to indicate that it is GE. Products such as flour, oils and glucose syrups have to be labeled as GE if they are from a GE source. Foods produced with GE technology, such as cheese produced with GE enzymes, do not have to be labeled. Meat, milk and eggs from animals fed on GE animal feed also do not need to be labeled. Any intentional use of GM ingredients at any level must be labeled. A threshold for the adventitious, or accidental, presence of GM material in non-GM food or feed sources is provided for. This threshold is set at 0.9% and only applies to GMOs that have an EU authorization.¹⁷

**Australia and New Zealand – Regulation**

In Australia and New Zealand, all genetically modified foods intended for sale there must undergo a safety evaluation by Food Standards Australia New Zealand (FSANZ). FSANZ will not approve a GM food unless it is safe to eat. If the genetic engineering causes an unexpected effect in the food, such as increasing its allergenicity or toxicity, it will not be approved. To date, FSANZ has identified no safety concerns with any of the GE foods assessed. Other national regulators who have independently assessed the same GE foods have reached the same conclusions. It is the responsibility of companies that have developed GE foods to demonstrate the safety of those foods and to supply FSANZ with the raw data from scientific studies to prove this. The data must be obtained using sound scientific methods and be collected according to strict quality control criteria. This procedure is no different from procedures used for new chemicals and drugs. FSANZ experts review the scientific information and form their own conclusions from the results of the studies and will and have requested companies to undertake additional studies, where necessary.¹⁸

**Australia and New Zealand – Labeling**

GE foods, ingredients, additives, or processing aids that contain novel DNA or protein must be labeled with the words “genetically modified.” GM foods that do not contain any novel DNA or protein or altered characteristics do not require labeling. A decision not to label these foods was made because the composition and characteristics of these foods is exactly the same as the non-GM food. These are typically highly refined foods, such as sugars and oils, where processing has removed DNA and protein from the food, including novel DNA and novel protein. Labeling is also required when genetic modification results in an altered characteristic in a food, e.g. soy beans with an increased oleic acid content. GM labeling is not about safety. It is about helping consumers make an informed choice about the food they buy.¹⁸

According to the website justlabelit.org, some 64 countries around the world require labeling of genetically engineered foods.¹⁹ Among those requiring labeling, in addition to those mentioned above, are China and Japan, two countries that play important roles in the global food trade.

**Take Home Message**

There are many questions left to be answered regarding genetic engineering of foods intended for human consumption. Two main areas of concern have been raised since the first generation of genetically engineered crops were introduced: risk to the environment and risk to human health.¹ Those concerned about risk to human health suggest that although methods of gene insertion are considered relatively precise, the process of transformation could result in unintended effects.² Some scientists suggest that the environment may be threatened if farmers do not comply with Environmental Protection Agency requirements of planting refuges when non-GE corn is planted near GE corn.²⁰,²¹ Studies conducted have been primarily of short duration (90 days or less) on animals, rats in particular, and human cells in vitro; data are inconclusive at this time regarding the safety of genetically engineered foods in humans.²²

This issue of The Integrative RD revisits the topic of GMOs discussed in this newsletter over ten years ago in an attempt to educate members with credible and peer-reviewed professional resources and research. Opinions differ significantly and, more than likely, will continue to for years to come. Can GE foods fulfill the promises of increasing the nutritional value of foods in underdeveloped countries, can they help feed the world and reduce pesticide use in a safe and environmentally responsible
manner? It depends on how the technology is used. It may be something that only time and credible and unbiased research will be able to tell.

Sarah Harding Laidlaw, MS, RDN, CDE is the DIFM Newsletter Editor. She is semi-retired, living in Western Colorado where the interest in and options for organic farming/gardening and non-GE foods is flourishing. Contact Sarah at peaknut70@gmail.com or 970-216-2356.

References
1. According to the World Health Organization, a genetically modified organism (GMO) is defined as an organism in which:
   A. the genetic material has been altered in a way that does not occur naturally
   B. a specific genetic trait has been improved upon through cross-breeding or mating
   C. a new genetic trait has been added by the insertion of genetic material from a different species
   D. a gene has been modified to work differently by the insertion of genetic material from the same species

2. How many estimated bioengineered crops are currently being marketed or considered for marketing in the United States?
   A. 3
   B. 12
   C. 36
   D. 300

3. Which of the following is currently one of the most common GE crops in the United States?
   A. Peanuts
   B. Potatoes
   C. Soybeans
   D. Wheat

4. The first step in the process of genetic engineering is:
   A. Replication of an organism's desired gene
   B. Extracting the desired DNA from an organism
   C. Locating the desired gene on an organism's DNA
   D. Identification of an organism with a desired genetic trait

5. Which agency is responsible for regulating the safety of genetically engineered crops consumed by humans or animals in the US?
   A. EFSA
   B. EPA
   C. FDA
   D. USDA

6. The US requires labeling of GE foods if:
   A. The food contains novel DNA
   B. The food has been produced with GE technology
   C. The food contains any ingredients produced from GMO’s
   D. The food has significantly different nutritional properties than its non-GE counterpart

This activity has been approved for one and a half hours of CPE credit. You will be notified if hours are not approved. Possible Learning Codes: 2040, 7100, and 8018
Cranberries and their Bioactive Compounds in Human Health

Amy B. Howell, M.S., Ph.D., Associate Research Scientist, Marucci Center for Blueberry Cranberry Research, Rutgers University, Chatsworth, NJ

Consumers have become increasingly interested in managing their own health as they age, especially through consumption of foods with functional health benefits. Determination of the bioactive compounds in healthy foods and how they work has helped consumers to understand more about effective dosages and how these foods can positively impact their health. The American cranberry (Vaccinium macrocarpon Ait) is a very rich source of functional bioactive compounds, which has helped to propel it into the “superfruit” category. Cranberry has a wide array of potential health benefits, the most substantiated being prevention of urinary tract infections (UTIs). But recent research suggests that the health benefits of cranberry consumption extend well beyond the urinary tract, from reducing risk factors for heart disease to promotion of gastrointestinal health. Cranberries are closely related to blueberries and lingonberries, but they contain a different array of bioactive compounds that promote unique health benefits.

Cranberry Cultivation and Product Types

Cranberries are grown in several states, including Wisconsin, Massachusetts, New Jersey, Oregon and Washington, with cultivation extending into Canada and south into Chile. In North America, the fruit is harvested mid-September through October. A small percentage of the crop (about 3%) is dry-harvested and sold fresh. The vast majority of the fruit is harvested by flooding the marshes with water and using machines to knock the fruit off the vines. The inside of the berries has several hollow chambers, allowing the fruit to float on the surface of the water and be collected. Water-harvested berries are made into juices, dried fruit, sauces and powders. Cranberries are naturally low in sugar, so products are sweetened for palatability. The sugar content of commercial cranberry juice drinks is similar to apple and orange juices, but lower than grape juice. Alternatively sweetened, low carbohydrate cranberry products are also available for consumers. Research suggests that all these different forms of cranberry elicit health benefits.¹

Bioactive Compounds in Cranberries

The fruit is native to North America and was historically utilized by Native Americans to manage urinary disorders and other bacterial afflictions. Cranberries contain a number of phytochemicals, among them anthocyanins (red pigments), flavonol glycosides (insect attractors), organic acids, and complex oligomeric flavonoids known as proanthocyanidins (PACs) or condensed tannins, which are astringent and protect the plant from predation.² PACs appear to be particularly bioactive and, in recent years, have gained the attention of the medical and pharmaceutical communities for their wide array of potential health benefits.³ Cranberry PACs are shaped differently from those found in other PAC-rich foods, like chocolate and grape that contain single B-type linkages.⁴ Cranberry PACs have unusual double A-type linkages⁵ that are associated with preventing specific types of pathogenic bacteria (but not probiotics) from adhering to cells in several sites in the body, including the urinary tract, stomach and oral cavity. Thus, the acidity of cranberry is not responsible for the beneficial effect on the urinary tract, but rather it is due to prevention of P-fimbriated Escherichia coli (E. coli) bacterial adhesion,⁶ the initial step in the infection process and that is necessary for bacterial growth. Inhibiting this adhesion step prevents subsequent colonization and infection. The advantage of this mechanism is that it should not promote antibiotic resistance or lead to significant selection pressure favoring survival of antibiotic-resistant bacterial strains because the bacteria are not eradicated.⁷ They are not able to cause infection so they are simply flushed out of the body in the urine stream. This type of preventive strategy could become more important as antibiotic resistance rates continue to increase as a result of over-use of antibiotics. Thus, utilization of cranberry to prevent certain bacterial infections could potentially aid in reducing the pace of antibiotic resistance development.

Clinical Evidence Supporting Use of Cranberry in Maintenance of Urinary Tract Health

There have been a number of clinical intervention trials that have investigated the association between cranberry consumption and prevention of UTIs. A recent review supports the use of cranberry in the prevention (but not treatment) of recurrent UTIs in young and middle-aged women. However, evidence of its clinical efficacy among other groups remains controversial.⁸ Past clinical reviews have been mixed with several suggesting that cranberry may help prevent infections, particularly in women with recurrent UTI,⁹,¹⁰ with the latest Cochrane Review finding no benefit for cranberry.¹¹ Compliance in some studies included in the Cochrane review finding no benefit for cranberry.¹¹
Compliance in some studies included in the Cochrane Review was low, but may have been confounded by the use of poor compliance measures. Most of the studies used cranberry products that were not standardized to A-type PACs and may not have had sufficient amounts of bioactive PAC (36 mg PAC/day) to achieve clinical efficacy. It is important to note that cranberry is a food that comes in different product forms (juice, powder, dried fruit, etc.) making it difficult to use a meta-analysis to compare results from multiple trials that each used different product forms. Additionally, the choice of study subjects is particularly important as the pathogenesis of UTI is specific to different patient groups. Several studies completed since the Cochrane Review had positive outcomes for cranberry in preventing UTI recurrence and are included in the most recent review of Micali et al. Nevertheless, more work is needed to determine the optimal dose, frequency of administration, length of consumption, subject characteristics, and product form.

Several clinical studies have compared cranberry to low-dose antibiotics as a prophylaxis in children and postmenopausal women, and found that cranberry was not quite as active as the drugs. However, the authors concluded that in both women and children, cranberry should be considered for use because it did not encourage growth of resistant bacterial strains, as the antibiotics did. It is particularly important to reduce antibiotic use not only in children but in the elderly, who are at an increased risk for development of antibiotic resistance. Thus, there is an opportunity to use cranberry as an alternative to low-dose antibiotics for UTI prevention and subsequently avoid infection and the need for treatment antibiotics. Cranberry has great potential to help slow the pace of resistance development in an era when consumers are very concerned with having to rely on pharmaceuticals to prevent and treat disease. Since UTIs are the second most common type of infection in the body, prevention of UTI through consumption of cranberry products could make a significant impact in reducing healthcare costs in general, as well as those due to antibiotic resistance.

Other Health Benefits of Cranberry

The bacterial anti-adhesion mechanism goes beyond the urinary tract and is active in other sites in the body. Isolated cranberry PACs reduced plaque biofilm formation in the oral cavity and prevented and even reversed bone loss and inflammation associated with periodontal disease. Extracts of cranberry containing PACs prevented Helicobacter pylori, the bacteria that cause stomach ulcers, from attaching to isolated stomach cells and clinical results revealed a significant eradication of the bacteria from the stomach. Cranberry PACs have also demonstrated activity against E. coli invasion in the gut, which may help reduce persistence of the bacteria. Reducing the resident population of pathogenic bacteria in the gut capable of causing UTIs may help to lower the rate of recurrent infections.

Cranberry bioactive compounds including anthocyanins, flavonol glycosides and PACs have all demonstrated antioxidant and anti-inflammatory activities. Environmental and lifestyle factors such as cigarette smoking, pollution, poor diet, stress, etc. can lead to high levels of oxidative stress and inflammation. As our bodies age, our endogenous production of antioxidants decreases and it may be helpful to supplement our diet with antioxidant-rich foods, like cranberries. Research shows that cranberries reduce overall oxidative stress and inflammation associated with progression of a number of diseases and afflictions, such as heart disease and cancer.

In a clinical study in overweight men, high density lipoprotein (HDL) cholesterol levels were increased by over 8% following daily consumption of 250 mL/day of 27% low-calorie cranberry juice drink for a period of 12 weeks. High HDL is associated with heart disease risk reduction. Cranberry reduced esophageal cancer cell growth and breast tumor growth in several cell line studies, but clinical work is necessary.

How to Include More Cranberries in Your Diet

Research shows that all different cranberry products (juices, dried fruit, sauces and encapsulated powders) promote health benefits. Continuing research on the cranberry bioactives aimed at understanding more about the complex nature of these compounds (especially the PACs) will provide further validation of the health functionality of cranberry, more accurately define dosages and the efficacy of product forms, and enable more effective clinical study designs utilizing cranberry. For further information on specific aspects of cranberry health research, a comprehensive review article has recently been published: http://advances.nutrition.org/content/4/6/618.full.
The broad array of health benefits and the tangy flavor of cranberries make them a great choice to include as part of the regular diet. Cranberry is an inexpensive, convenient functional food that is effective in reasonable single serving sizes per day. Look beyond cranberry juice… Fresh or frozen berries can be an ingredient in fruit smoothies, relishes for sandwich spreads, or chutneys. Dried cranberries add a unique tart flavor to oatmeal, salads and rice dishes.

References
News You Can Use
Compiled By: Jacqueline Santora Zimmerman, MS, RDN

Upcoming Conferences and Meetings


September 17-21, Food as Medicine Professional training program, East Coast. Stockbridge, MA. [http://cmbm.org/professional-trainings/food-as-medicine/]

Video Reviews: Focus on GMOs

Fed-Up
Opened May 9th in Theatres. Produced by Laurie David (Inconvenient Truth), directed by Stephanie Soechtig and narrated by Katie Couric. A powerful and revealing documentary exploring the connection between obesity and sugar laden foods produced by America’s food industry.

The World According to Monsanto
Directed by Marie-Monique Robin; 2008. Available free online. French documentary offering a complete history of GMO production and usage as well as Monsanto's role in the food and agricultural industry; 108 min. [http://topdocumentaryfilms.com/the-world-according-to-monsanto/]

Genetic Roulette: The Gamble of Our Lives
Written, produced, and directed by Jeffrey Smith; 2012. DVD: $17.95; Rent $2.99. Through a series of interviews, this film emphasizes the questionable safety of GMOs and the labeling initiative in the United States; 85 min. [http://geneticroulettemovie.com/]

Food Inc.
Directed by Robert Kenner, 2008. DVD: $11.75; Rent $2.99; free instant streaming with Amazon Prime. Feature film focusing on GMOs’ impact on farmers, agriculture and the American food industry; 91 min. [http://www.imdb.com/title/tt1286537/]

David vs. Monsanto
Directed by Bertram Verhaag, 2011. DVD: $6.99; Rent: $2.99; free instant streaming with Amazon Prime. Documentary portraying the legal battle of a Canadian farmer whose canola fields were contaminated through cross-pollination with Monsanto’s genetically engineered plants. Although he never planted the seeds, he was sued by the company for violation of patent laws; 66 min. [http://rclvideolibrary.com/2012/11/08/david-versus-monsanto/]

Seeds of Death: Unveiling the Lies of GMOs
Directed by Gary Null and Richard Polonetsky, 2012. Available free online. Documentary summarizing the research pointing to the potential health risks of GMOs; 90 min. [http://topdocumentaryfilms.com/seeds-death/]

Organic Matters

Farmageddon: The Unseen War on American Family Farms
Directed by Kristen Canty, Co-produced by Kristen Canty and Paul Dewey, 2011. DVD: $14.96; Rent on Netflix or itunes. Film describing the difficulties of small family farmers in today’s world of agri-business; 90 min. [http://farmageddonmovie.com/film/]

HOT Nutritional Genomics Research Publications February 1, 2014
Courtesy of the International Society of Nutrigenetics and Nutrigenomics (ISNN), [http://www.isnn.info/], and [www.nutrigenetics.net].

Nutrigenomics - perspectives from registered dietitians: a report from the Quebec-wide e-consultation on nutrigenomics among registered dietitians.
A survey among Quebec-area dietitians found that although interested in nutritional genomics, most do not yet feel sufficiently prepared to use it in their practices.

Dietary magnesium and genetic interactions in diabetes and related risk factors: a brief overview of current knowledge.
Both genetics and environmental/lifestyle factors influence risk of developing type-2 diabetes. Magnesium research results are listed in several tables, and discussion is provided regarding gene variants which can affect magnesium homeostasis and risk of diabetes.

Nutrigenomics: the role of nutrients in gene expression.
Specific nutrients can affect gene expression in periodontal diseases (gingivitis and periodontitis) involving both the immune system and inflammatory responses. Periodontal disease among type-2 diabetics is discussed with regard to the rs13266634 variant of SLC30A8, a...
zinc-transporter gene, and the potential usefulness of zinc supplementation.

**Interactions between zinc transporter-8 gene (SLC30A8) and plasma zinc concentrations for impaired glucose regulation and type 2 diabetes.** *Diabetes.* 2013 Dec 4. [Epub ahead of print] (PubMed ID: 24306209)
The rs13266634 variant of SLC30A8, a zinc-transporter gene, can increase the risk of developing type-2 diabetes; however, among carriers of this variant, higher plasma zinc levels were found to be associated with reduction of this risk.

Supplementation with higher levels of vitamin E have been associated with increases in risk of mortality among general populations. However, diabetics who carry the 2-2 allele/phenotype of haptoglobin (that is, HP 2-2) suffer greater oxidative stress. This allows them to benefit from greater vitamin E supplementation, whereas those carrying the 1-1 or 2-1 alleles do not. Both diabetic nephropathy and diabetic retinopathy are discussed.

Americans were found to be supportive of more research on genetics, government protections from genetic discrimination, and involvement of healthcare professionals for explaining direct-to-consumer genetic test results.

Table 1 provides a listing of 10 gene variants from 9 genes associated with risk of developing metabolic syndrome, and identifies potential risk modifiers. Risk estimates are also indicated, ranging from 1.57 to 4.4-fold increased risk except for one variant which is protective (odds ratio of 0.32). Although the authors believe that nutrigenetics has great potential for both prevention and treatment, they also suggest a holistic approach to overall dietary and lifestyle recommendations.

The 2-2 allele/phenotype of haptoglobin (that is, HP 2-2) is less effective at protecting from oxidative stress which can be induced by the pro-oxidant effects of heme-iron. HP 2-2 is carried by about 37% of the Finnish population tested for this report, and is associated with increased risk of unstable atherosclerotic plaque and major cardiovascular events, including ischemic stroke and myocardial infarction. (Note that other recent reports have indicated that supplemental vitamin E can be helpful for carriers of HP 2-2, but not for carriers of HP 1-1 or HP 2-1.)

Advances in genetic technologies, including cost reductions, have increased the usefulness of genetic testing for broader aspects of public health and healthcare. Background principles for the ethical introduction of genetics-based technologies into public health are described.

Inquiries about above references? Contact Ron L Martin, MS, President, Nutrigenetics Unlimited, Inc.; ron@nutrigenetics.net. Access to the extensive Nutrigenetics.net database is free on weekends, but please check out www.NutritionAndGenetics.org to learn more about the ISNN membership discount for dietitians, which includes round-the-clock database access as a benefit.
“The days of blindly treating symptoms with supplements are over. Pinpoint the deficiencies and targeted treatment with personalized plans and dosage.” - Ron Grabowski, RD, DC

SpectraCell’s Micronutrient Testing provides a comprehensive assessment of 35 nutritional components at an intracellular level.

**FREE OFFER:** To receive SpectraCell’s Nutrient Function Booklet, email your name and address to Spec1@SpectraCell.com with DiFM Book in the subject line.

For more information visit www.SpectraCell.com

Get to the Root of the Symptoms

Attend the Academy’s Food & Nutrition Conference & Expo™ to discover new trends and research impacting our profession. Enhance your professional development.

Visit [www.eatright.org/fnce](http://www.eatright.org/fnce) to view educational sessions, videos and more.
Justice Begins With Seeds
By: Mary Purdy

The Justice Begins with Seeds conference took place in Seattle, WA August 2-3, 2013 and was organized by the BioSafety Alliance, which advocates for a GMO-free food supply. The conference’s main themes centered around supporting the non-GMO movement, bio-diversity and food sovereignty. More than 50 speakers were featured, representing a variety of organizations, including the Community Alliance for Global Justice, the Non-GMO project, the Institute for Food and Development, the Center for Farm Workers, Food and Water Watch, and the Center for Food Safety. Additionally, there were a variety of individual speakers including an economist, a graduate student, a local farmer, a beekeeper, Washington State Senator Maralyn Chase, and a number of university professors who asked the question: Who controls our food supply - people or corporations?

Lecture titles included “Our Seeds, Our Life, Our Future,” “How To Influence Your Corporate Political Actors,” “Health Risks of GMOs,” “Hunger, Genetic Manipulation and Faith,” and many more.

Much of the conference focused on the growing concern around genetically engineered or modified foods (GMO) and the desire to protect not only the food supply, the farmers who produce food and the farm workers who work the land, but also the eco system and the cultures that have given rise to many centuries old agricultural practices. There was also a dispute to the contention that genetically modified foods will “feed the world” and concern with the fact that many farmers are now being forced to purchase seeds instead of recycling their own.

According to Courtney Pineau, Executive Director of the Non-GMO Project, the process of genetically engineering food involves taking DNA from one species and splicing it into the DNA of another species to create plants that have combinations of plant, animal, bacterial, and viral genes that cannot occur inherently in nature.

The six major GMO crops are soy, corn, canola, sugar beets, and alfalfa. Each has been given bacterial genes allowing them to survive what would otherwise be a deadly dose of the weed killer called Round-Up. This means that farmers often need to use more herbicides on these crops, which may lead to higher herbicide residues in our food and soil. Currently only 10% of the corn and soybean crops are actually grown for human consumption. The rest are meant for cattle feed and biofuels.

Another example of genetic modification is crops into which a bacteria called Bacillus Thuringiensis (BT) is inserted, allowing the plant to secrete its own built-in insect-killing BT toxin. Pineau claimed that none of the traits created by GMOs offer increased yields, drought tolerance or nutritional superiority. She also reiterated that currently, 61 countries require labels on foods that contain GMOs and many have restrictions against GMO production.

While it’s difficult to capture the vast amount of information presented during the two-day conference, major points included health concerns around consumption of GMOs, ranging from infertility and immune issues, gastrointestinal dysfunction, and the potential for increased food allergies. The contention was made that much of the soil from GM crops is sorely lacking in nutrients, which may mean that the plants are lower in nutritional value. Glycosate, (aka Round-Up herbicide) acts as a binding agent, binding to minerals and potentially robbing the plant of its ability to absorb what minerals exist in the soil. Additionally, fertility and health issues have been observed in cattle fed GM feed, prompting concern for other health risks in humans.

Environmental concerns included an increased potential for water and soil toxicity, destruction of forests, development of resistant “super” weeds and “super” bugs, and the loss of biodiversity, which is thought to be the key to healthy crops. For example, many original strains of corn grown in Mexico are slowly disappearing along with the indigenous knowledge about which strains grow best in which climates, valuable information in helping to maintain the food supply in those areas. Lastly, there was great discussion around loss of current agricultural practices, like seed saving and the detrimental impact this is having on small farming communities both here and abroad. Many of these small farming communities are slowly being ousted from their land and being replaced by large agribusinesses. A number of speakers touched on how small farms actually produce higher crop yields and that in times of drought, organic practices fare better. One issue that was strongly emphasized was an initiative that was on the ballot in November 2013 in Washington State demanding labeling for genetically engineered foods. The idea behind the initiative was that regardless of any potential health or environmental risks, consumers have a right to know what is in their food in the same way that they are informed on how much sodium, sugar and fat are contained in the things they eat. While the initiative didn’t pass, it sparked much discussion and has galvanized numerous other counties and states to pursue the same labeling.

The conference also included break-out sessions, which allowed small groups to discuss how to be more politically active in the food system and encouraged community involvement. Additionally there was education around how to speak to
representatives about rights of the consumer, the farmers, farm workers and even the animals. John Roulac, CEO of Nutiva Foods, shared how his company has found creative ways via social media to influence food manufacturers to stop using GMO foods in their products, including launching several Facebook campaigns to encourage certain food companies to be more transparent. From the presentations it appeared clear that GMO has consequences extending far beyond the genetically modified food itself. It is a social justice issue and participants were encouraged to vote using food dollars.

The amount of information presented is difficult to capture in this short article, however, additional information can be found at http://www.responsibletechnology.org/, http://www.nongmoproject.org/, www.yeson522.com, and http://biosafetyalliance.org/.

Although the conference did not allow for much perspective from “the other side,” that did not seem to be its purpose. The idea was to bring together groups of like-minded individuals with similar goals around food justice and food sovereignty to establish networks and paths towards change. It was apparent that participants felt motivated and inspired to form alliances and work towards constructing new food systems. While many feel that the research about health risks associated with genetically modified foods is still somewhat controversial, the impact they are having on our environment and food policies is undeniable. The hope is that the discussion will continue and the seeds of information will be widespread enough so that increased communication, collaboration and change can occur for the benefit of people, animals, and the earth.

Mary Purdy, MS, RDN holds a Master’s Degree in Clinical Nutrition from Bastyr University. She provides medical nutrition therapy and nutritional counseling at her Private Practice at the Seattle Healing Arts Center and is Clinical Supervisor at the Bastyr Center for Natural Health. Mary is the Communications Chair of Dietitians in Integrative and Functional Medicine. Contact Mary at mary@nourishingbalance.com.
Among the many resources devoted to digestive health, a book authored by a Registered Dietitian is a welcome sight. Digestive Health with REAL Food offers a path to wellness using whole foods and a strict elimination-reintroduction diet. To date, no clinical trials have been conducted to evaluate maintenance of mucosal healing from the use of elimination-reintroduction diets; however, studies supporting reduced symptoms of food intolerance exist. Author Aglaée Jacob points out that a lack of studies equates to limits of science, not failure of the concept and for those suffering, waiting for studies to prove that this approach works means prolonged pain. She employs the theory that the optimal way of eating is consuming unprocessed foods consisting mostly of animal protein, healthy fats, and easily digested vegetables with little to no carbohydrate. Throughout the book, the theory is supported with both evidenced-based and non-evidence-based hypotheses.

Aglaée Jacob writes with a passion for wellness, a positive approach and personal explanation of her journey through digestive issues. Based in Canada, she practices as “The Paleo-Dietitian” and is studying naturopathic medicine. Her friendly and encouraging writing style attracts the reader through compassion for the discomfort caused from eating. Throughout the book she offers hope for digestive healing.

Jacob’s guiding premise is empowerment for those who suffer from digestive problems and have unsuccessfully exhausted a variety of techniques to alleviate them. She tackles this through a functional approach incorporating philosophies from the Weston Price Foundation, gluten elimination, FODMAPS, small intestinal bacterial overgrowth, and ketogenic diets, often expressing frustration with the conventional methods used by allopathic medicine.

The beginning chapters employ self-drawn pictures, charts, and tables to explain the intricacies of digestion in an easily understandable way. The multitude of causal factors presented convincingly makes a case for the REAL foods method as a vehicle for an individualized, well-tolerated, optimal diet.

The remainder of the book is devoted to the three phases of the healing plan. REAL foods, defined as unprocessed, nutrient-dense, anti-inflammatory, and low-irritant are the cornerstone of each phase. The first, a 3-4 week elimination diet, is restricted to animal protein, four types of vegetables, and fats. The reintroduction phase mimics the introduction of solids to an infant, adding one food every three to four days until tolerance is established. Finally, the ultimate, unique-to-the-individual eating plan, referred to as Build Your Own (BYO) diet, is reached through experimentation and evaluation of food tolerances. Food lists, meal plans and recommendations for supplementation, travel and dining out are included. Last, but certainly not least are over 40 recipes.

The extensive and thorough explanation used to support this elimination-reintroduction, REAL Food diet is excellent food for thought, whether believing in the plan or not. For a person to undertake the strict diet, there is a lot of information to sift through and often the reader is left to experiment in developing their personal plan.

While this book benefits both professionals and those seeking digestive healing, disheartening remarks portray dietitians as unknowledgeable, influenced by food industry, and conformists to conventional nutritional practices. A more unified approach might acknowledge professional diversity while kindly pointing out inadequacies in an effort to keep dietitians cohesive and strong as part of a universal whole supporting health and wellness. Overall, Digestive Health with REAL Food is a valuable resource to help navigate through some of the many issues surrounding the evolution of dietary practice for achievement of digestive wellness.

Reviewed by Dina Ranade RDN. DIFM Newsletter Resource Reviews Editor. Contact Dina at dranade@comcast.net.
IFM wants to provide more education and professional development opportunities for you! As DIFM strives to continue to create and offer meaningful member benefits for you, I ask you to consider your scope of practice (scope). Individual scope reflects education and training, credentialing, and competence. Knowledge, skills and experience vary among nutrition and dietetics practitioners—an individual may not be competent in all practice areas. According to the Code of Ethics, RDNs must practice only in areas where they are competent.

Where are you in your integrative and functional medicine (IFM) learning? Are you competent to practice IFM? To answer the question, consider reflecting on the Council on Future Practice Dietetics Career Development Guide for life-long learning and professional development.

Now, let’s reframe the Dietetics Career Development Guide from an IFM perspective…

• Novice in IFM—focused on didactic learning in IFM;
• Beginner in IFM—in supervised practice of IFM or just beginning to apply IFM principles in your practice area;
• Competent in IFM—within the first three years of IFM practice; continuing to acquire and apply new knowledge and skills in IFM practice;
• Proficient in IFM—adeptly practicing IFM; can apply IFM principles to clinically complex situations, can synthesize IFM knowledge for development of programs, products or services;
• Advanced Practice in IFM—continuing at the highest level of knowledge, skills, and behaviors including leadership and vision in IFM;
• Expert in IFM—builds and maintains knowledge, skills and credentials, achieves peer recognition, contributes to the profession in authored publications and/or research, sought out as subject matter expert, mentors peers in IFM.

Once you’ve reflected on your current level of practice, and identified your level of knowledge and skills acquisition in IFM (novice to expert level), consider how these may be incorporated into your Professional Development Portfolio process:

• Identify your future practice goals;
• Conduct a learning needs assessment;
• Develop a learning plan to advance your practice in IFM.

Some great resources for your learning plan can be found on DIFM’s website under ‘Resources’ and ‘How do I learn about Integrative and Functional Nutrition?’ There is a treasure trove of certificate and training programs, books and textbooks, conferences, live trainings, and e-learning opportunities. Check out the ‘IFMNT Radial’ (also under Resources), and choose one or more spheres of the radial, such as Lifestyle, Systems, Signs & Symptoms, Biomarkers, Metabolic Pathways, or Core Imbalances, to incorporate into your CPE and professional development portfolio. For Novices or Beginners in IFM, a great place to start might be with the top three Core Imbalances—Digestion, Detoxification, and Inflammation. Then wander on over to the Members section of the website, select ‘Learn,’ and check out the webinar archives for webinars on Core Imbalances.

Last, but certainly not least, be sure to avail yourself of your DIFM member benefit—Natural Medicines Comprehensive Database (accessed through DIFM website). Use it as a self-study resource. Search it by Natural Product Monograph, Brand Search, Natural Product Effectiveness Checker, Natural Product Drug Interaction Checker, and Nutrient Depletion Checker, or access the Clinical Management Series for self-study on disease-specific approaches to ADHD, anxiety, asthma, headache, hyperlipidemia, hypertension, and more.

I think that about covers it for now—happy learning! As Mahatma Gandhi said, “Live as if you were to die tomorrow. Learn as if you were to live forever.”

Mary Beth Augustine, RDN, CDN DIFM Chair, 2014-2015
As the state of Colorado prepares to vote on whether it will join ranks with Vermont to require labeling of genetically modified or engineered foods, DIFM is publishing this issue of *The Integrative RDN* on this controversial topic. Thirteen years ago, then called the Nutrition in Complementary Care DPG, we looked at genetically modified organisms, presenting both sides of the equation. Little did we realize that it would continue to be such a hot topic with strong feelings on both sides of the argument.

The CPE article presented in this issue is the culmination of many hours by the author, the CPE reviewers, and the newsletter editors to assure that the information is credible and presented in an objective manor. Unfortunately we were unable to provide the ‘pro’ side of the argument at this time. However, we endeavored to provide as balanced a view as possible for members to be able to formulate their own opinion.

I want to take this opportunity to thank everyone who contributed to this issue from the authors, to the reviewers, the CPE Editor, and the Academy. I encourage you to contact me—the Editor, the CPE author, or any one of *The Integrative RDN* editorial staff or DIFM EC if you have comments or ideas to share regarding this issue.

Stay tuned for an exciting and educational year. We will be offering insight into the modules that will be offered with the Online Certificate of Training, beginning with an interview with Kathie Madonna Swift, MS, RDN, LDN who is developing the first module. Look for more information about the ‘Emerging Integrative Approaches for Nutrition and Dietetics Practice’ offerings at FNCE in Atlanta, GA this fall. DIFM is excited about partnering with the many knowledgeable individuals in functional medicine to make more information and educational opportunities available to members.

As always, I welcome your comments and would encourage you to become involved with any DIFM volunteer activities. Please feel free to email me at peaknut70@gmail.com or contact our illustrious Executive Assistant, Amy Jarck at info@integrativeRD.org.

Sarah
Election Results

Congratulations to the following elected Executive Committee Members

Chair Elect: Monique Richard, MS, RDN, LDN
Treasurer: Stephanie Harris, PhD, MS, RDN, LD
Nominating Committee Chair Elect: Kathy King Helm, RD, LD
Nominating Committee Member: Rita Batheja, MS, RDN, CDN

Networking News

DIFM has great news:
A new Networking partnership has been formally established. The Kansas University Medical Center will now offer specific benefits to DIFM members as well as provide support for the DPG’s mission and vision.

The Department of Dietetics and Nutrition, University of Kansas Medical Center, offers an Academy of Nutrition and Dietetics-accredited graduate dietetic internship certificate program in addition to a Master of Science in Dietetics and Nutrition and doctoral degree in Medical Nutrition Science. Recently, an integrative and functional nutrition certificate program and IN tracks within the dietetic internship and Master of Science degree have been developed.

Benefits to DIFM members:
- Online classes for qualified DIFM members:
  - KUMC Online Registration contact Sharon Jones, DN Admin, School of Allied Professions, KUMC, sjones@kumc.edu.
  - DIFM Members will be given Kansas In-State tuition rates. Currently each class is about $750 in-state for 3 credit hours with all fees included for 48 graduate CME credits (~$16 per credit CME hour) plus books/materials.

Class examples:
- DN 881 – Introduction to Integrative Nutrition (IN) (3 credit hours)
- DN 882 – Inflammation and Immune Regulation (3 credit hours)
- DN 883 – Nutritional Toxicology (3 credit hours)
- Graduate Certificate in Integrative Nutrition (12 graduate credit hours), University of Kansas Medical Center.
- The Graduate Certificate requires four online classes @ approximately $3000 plus books/materials.
- Two - 60 min DIFM webinars annually on topics of integrative nutrition
- All web resources on both www.dietetics.kumc.edu/ and integrativemed.kumc.edu/ at KUMC websites (no password required)
### Executive Committee List

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>Email/Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications Chair 2013-2015</td>
<td>Mary Purdy, MS, RDN</td>
<td><a href="mailto:MaryPurdyRD@gmail.com">MaryPurdyRD@gmail.com</a></td>
</tr>
<tr>
<td>Communications Associate 2014-2015</td>
<td>Malorie R. Blake, MS, RD, LDN, CNSC</td>
<td><a href="mailto:mblake822@gmail.com">mblake822@gmail.com</a></td>
</tr>
<tr>
<td>Development Chair 2014-2016</td>
<td>Kristen Mancinelli, MSPH, RDN</td>
<td><a href="mailto:DIFMDevelopment@gmail.com">DIFMDevelopment@gmail.com</a></td>
</tr>
<tr>
<td>DPG Delegate 2013-2016</td>
<td>Kathie Madonna Swift, MS, RDN, LDN</td>
<td><a href="mailto:swiftdifm@gmail.com">swiftdifm@gmail.com</a></td>
</tr>
<tr>
<td>Executive Asst/Website Mgr/</td>
<td>Amy Jarck</td>
<td><a href="mailto:info@integrativeRD.org">info@integrativeRD.org</a></td>
</tr>
<tr>
<td>Newsletter Associate 2014-2015</td>
<td>Jacqueline Santora Zimmerman, MS, RDN</td>
<td><a href="mailto:jacq.zimmerman@gmail.com">jacq.zimmerman@gmail.com</a></td>
</tr>
<tr>
<td>Newsletter Editor Associate 2014-2015</td>
<td>Emily D. Moore, MS, RDN, LDN</td>
<td><a href="mailto:emilydavismoore@hotmail.com">emilydavismoore@hotmail.com</a></td>
</tr>
<tr>
<td>Newsletter Content Chair Elect 2014-2015</td>
<td>Shari B. Pollack, MPH, RDN</td>
<td><a href="mailto:sbethp@gmail.com">sbethp@gmail.com</a></td>
</tr>
<tr>
<td>Newsletter Resource Reviews Editor 2014-2015</td>
<td>Dina Ranade, RDN, LD</td>
<td><a href="mailto:dranade@comcast.net">dranade@comcast.net</a></td>
</tr>
<tr>
<td>Nominating Committee Chair 2014-2015</td>
<td>Kathy Moore, RDN, LD, CCN</td>
<td><a href="mailto:moorenutritiondifm@gmail.com">moorenutritiondifm@gmail.com</a></td>
</tr>
<tr>
<td>Nominating Committee Chair Elect 2014-2015</td>
<td>Kathy King, RD, LD</td>
<td><a href="mailto:kathyking@centurytel.net">kathyking@centurytel.net</a></td>
</tr>
<tr>
<td>Nominating Committee Member 2014-2015</td>
<td>Rita Kashi Batheja, MS, RD, CDN</td>
<td><a href="mailto:krbat1@juno.com">krbat1@juno.com</a></td>
</tr>
<tr>
<td>Nutritional Genomics Advisor 2013-2015</td>
<td>Colleen Fogarty Draper, MS, RDN, LDN</td>
<td><a href="mailto:colleen.fogarty.draaper@gmail.com">colleen.fogarty.draaper@gmail.com</a></td>
</tr>
<tr>
<td>Public Policy Chair/Policy Advocacy Leader 2013-2015</td>
<td>Ane Marie Kis, MS, RDN, LD</td>
<td><a href="mailto:amkis@verizon.net">amkis@verizon.net</a></td>
</tr>
<tr>
<td>Social Media Chair 2014-2015</td>
<td>Audrey E. Fleck, RDN, LDN</td>
<td><a href="mailto:DIFMsocialmedia@gmail.com">DIFMsocialmedia@gmail.com</a></td>
</tr>
<tr>
<td>Student Committee Chair 2014-2015</td>
<td>Olivia Wagner</td>
<td><a href="mailto:oliviawagner28@gmail.com">oliviawagner28@gmail.com</a></td>
</tr>
<tr>
<td>Academy Practice Manager 2014-2015</td>
<td>Carrie Kiley, MBA</td>
<td><a href="mailto:ckiley@eatright.org">ckiley@eatright.org</a></td>
</tr>
<tr>
<td>Fulfillment Chair 2014-2016</td>
<td>Christine Doolittle, MS, RDN, CSSD, LDN, CLT</td>
<td><a href="mailto:DIFMFulfillment@gmail.com">DIFMFulfillment@gmail.com</a></td>
</tr>
<tr>
<td>Member Services Chair 2014-2015</td>
<td>Dana Elia, RDN, LDN</td>
<td><a href="mailto:DIFMMemberServices@gmail.com">DIFMMemberServices@gmail.com</a></td>
</tr>
<tr>
<td>Network Chair 2014-2015</td>
<td>Laura Tolosi, MS, RDN, CCN</td>
<td><a href="mailto:DIFMnetworkchair@gmail.com">DIFMnetworkchair@gmail.com</a></td>
</tr>
<tr>
<td>Newsletter Editor 2014-2015</td>
<td>Sarah Harding Laidlaw, MS, RDN, MPA, CDE</td>
<td><a href="mailto:difm.policy.advocacy.leader@gmail.com">difm.policy.advocacy.leader@gmail.com</a></td>
</tr>
<tr>
<td>Professional Advancement Chair 2014-2016</td>
<td>Therese Berry, MS, RDN, LD, CNSC</td>
<td><a href="mailto:austint@coramhc.com">austint@coramhc.com</a></td>
</tr>
<tr>
<td>Professional Advancement Co-Chair 2014-2016</td>
<td>Kelly Morrow, MS, RDN</td>
<td><a href="mailto:kmorrow@bastyr.edu">kmorrow@bastyr.edu</a></td>
</tr>
<tr>
<td>Professional Advancement Associate Co-Chair 2014-2016</td>
<td>Ashley Harris, MS, RDN, CSO</td>
<td><a href="mailto:aharrisDIFM@gmail.com">aharrisDIFM@gmail.com</a></td>
</tr>
<tr>
<td>Social Media Chair 2014-2015</td>
<td>Audrey E. Fleck, RDN, LDN</td>
<td><a href="mailto:DIFMsocialmedia@gmail.com">DIFMsocialmedia@gmail.com</a></td>
</tr>
<tr>
<td>Student Committee Chair 2014-2015</td>
<td>Olivia Wagner</td>
<td><a href="mailto:oliviawagner28@gmail.com">oliviawagner28@gmail.com</a></td>
</tr>
<tr>
<td>Academy Practice Manager 2014-2015</td>
<td>Carrie Kiley, MBA</td>
<td><a href="mailto:ckiley@eatright.org">ckiley@eatright.org</a></td>
</tr>
<tr>
<td>DIFM Office Address</td>
<td>Dietitians in Integrative and Functional Medicine</td>
<td>eatright.org</td>
</tr>
</tbody>
</table>

DIFM Office Address

Dietitians in Integrative and Functional Medicine
P.O. Box 3624
Pittsfield, MA 01202
Phone: 800-279-6880
Fax: 877-862-8390
Email address: info@IntegrativeRD.org
Website: www.IntegrativeRD.org