



# Nutrition for Family Living

Susan Nitzke, Nutrition Specialist; [susan.nitzke@ces.uwex.edu](mailto:susan.nitzke@ces.uwex.edu)  
Sherry Tanumihardjo, Nutrition Specialist; [sherry.tan@ces.uwex.edu](mailto:sherry.tan@ces.uwex.edu)  
Amy Rettammel, Outreach Specialist; [arettamm@facstaff.wisc.edu](mailto:arettamm@facstaff.wisc.edu)

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## February, 2004 Topics

Straight from the Tanumihardjo Laboratory: What about commercial lutein supplements?  
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Addressing Pyramid Questions...from Amy and Susan

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## Straight from the Tanumihardjo Laboratory: What about commercial lutein supplements?

Lutein is one of the major carotenoid pigments found in human blood and may have protective effects in humans against major chronic diseases. While presumed to be an important antioxidant, lutein along with zeaxanthin, have been identified as the pigment in the back of the eye. Lutein's presence in the eye suggests that it has functions not fully determined. Crystalline lutein supplements, up to 20 milligrams (mg), are available commercially and their bioavailability has not been adequately determined.

The beneficial effects of carotenoids are potentially related to the manner in which they are absorbed, transported, and stored in the body. Researchers have studied the interaction of two common carotenoids: lutein and  $\beta$ -carotene.  $\beta$ -Carotene absorption significantly decreased absorption of lutein. Lutein, 15-26 mg, was well absorbed but the doses were administered dissolved in oil to the experimental subjects. While putting carotenoids in oil enhances carotenoid bioavailability, this type of formulation is not necessarily conducive to daily supplement use nor has it been adopted by supplement formulators.

Our research group reported (NFL 2003) that after 7 days of supplementation with 1.7 mg of lutein, an average increase in blood lutein concentration of 1.3-fold was noted in young adults from baseline indicating that the lutein supplement, which was dissolved in canola oil, was delivered in a very bioavailable form. Other published lutein supplementation studies have looked at the increase in blood lutein concentration after a long period of supplementation. When 10 mg of lutein was given for 3 months or 15 mg for one month, a 5-fold increase in blood lutein concentration occurred. Moreover, after 140 days of supplementation with 30 mg of lutein derived from marigold flowers in canola oil, a 10-fold increase was noted in blood lutein concentrations in 2 male subjects. Supplements in these studies were all made differently and therefore the absolute bioavailability between the studies cannot be compared.

In the study reported here we wanted to determine the bioavailability of a single dose of lutein with a formulation similar to what is commercially available. Our specific objectives for this study were twofold: 1) to determine to what extent lutein supplements are bioavailable and 2) to determine whether co-supplementation with either vitamin C or vitamin E influences absorption and/or blood clearance of lutein. Hence, the experiment was designed as three separate treatments: lutein only, lutein + vitamin C, and lutein + vitamin E.

Nine young adults, aged  $26.6 \pm 2.6$  y, participated in this study. Intervention treatments consisted of 18 mg of lutein softgel supplements either given alone or with 2 grams of vitamin C or 800 IU of vitamin E. Blood samples were drawn several times after the dose. The individual variation both between and within subjects (190- and 70-fold, respectively) was very high even though a standardized meal was fed at each dosing. By fitting a mathematical model of blood concentration over time, lutein is absorbed faster with simultaneous supplementation of vitamin



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C. Thus, the bioavailability of crystalline lutein from supplements varies greatly both within and between subjects and co-supplementation with another antioxidant may facilitate absorption.

Mean dietary lutein/zeaxanthin intake in the US is  $1.3 \pm 0.9$  mg/d. A  $\frac{1}{2}$  cup serving of cooked spinach provides 6.3 mg lutein/zeaxanthin; 1 cup of raw spinach provides 3.6 mg; and  $\frac{1}{2}$  cup cooked corn provides 1.5 mg. Therefore, judging by the discrepancy between mean intake and amounts found in food, people are not regularly consuming lutein containing vegetables. Another source of bioavailable lutein is egg yolk. While it only contains 190 microgram/large yolk, feeding eggs has been shown to increase macular pigment. Considering that eggs also contain cholesterol and saturated fat, it may be wise for some people to consume low-dose lutein supplements. Most lutein supplementation trials to date have fed large doses of lutein, 10-30 mg, and looked at increases in blood after 1 to 4.5 mon. Five- to ten-fold increases in lutein were measured. Thus, with repeated dosing of various formulations of lutein, blood responses are measurable. While 10 mg is reachable with diet, most people do not consume this amount.

Based on studies with crystalline  $\beta$ -carotene, high-dose supplementation has not been found to be beneficial. In fact, enhanced disease risk has been associated with high dose supplements in smokers. Follow-up studies in ferrets exposed to cigarette smoke showed that low doses of  $\beta$ -carotene had no harmful effects and may offer weak protection against lung damage while larger doses increased damage. While lutein is not a provitamin A carotenoid, its bioavailability in general is higher than  $\beta$ -carotene and therefore could counter indicate high-dose supplement usage. Our results clearly show that crystalline supplements are not uniformly bioavailable in young adults. Future studies are needed to improve supplement formulation such as testing crystalline versus oil preparations; and then testing the effect of added antioxidant.

*Implications:* The goal of most nutritionists is for people to increase their consumption of fruit and vegetables to get a wide variety of potentially beneficial phytonutrients. Several studies have shown that lutein is readily available from vegetables, even though there is competition between carotenoids. A reasonable dietary target for lutein and zeaxanthin has been estimated to be about 6 mg based on feasibility and a lower risk for later stage age-related macular degeneration. Individuals who may be at risk for macular degeneration may benefit from a low-dose, highly bioavailable supplement, if they do not consume lutein and zeaxanthin-rich food sources.

Kostic, White, Olson. Intestinal absorption, serum clearance, and interactions between lutein and  $\beta$ -carotene when administered to human adults in separate or combined oral doses. *Am J Clin Nutr* 1995;62:604-10.

Molldrem, Li, Simon, Tanumihardjo. Lutein and  $\alpha$ -carotene are bioavailable in humans from lutein yellow carrots. *Am J Clin Nutr* (In press).

Berendschot, Goldbohm, Klopping, van de Kraats, van Norel, van Norren. Influence of lutein supplementation on macular pigment, assessed with two objective techniques. *Invest Ophthalmol Vis Sci* 2000;41:3322-6.

Granado, Olmedilla, Gil-Martinez, Blanco. Lutein ester in serum after lutein supplementation in human subjects. *Br J Nutr* 1998;80:445-9.

Landrum, Bone, Joa, Kilburn, Moore, Sprague. A one year study of the macular pigment: the effect of 140 days of a lutein supplement. *Exp Eye Res* 1997;65:57-62.



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### FDA's initiatives complement "Eating well, being active" team messages

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The Food and Drug Administration (FDA) recently announced priorities and initiatives to protect and advance consumer health and safety. Their 2003 achievements included cracking down on false products and false claims and helping consumers improve their health through better information and greater "health literacy." FDA also reported major expansions of food safety activities, especially systems for mercury warnings and Listeria risk assessment.

As part of their *Consumer Health Information for Better Nutrition* initiative, FDA worked with the National Cancer Institute (NCI) to develop the following dietary guidance message: "*Diets rich in fruits and vegetables may reduce the risk of some types of cancer and other chronic diseases.*" FDA is encouraging companies that sell fruits and vegetables to use this dietary guidance statement for food labels.

(Note that this is a "dietary guidance statement" and not a "health claim" or a "structure/function claim" which have different labeling requirements for drugs and supplements.)

Implications: Repetition and consistency promote understanding and acceptance of educational messages. These FDA initiatives are a welcome step in that direction.

For more information, see

<http://www.fda.gov/bbs/topics/NEWS/2004/NEW01004.html>

<http://www.cfsan.fda.gov/%7Edms/lab-dg.html>



## Addressing Pyramid Questions...from Amy and Susan

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In December, we sent out an email asking for the most challenging Pyramid questions you've been getting lately, and some of the responses that have worked for you. We heard back from 24 counties.

You won't be surprised to find that the major theme was "too many carbs!" You said that people are doing everything from questioning the Pyramid's emphasis on carbohydrates to saying that they know the Pyramid is outdated because their nutritionist gave them a different one. Some people are even telling you that grains are the way cattle are fed and USDA doesn't know that people are different (!).

We also heard some exasperation in a few of your (email) voices. We thought this one summed it up well: "The questions are not so much challenging but rather frustrating. The ridiculous media crush about 'carbs' and Atkins; the mainstream acceptance that this is a normal way to eat and that the pyramid and apparently all nutrition experts are flawed. This is frustrating. The number of people in my office and personal life and work life who are on the Atkins diet and defend it like a religion - this is frustrating. I feel like it is an uphill battle right now, even senior citizens are jumping on the bandwagon! We are fighting against every major media source, the entertainment industry, the food industry, even occasionally physicians and nurses. I just feel out powered."

We hope this summary of information can help. You may find a response you'd like to try, or even just feel better knowing that you're not the only one out there encountering resistance when you teach the 'same old research-based information.'

We'd like to start with the themes that emerged from your emails, each accompanied by some of the responses you sent in, followed by our comments. Finally, at the end of this article, we've included a Q&A sheet, "Questions and Answers about the USDA Food Guide Pyramid," that you can use with stakeholders who have questions. We decided to do this because we've heard from a number of you that stakeholders (i.e. school nurses and principals) are questioning your use of the 'outdated' Pyramid. We hope this will help you respond.

### Question Themes (...and responses that have worked for some)

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#### **Theme 1 - Too many carbohydrates**

Responses that have worked for some of you:

- There are more nutritious (lower-fat/calorie) and less nutritious (higher-fat/calorie) choices in each category of the pyramid.
- Carbohydrates/grains are used efficiently by the body for energy – quick access
- There is a range of servings recommended from the grain group (6-11) – not just 11
- People sometimes get overwhelmed thinking about eating 6-11 servings of breads, but often realize they are consuming that or more when related to portion size.
- I collect articles from Tufts University Nutrition Letter, ADA, and the Berkeley newsletter about the issues with Atkins and other fad diets, and appropriate pyramid based diets. I use them as resources and to help give me ideas in response to other peoples' comments.
- I stress that foods from the grain group should be whole grains, like oatmeal and whole wheat bread.



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- The media touts grains as the ‘bad guy’ because the high protein, low carbohydrate diets are popular. Carbohydrate is still the preferred fuel of the body.
- The myth about starchy foods being fattening is just that; we need to watch, as with other foods, the portion size eaten and the preparation method. Excess calories of any food group will cause weight gain.
- For grains, I always turn the focus to serving sizes and show them how it could be spread out during the day.

Our comments:

Researchers compared Food Guides from 12 different countries, including the United States, and found that the core recommendation for individuals to consume large amounts of grains, vegetables, and fruits with moderate intake of meat, milk, and dairy products was consistent in all the international food guides included in the study. Thus none of the countries examined in that study recommended a high protein diet as a healthy eating pattern for their population.

<http://www.eatright.org/images/journal/0402/commentary.pdf>

### **Theme 2 – The USDA Food Guide Pyramid is out of date**

*According to your feedback, you encounter people with this opinion, but they don't all agree on what should be used instead. Some are telling you that Dr. Walt Willett's "new food guide pyramid" is the most current eating guide for Americans (this is what we heard most). Some of you are reporting that health professionals, including RD's, hand out different pyramids or alter USDA pyramid handouts before giving to patients/clients (i.e.: crossing off 2-3 servings for the milk group and writing in 3-5 instead).*

Responses that have worked for some of you:

- I tell learners that the pyramid is going through a process of revision, with an expected debut in 2005. I also tell them that they can give their opinion, and be included in the debate about how it should be revised.
- I usually say that the pyramid is developed through a form of consensus. A lot of people who really know how the body works like doctors, dietitians, nutritionists, as well as interest groups and the general public debate about how the food guide pyramid should be organized. It is not a process that can be left to any one individual or research group. We can feel comfortable that those folks who designed this pyramid know what they are doing and took many angles into consideration.
- When learners refer to the ‘new food guide pyramid’ I say, “you may be referring to the pyramid that is being presented to the public by a doctor named Walt Willett from Harvard? Actually the FGP that we have here is currently the pyramid that is presented by USDA. Willett has proposed a revised pyramid, but it has not been adopted by USDA.” If the learner persists, I tell them that they can contribute to the process that is underway for reassessing the Pyramid and updating the Dietary Guidelines if they wish. They usually decline.
- What I have said is usually something to the extent that while they are debating about the pyramid, the most important thing to remember about nutrition is to eat a variety of foods in moderation that have the key nutrients we need for health which the pyramid does provide for.
- Many people really don't understand the pyramid although they think they do. I like to focus on the bread group in teaching the



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- pyramid to adults and give visuals/measure the actual serving sizes and stress the importance of whole grains within the group. Most have somewhat different opinions after that.
- We make the following points: 1) the Pyramid has undergone more scientific scrutiny and review than anything else that's out there and when it was developed, it also underwent testing for general public "understandability"; 2) we remind people that coming up with a single symbol to help Americans eat well is a tall order. Given that, the simplistic, universally recognizable Pyramid graphic does a pretty good job.
- I tell them that the revised pyramid will likely not be that different from the current one. Many of the changes under consideration are already taught, but just not shown in the pyramid graphic itself (e.g., consuming several servings of whole-grain products daily). Nutrition education is needed to explain the pyramid because all nutrition recommendations cannot be conveyed with a simple tool alone – individual needs depend upon gender, age, activity level, and reproductive status.
- My response is simply that the pyramid is not outdated and that all of our information is research-based. We do not teach fad diet material. Working for the University, I know that all of our information is up to date and if there are any permanent changes made to the Food Guide Pyramid, we would be the first to know.

Our comments:

Health professionals and scientists with good credentials are questioning the USDA Food Guide Pyramid and supporting other pyramids, most notably Willett's. Nutrition researchers often have conflicting views, even though they are all based in science – this is the nature of scientific research. Because of that, we think that a process that seeks scientific consensus across institutions and research groups, seeks public comment, and tests consumer understanding, holds up to scrutiny better than a proposed pyramid revision from one research group that has not sought this kind of consensus nor undergone this kind of testing. Willett's proposal ought to be (and is) one of the pieces of public comment that is considered by the scientific panel reviewing the Dietary Guidelines.

With regard to altering the milk group servings on the pyramid (crossing out 2-3 and writing in 3-5), we think that kind of alteration can only be justified after fully understanding the scientific basis that the Dietary Guidelines committee used to support that recommendation, in the context of the entire eating pattern being recommended in the DGAs, and providing enough new scientific evidence to overcome the evidence that backed the initial recommendation. The panel of scientists that considers new research and develops revisions for the DGAs every 5 years fills that role. Therefore, we use the Food Guide Pyramid in nutrition education as it is written, for a general healthy American population.

**There were three other concerns that surfaced, but not with enough frequency to be a 'theme.' Nevertheless we'd like to help you address them, so we've provided our own comments in response to each concern:**

### **Special interests dictate the content of USDA's Food Guide Pyramid**

- The Dietary Guidelines for Americans (DGAs) dictate the content of the Food Guide Pyramid (FGP). This is because the FGP was developed as the graphic representation of the DGAs. To understand how FGP content is determined, you must understand how the DGAs are determined.



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- The DGAs are the cornerstone of Federal nutrition policy and nutrition education activities. They are jointly issued by USDA and DHHS and updated every 5 years. The DGAs are updated by a scientific panel that is jointly appointed by the secretaries of USDA and DHHS. The panel membership and transcripts of their meetings are a matter of public record, and public comments are accepted throughout the process. Incidentally, the 13-member panel that is working on the 2005 DGA's had their first meeting in September. The meeting summary is available online, and includes an outline for how they will proceed:  
<http://www.usda.gov/cnpp/DG2005/index.html>
- There are numerous stakeholders involved in the review process, including policymakers; nutrition and health educators; health care providers; food, nutrition, and health organizations; trade associations and industry; media; and consumers.
- The Food Guide Pyramid is currently being reassessed for the first time since its release more than 10 years ago. New nutritional recommendations have emerged since then, including the new Dietary Reference Intakes for many nutrients and two revisions of the Dietary Guidelines. New information is also available about food consumption, through national surveys.
- USDA is gathering and using three types of information in the Pyramid reassessment process: technical information, consumer feedback, and stakeholder input. The science behind the DGAs will be reflected in the new FGP, including any changes to the content. This site provides more information, including links to meeting summaries and instructions for submitting comments for both the DGA and FGP revision processes:  
<http://www.usda.gov/cnpp/DG2005/index.html>

### **It's so hard to argue with people who believe in fad diets, especially when the diets have 'worked' for them.**

- This is very true, and has always been true, but this current low-carb diet craze seems to have particular fervor. We think that's due to a combination of things, one of which is the obesity epidemic. Partly as a result of rising obesity rates, there are widespread problems of insulin resistance, metabolic syndrome, and type 2 diabetes on the rise. These are health conditions that legitimately require a close monitoring of carbohydrate intake.
- While health professionals can adapt them for use in medical nutrition therapy, the Food Guide Pyramid and Dietary Guidelines are not written for Americans with insulin resistance, metabolic syndrome, diabetes, or other health conditions. The FGP and DGs are written to help healthy Americans prevent chronic disease.
- There are no magic words you can use to discourage a person from following a fad diet. What you can do is provide education about eating patterns that optimize health, and help people strategize ways they can fit these patterns into their daily lives. The education you provide can only come out of the best research-based, consensus-supported knowledge we have at any given time.
- It may help to recognize that there may be an inherent media and public interest in stories that suggest someone is going against the establishment. This may be part of what makes stories that criticize the FGP or lowfat/high carbohydrate eating patterns so attractive. This is something that is probably impossible to refute just with science. (We'd like to thank Beth Olson, Asst. Professor and Nutrition Specialist in Michigan, for sharing this insight with us).
- Keep in mind that people started going on Atkins-style low-carb diets in the 70s, and obesity rates have continued to climb during that period. Low-carb diets are not a "magic bullet," though some people have found it "works for them," at least for a few months. James Hill and others who have been gathering data on how people who are successful dieters (adults who



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have maintained a weight loss of 30 pounds or more for over a year) show that successful dieters have tended to restrict their calorie intake in many ways – more often less fat than low carb. They almost always are faithful exercisers. Abstracts of studies from the weight control registry are available on the web:

[http://www.lifespan.org/Services/BMed/Wt\\_loss/NWCR/Research/default.htm](http://www.lifespan.org/Services/BMed/Wt_loss/NWCR/Research/default.htm)

### **Because of its emphasis on grains, the USDA Food Guide Pyramid is for cattle, not humans.**

- The FGP was designed as a tool for helping people follow the Dietary Guidelines for Americans (DGAs). Nutrition scientists with expertise in human nutrition, not animal nutrition, devised recommendations in the DGAs. Just as UW-Extension has experts on cattle feeding who may express opinions but don't write our human nutrition education materials, similar combinations of colleagues exist at USDA. If you're curious, UW-Extension publications about appropriate cattle nutrition are available online at <http://cecommerce.uwex.edu/>.

## QUESTIONS AND ANSWERS ABOUT THE USDA FOOD GUIDE PYRAMID

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### Isn't there a new pyramid?

Not yet. The United States Department of Agriculture (USDA) is in the process of reassessing the Food Guide Pyramid (FGP) for the first time since it was introduced more than 10 years ago.

In the December 2002 issue of *Scientific American* magazine, Walt Willett and Meir Stampfer, professors of medicine, epidemiology, and nutrition at Harvard, proposed a revised pyramid. They wrote, "The USDA's Center for Nutrition Policy and Promotion is now reassessing the pyramid, but this effort is not expected to be completed until 2004. In the meantime, we have drawn up a new pyramid that better reflects the current understanding of the relation between diet and health."

While the pyramid proposed by Willett and Stampfer has received much attention, the USDA has not adopted that version. UW-Extension continues to use the USDA FGP and will begin using the new version of that pyramid when it becomes available (projected 2005).

### Understanding revision of the USDA Food Guide Pyramid.

There are currently two processes occurring simultaneously to assess the Federal government's nutrition recommendations for the public. One is the review of the Dietary Guidelines for Americans (DGAs) and the other is reassessment of the Food Guide Pyramid (FGP). This takes awhile because both processes seek scientific consensus, public comment, and testing of new messages for consumer understanding.

The FGP was released in 1992 as the teaching tool for conveying the messages contained in the DGAs. Therefore to understand how FGP content is determined, you must understand how the DGAs are determined.

The DGAs are the cornerstone of Federal nutrition policy and nutrition education activities. By Congressional mandate, the DGAs must be reviewed every 5 years in the context of the most recent body of scientific evidence. The DGAs are updated through deliberation by a scientific panel that is jointly appointed by the secretaries of USDA and the Department of Health and Human Services (currently Ann Veneman and Tommy Thompson, respectively). There is currently a 13-member panel developing recommendations for the 2005 DGAs. The panel membership and transcripts of their meetings are a matter of public record, and public comments are accepted throughout the process.

The FGP is being reassessed for the following reasons: official nutritional recommendations have been revised or developed since the pyramid's release, including the new Dietary Reference Intakes for many nutrients and two edits of the DGAs. New information is also available about food consumption, through national surveys.

USDA is gathering and using three types of information in the pyramid reassessment process: technical information, consumer feedback, and stakeholder input. The science behind the DGAs will be reflected in the new FGP, including any changes to the content.

This site provides more information, including links to meeting summaries and instructions for submitting comments for the DGA revision processes (the FGP public comment period is over): <http://www.usda.gov/cnpp/DG2005/index.html>

**Will the revised pyramid put less emphasis on carbohydrates?**

The FGP is advice for the general public, and therefore it is not likely to de-emphasize carbohydrates. Governments around the world emphasize grains, fruits, and vegetables in the eating patterns they recommend to keep their populations healthy. This is because basic human metabolism requires that most calories come in the form of energy that is easy to access. This function is well served by a diet high in high-carbohydrate foods, like grains, fruits, and vegetables.

Many Americans have health conditions, like diabetes, that require them to carefully monitor their carbohydrate intake. These Americans require individualized care by health professionals who can provide medical nutrition therapy and monitor their progress. The FGP, while health professionals can adapt it, was not designed for people with health conditions. It was designed to recommend an eating pattern that helps prevent chronic disease, like diabetes, heart disease, and some cancers.

The low carbohydrate diet craze has a long history in America. It may be particularly appealing in the face of the current rise in obesity. While it may provide weight loss in the short-term, a low carbohydrate, high protein diet is not recommended as a way to keep a population healthy in the long term.

You can read more about the proposed changes to the FGP here:

<http://www.usda.gov/cnpp/pyramid-update/index.html>

Authors: Amy Rettammel MS RD, UW-Extension Outreach Specialist and Susan Nitzke PhD RD, UW-Extension Nutrition Specialist. JANUARY 2004.