

New Insights on the Nature of Food Quality

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Presentation Outline

- Organic Center 101
- Nutrient and Mineral Density
- Fatty Acid and Lipid Profiles
- Antioxidants and Polyphenols
- How Organic Food Can Help Confront the Obesity Crisis



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Organic Center 101

Our Mission

...to promote research and science-based consumer education on the human health and environmental benefits of organic food and farming systems.



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The Challenge

More and better scientific evidence is needed to prove and quantify the many different benefits that are associated with organic food and farming systems.



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Science-Side Activities

- State of Science Reviews (SSRs)
- Identifying research priorities and finding ways to initiate and fund priority projects
- Highlighting "Hot Science"

<http://www.organic-center.org/science.htm?groupid=8>

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Consumer-Side Activities

- Tracking consumer attitudes, interests, and understanding of the organic benefit
- Providing information that brings home to people the nature of the organic benefit

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Consumer-Side Activities, cont.

- Helping organic farmers, food companies, and the retail sector communicate the latest scientific findings in clear and meaningful ways

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Who Guides the Work of the Organic Center?

- 14 member Board of Directors
<http://www.organic-center.org/about.htm>
- 26 member Scientific and Technical Advisory Committee (STAC)
<http://www.organic-center.org/about3.htm>
- 25 member Communications and Education Committee (C&E)

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Executive Summary of the First SSR...

Released in May 2004...

Posted on the Center website.



What we know today is just the tip of the...



Protecting the most vulnerable



Premature birth: A silent crisis

Every day 1 in 8 babies born in the U.S. arrives too soon. Premature birth can happen to any woman and be life threatening for her baby.

March of Dimes

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Many Epidemics

ADHD
ADHD

Prematurity Low-birth weight

Asthma Autism

Asperger's syndrome learning disabilities

Hypospadias Falling sperm counts

Leukemia Testicular cancer

Breast cancer

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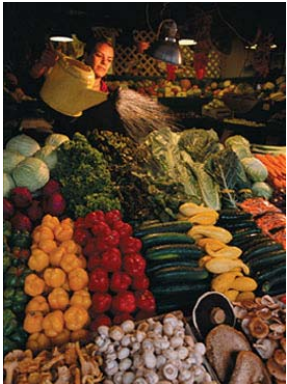


Photo by Jim Richardson
National Geographic May 2002

The fundamental problem

The goal of US agriculture has been quantity, not quality

- More bushels per acre
- More pounds of milk per cow
- More bags, boxes, litres.....

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Dimensions of food quality sacrificed in the quest for quantity at lowest cost

- Nutrient and mineral content
- Protein quality and levels
- Freshness, flavor and taste
- Concern for animal welfare
- Distinctive regional or varietal characteristics

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FOCUS: The roots of nutritional quality

- Vitamin, mineral and protein content and quality
- Fatty acids and lipid content
- Antioxidants and polyphenols
- How organic food can help change consumer behavior and help address public health challenge # 1 – obesity and its complications, especially diabetes and heart disease

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Nutrient content and density

- Clear-cut benefits from higher concentrations per ounce and per calorie
- Critical dimension of the 'organic premium'
- Supports rethinking of 'yield' goals

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More on nutrient content and density

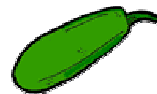
- Increasing the concentration of nutrients is needed for only some constituents in food (not protein and total fat)
- Big difference between health maintenance levels and therapeutic and/or disease preventive levels of nutrients/minerals

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Nutrient dilution

More water and bulk in conventionally grown crops tends to dilute the nutrients



Organically grown



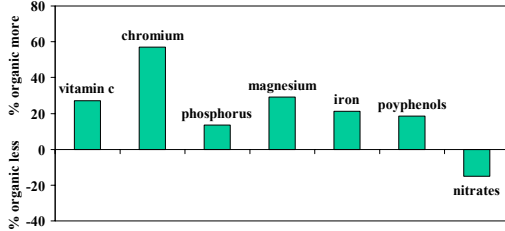
Conventionally grown

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Organic Compared to Conventional Crops

(Percent Difference in Nutrient Content)



V. Worthington, 2001, *Journal of Altern. Complim. Med.*



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Hot Science

“New Science Supports Old Advice – ‘Eat a Variety of Foods’ – and Highlights the Need to Increase Nutrient Density”

USDA study of 10,000 healthy adults focused on 15 key nutrients.

- ~ 38% had inadequate intakes of all 15 nutrients (average of men & women)
- Only 6.8% of women and 14.1% of men had adequate intakes of vitamin E
- Diversity of consumption in the dairy and fruit group increased the odds of adequate intake across the 15 nutrients studied

Source: Foote et al., *The Journal of Nutrition*, Vol. 134, No. 7, July 2004.



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Improving fatty acid profiles



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Beneficial fats

Omega-3s:

- anti-inflammatory
- anti-pain
- help prevent blood clots

CLA (conjugated linoleic acid):

- cancer protection
- weight control



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Beneficial (essential) fats for babies

CLA may help prevent cancer and obesity

Omega-3 fats needed for development of vision, nervous system and IQ

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Hot Science – “Health Benefits of Conjugated Linoleic Acid (CLA)”

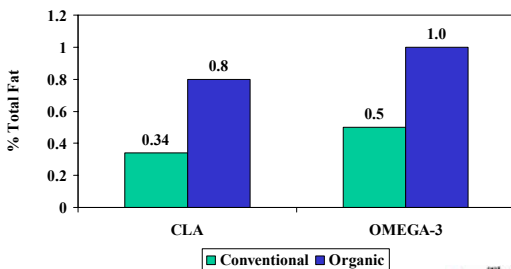
- 3,500 mg/day of CLA will deliver most of the health benefits associated with CLA consumption
- Contemporary levels of consumption way below 3,500 mg/day
- Organic production systems can increase CLA levels three to five-fold, and sometimes 10-fold in some meat and poultry products

Source: Angel, *Journal of Clinical Nutrition*, June 2004 Supplement.

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Beneficial fats in cow's milk



V. Worthington, 2001, *J. of Altern. Complim. Med.*

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Hot Science

“Scientists Identify Key Lipid-Lowering Ingredients in Soybeans”

- Italian scientists have discovered the protein in soybeans that lowers LDL
- Works by up-regulating the Beta-VLDL receptor in the liver

“The results...are extremely intriguing because they show for the first time that a dietary protein is active at concentrations that are lower than those reported for hypolipidemic drugs.”

Duranti et al., *The Journal of Nutrition*, Vol. 134, No. 6, June 2004.

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Impacts of organic farming and processing on antioxidant levels

- Priority area for the Organic Center
- SSR scheduled for release in late 2004



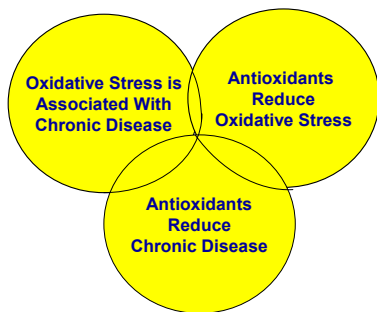
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Three projects initiated in 2004

- World Vegetable Center
 - ✓ lycopene in tomatoes
- WSU Team
 - ✓ strawberry fruit quality
- Tufts University
 - ✓ test methodologies and preliminary assessment of comparative levels



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Source: Dr. Jeff Blumberg, Tufts University



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Institute of Medicine, Food and Nutrition Board Panel on Dietary Antioxidants and Related Compounds

Criteria for defining an antioxidant:

1. The substance is found in human diets.
2. The content of the substance has been measured in foods commonly consumed and can be calculated from available national databases.
3. In humans, the substance decreases the adverse effects of ROS and RNS *in vivo*.

National Academy Press, 1998



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Chronic degenerative diseases associated with free radical damage

| | |
|-------------------------------------|---|
| Adult respiratory distress syndrome | Familial amyotrophic age-related macular degeneration |
| Alcoholism | Hemorrhagic shock |
| Aluminum neurotoxicity | Inflammation |
| Alzheimer's disease | Ischemia |
| Cancer | Pancreatitis |
| Cardiovascular disease | Parkinson's disease |
| Cataracts | Porphyria |
| Diabetes | Rheumatoid arthritis |

Source: Dr. Jeff Blumberg, Tufts University

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Antioxidant Defense Network

Endogenous

- ENZYMATIC
 - catalase (Fe)
 - glutathione peroxidase (Se)
 - superoxide dismutases (Mn, Cu/Zn)
- CELLULAR
 - glutathione
 - α-lipoic acid
 - ubiquinone
 - uric acid
- PROTEIN
 - ceruloplasmin
 - ferritin
 - transferrin

Exogenous

- ascorbic acid
- tocopherols/tocotrienols
- carotenoids
- phenolic acids
- polyphenolics

Source: Dr. Jeff Blumberg, Tufts University

Flavonoid consumption in several countries

| Country | Flavonoids Evaluated | Intake (mg/d) |
|---------------|----------------------|---------------|
| Holland | 2 flavones | 23 |
| | 3 flavonols | |
| | 6 flavan-3-ols | |
| | 4 isoflavones | |
| | <i>total</i> | 73 |
| Japan | 1 flavone | <1 |
| | 4 flavonols | 16 |
| | 2 isoflavones | 47 |
| | <i>total</i> | 63 |
| United States | 2 flavones | <1 |
| | 3 flavonols | 20-22 |
| | 4 isoflavones | <1 |
| | <i>total</i> | 12 |
| | <i>total</i> | 20-34 |

(continued on next slide)

Flavonoid consumption in several countries

| Country | Flavonoids Evaluated | Intake (mg/d) |
|---------|----------------------|---------------|
| Denmark | 3 flavanones | 7-14 |
| | 1 flavone | 1-2 |
| | 2 flavonols | 15-30 |
| | <i>total</i> | 23-46 |
| Finland | 3 flavanones | 20 |
| | 2 flavones | <1 |
| | 4 flavonols | 4 |
| | <i>total</i> | 24 |

Sources: Dragstead et al. *Eur J Can Prevention* 1997, Knekt et al. *Am J Clin Nutr* 2002, Hertog et al. *Nutr Cancer* 1993, Arts et al. *Eur J Clin Nutr* 2001, Boker et al. *J Nutr* 2002, Arai et al. *J Nutr* 2000, Sampson et al. *J Am Diet Assoc* 2002, de Kleijn et al. *J Nutr* 2001, Wu et al. *Carcinogenesis* 2002

Hot Science

"Something Going On – The Health Benefits from Antioxidants in Produce Prove Superior to Benefits from Supplements"

- Three groups: no fruits and vegetables plus placebo; six servings per day of fruits and veggies; no f&v plus a pill with same level of known vitamins and minerals as the six servings
- Group consuming fruits and veggies had more antioxidant activity than the other groups

Dragsted et al., *American Journal of Clinical Research*, Vol. 79, No. 6, June 2004.

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So many choices.....



Photo by Jim Richardson
National Geographic May 2002

The obesity epidemic



The obesity and diabetes epidemics -- Public Health Challenge # 1

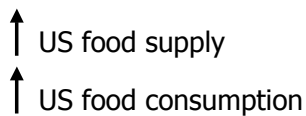
- Critical challenge for the whole of society, not just health care providers, policy makers, the food industry and farmers
- Enormous personal and cultural changes will be needed
- Ways that organic food can contribute

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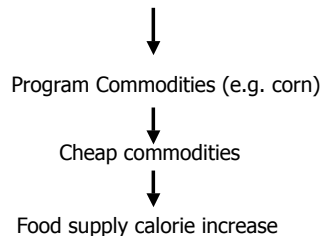
Obesity epidemic factors

ENERGY INTAKE is a function of --



Obesity epidemic factors

Agricultural policy promotes excess food production



Obesity epidemic factors

Energy intake of children --

- Rising caloric intake driven by high sugar foods and drinks
- 2% meet food guide pyramid recommendations
- Soft drinks displace milk and fruit juice
- "Fast foods" available in 98% of Senior High Schools
- Each additional can of soda/day increases risk of being overweight by 60%

Source: Slide 13, Susan Roberts, "Policy Options for Promoting Healthy Environments to Address the Global Obesity Epidemic," presentation before the 2003 Society of Nutrition Education annual meeting

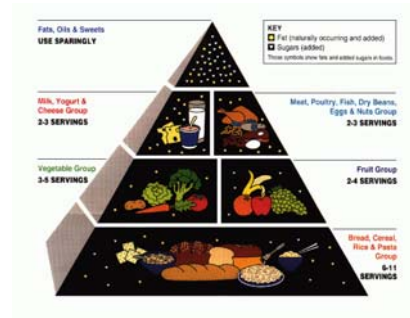
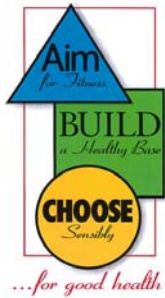


Nutrition related disease

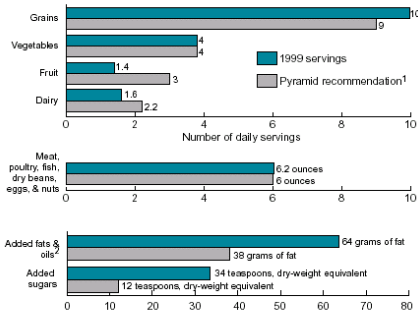
- Many have their roots in excess, not unlike many of the production problems in the US agricultural system
- Food choice and energy balance are at the core of disease management
- So how well does mainstream nutrition advice and education guide and motivate people to make good food choices?



USDA's Dietary Guidelines for Healthy Americans 2000, 5th edition



1999 Food Supply Servings Compared With Food Guide Pyramid Serving Recommendations



¹Pyramid recommendation based on a sample diet of 2,200 calories.
²The Food Guide Pyramid does not make a recommendation for added fats and oils. This recommendation is implied by the 52-percent share of total fats accounted for by added fats and oils in the food supply in 1997 and an upper limit on total fat consumption of 73 grams for a 2,200-calorie diet.
 Source: USDA's Economic Research Service.

USDA is slated to revise the Dietary Guidelines for Healthy Americans in 2005

"The term 'sound science' has become a misnomer and now nearly translates into the precise opposite of its apparent meaning."

"There will never be enough sound science to prompt any industry association promoting salt, sugar or beef to agree that consumers should eat less of their commodity."

Tom Karst, *The Packer* Feb. 3, 2004

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Shaping attitudes

The general population has lost touch with the source and character of food. Why?

- Too many choices (>16,000 new food products introduced per year)?
- Lack of a basic understanding of nutrition?
- Lack of connected-ness to food production?

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An ongoing challenge -- managing diabetes and preventing its complications

- Millions of patients understand the importance of changing their diet but lack the motivation to change life-long habits.
- The traditional model of nutrition education is to tell people what to eat and what not to eat. The diet plan is the main "deliverable."
- Fewer than ~50% of patients are successful in changing their diets to best promote good health.

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An ongoing challenge -- managing diabetes and preventing its complications

- Novel ways are needed to motivate people to think differently about food choices in order to reach the other ~50%
- The emerging paradigm entails identifying and cultivating new dimensions in a person's relationship with food

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New paradigm approaches to help manage diabetes

Whatever works to foster a new connection with food that can then become a lever for dietary change –

- Grow a garden, build a new diet around the harvest
- Seek out local and/or organic food
- Join a CSA, visit the farmers market
- Pursue an active outdoor activity associated with growing or harvesting food
- Food as a cultural and political statement (i.e., the slow food movement, opposition to biotech and factory farming)

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