The Science of Organics

Nourishing the Land, Animals and People in the 21st Century

PRESENTED BY:

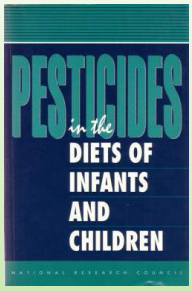
Charles Benbrook, PhD
The Organic Center

Meg Cattell, DVM, MS
Windsor Dairy/Dairy
Research & Technology LLC

Topics Covered

Food Quality	Food Safety	Dairy & Milk
Taste	Pesticides	Taste
Nutrient Content	Antibiotics	Nutrient Content
Antioxidants		Antioxidants
		Antibiotics
		Pesticides

New Scientific Consensus on Pesticide Risks



Regulation must protect the most vulnerable --

- Mom and the developing fetus
- Infants
- Children through adolescence
- The elderly

Source: NAS/NRC, 1993

Pesticide Exposures Surprisingly Common

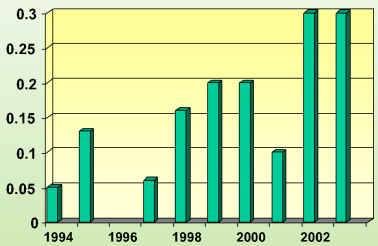
For individuals under 20 years of age on a **daily** basis --

- 200 million exposures in food
- 250 million exposures through drinking water
- Average of **five** exposures through food and water combined

Source: Frequency of residues data from PDP results; servings data from USDA

Over 500,000 Over-Tolerance Exposures Daily, and Rising

Percent of PDP samples found to have residues exceeding the established EPA tolerances, 1994-2003

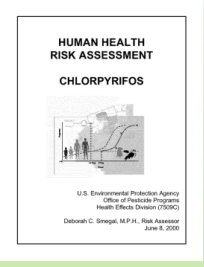


Contemporary Pesticide Risks

Organophosphate (OP) insecticides pose the greatest risks --

- EPA's dominant focus in implementing the FQPA

JOB FAR FROM DONE!



Significant Research

"Pesticide exposures in children with non-Hodgkin lymphoma"
(Buckley et. al., 2000. *Cancer* **89**:2315-21)

Exposures during fetal development and in early infancy increased non-Hodgkin lymphoma risk --odds ratios of 9.6 for Burkitt lymphoma!!

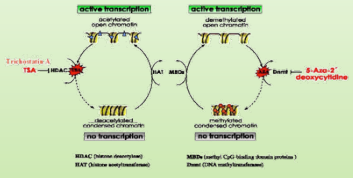
Significant Research

"Critical windows of exposure to household pesticides and risk of childhood leukemia"
(Ma et. al., 2002. *Environ Health Perspectives* **110**:955-60)

- Exposures heighten the risk of leukemia
- The more frequent exposures, earlier in life, the greater the risk

Enduring Consequences

Both a woman's egg and a man's sperm are extraordinarily vulnerable and can carry heritable epigenetic changes from one generation to the next… and the next….and the next



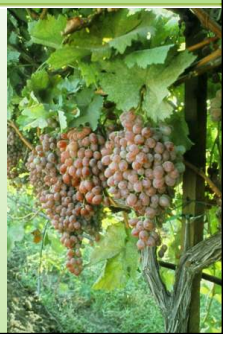
Source: Anway et al., 2005, *Science*

EPA's 2001 Cumulative Risk Assessment of the OPs

73% total OP dietary risk –

- Dimethoate/omethoate in grapes and apples
- Azinphos methyl in apples and pears

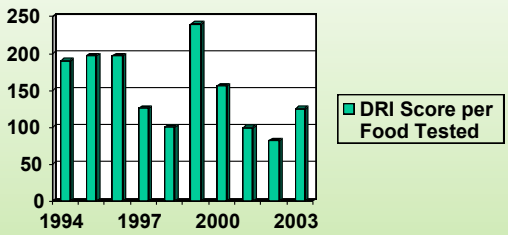
Four foods account for 85% risk (grapes, apples, pears, beans)



Growing Importance of Imports

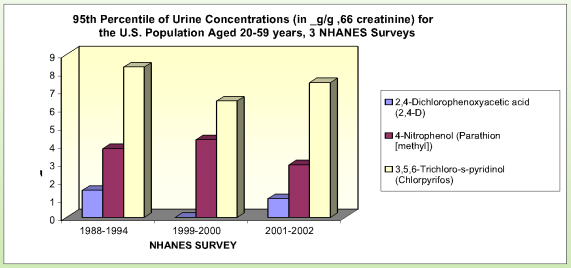
- Domestic DRI scores per crop tested down from 225 in 1994 to 65 in 2003
- Import DRI scores up from 98 to 244
- Combined DRI scores fell 191 to 126, or 34%

Dietary Risk Index – EPA Office of Inspector General Analysis



Source: Residue data from the PDP, 1994-2003

Human Exposure to Three Major Pesticides: Not Much Progress



Options to Reduce Pesticide Risks, Ranked by Effectiveness

- Switch to organic
- Biointensive pest management systems (but not "conventional" IPM)
- Reduced-risk pesticides
- Regulation
- Marketplace incentives and ecolabels

Source: Successes and Lost Opportunities, "Organic Center Critical Issue Report 2006"

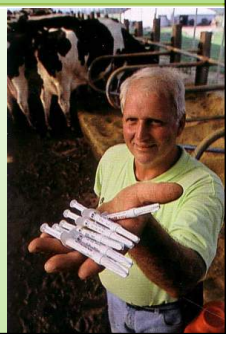
Increasing Milk Production Levels

	1995	1997	1999	2001	2004	2005
Average Production per Cow (pounds)	16,405	16,871	17,772	18,139	18,967	19,576
Percent Change		2.8%	5.3%	2.1%	4.6%	3.2%

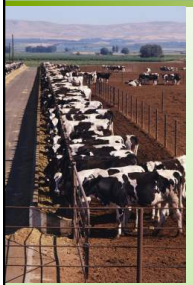
Source: "Characteristics and Production Costs of U.S. Dairy Operations," ERS, Feb. 200

Costs of Today's High-End Levels of Production

- Lameness and foot problems
- Shortened lifespan
- Reproductive problems
- High vet and drug costs



Increasing Production



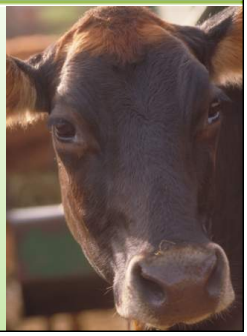
"The increase in production has been accompanied by declining ability to reproduce, increasing incidence of health problems, and declining longevity in modern dairy cows."

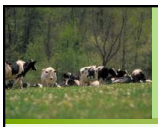
Source: "Selection for Increased Production and Welfare of Diary Cows: Are New Breeding Goals Needed?" Oltenacu and Algers, AMBIO, Vol.34, No. 4

Increasing Production

"Genetic selection for increased milk yield increasingly is viewed as increasing profit at the expense of reducing animal welfare."

Source: "Selection for Increased Production and Welfare of Diary Cows: Are New Breeding Goals Needed?" Oltenacu and Algers, AMBIO, Vol.34, No. 4





Call for a New Focus on Animal Welfare

"The economic future of the dairy industry is related directly to public acceptance of its breeding and production practices."

"A new breeding goal aimed at improving fitness and tolerance of metabolic stress is necessary to prevent the decrease in the quality of life of diary cows and instead, perhaps, enhance it."

Source: Oltenacu and Algers, AMBIO, Vol.34, No. 4

Are Today's High-End Levels of Production Sustainable?

The average cull rate in the NAHMS 2002 Dairy survey is 25.5% (APHIS, June, 2003); range 15% - 50%?

Average cow in California produces a little over 2 lactations

Are cows that burn themselves out in two lactations healthy?

Professional Concerns Over Ever-Higher Production Levels

"…the improvement in the genetic merit of dairy cows for production is being accompanied by deterioration in fertility."

"Health issues, such as metritis, ketosis, or lameness, can change in incidence from being a minor to a major problem."

Source: Tsuruta et al., J. Dairy Science, Vol. 88, 2005

Changes in Longevity and Production

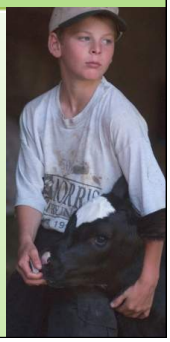
1960s – average cow had 3.4 parities (pregnancies)

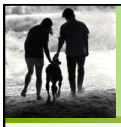
1980s – average cow had 2.8 parities; today?

1975 vs.1995 production up 3,323 kilograms (7,310 pounds, or about 64%)

Average increase per cow per year since 1975 = 313 pounds

Source: Tsuruta et al., J. Dairy Science, Vol. 88, 2005





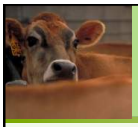
Changes in Longevity and Production

Odds of culling 1st, 2nd, 3rd lactation = 17%, 35%, 47%

Farmers milking first-lactation cull cows much longer – 226 days in 1960s-70s versus 386 days in 1990s

Increase in milk production associated with increase in days open

Source: Tsuruta et al., J. Dairy Science, Vol. 88, 2005



Changes in Longevity and Production

"…today's cows may be too effective at converting their body reserves into usable energy, whereby they are at an elevated risk level of being culled throughout their entire life."

Source: Tsuruta et al., J. Dairy Science, Vol. 88, 2005

Do Cows Remain in Production Longer on Organic Farms?

Conventional Wisdom

Cows on many organic farms produce through four or more lactations

- Better data needed to accurately compare longevity on conventional and organic farms
- Many factors impact cull rates

Organic Center Cow Health Study

Major three year effort – just underway

Will draw on 2005 ARMS and 2007 NAHMS survey results to full extent possible

Critical parameters -- longevity, average number of lactations, reasons for culling, veterinary and drug expenditures, somatic cell counts, frequency of mastitis and lameness, and reproductive performance

Antibiotic Use in Animal Production

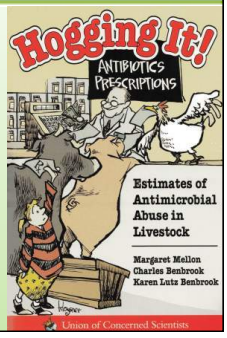
Antibiotic Use in Animal Production

Union of Concerned Scientist report released Jan. 8, 2001

Major impact on debate

Major findings never seriously disputed

Access text at: http://www.ucsusa.org



"Hoggin It" Findings

Total Annual Antimicrobial Use

	Total Use (pounds)	Percent Total Use
Beef	**3,693,017**	**15.0%**
Swine	**10,348,596**	**42.1%**
Poultry	**10,535,926**	**42.9%**
	24,577,539	

Trends in Antimicrobial Use per Animal

	1985*	Late 1990s	Percent Change
Beef	2,889,573	3,693,017	28%
Swine	11,710,650	10,378,596	-11.6%
Poultry	3,436,140	10,535,926	307%
	18,036,363	24,577,539	36.3%

•1985 use assuming the number of beef cattle, swine, and poultry produced in 1984 equaled late 1990s herd/flock size.

"Conventional Wisdom" Annual Estimates Prior to *'Hogging It'*

Total use (per NAS) = 50 million pounds

Total use in agriculture (per AHI) = 17.8 million pounds

Total use in humans = 32.2 million pounds

(Human use calculated: 50 – 17.8 = 32.2)

"Hoggin It"

	Total Pounds	Percent Total Use
Human Uses		
Inpatient	900,000	3%
Outpatient	2,100,000	6%
Total Disease Treatment	3,000,000	9%
Other Human Use	1,500,000	4%
All Human Uses	4,500,000	13%

Non-Human Antimicrobial Use

	Total Pounds	Percent Total Use
Livestock Uses		
Non-therapeutic (3 species)	24,600,000	70%
Non-therapeutic (other)	3,000,000	8.5%
Therapeutic (all species)	2,000,000	5.7%
Pesticide Uses	50,000	0.1%
Companion Animals	1,000,000	2.8%
Total Non-Human Uses	30,600,000	87%
Human Use	4,500,000	
Total Use	35,100,000	

Shares of Total Antimicrobial Use

	Conventional Wisdom AHI	Hoggin It
Animal	34%	84%
Human Medicine	66%	9%
Other	-----	7%

Estimating the Cost of Resistance and Foodborne Pathogens

Resistant infections require –

- An average 30% longer treatment,
- 50% higher doses, and
- Drugs that are, on average, twice as expensive

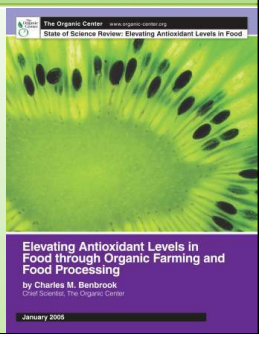
"Hoggin It" Conclusions

Pounds of antibiotics used in treating largely healthy (although stressed) animals exceeds human use about 8 to 1

Antioxidants

Critical role in health promotion

Average antioxidant intakes are about one-third optimal levels – a major reason why USDA is recommending a 2X increase in fruit and veggies intakes

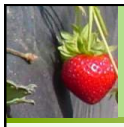


Antioxidants

People need antioxidant-rich foods every meal

Organic production increases antioxidant concentrations, on average, about 30%

- Lycopene in organic catsup up over 50%
- Organic produce delivers more antioxidant capacity per calorie



Phytochemicals in Strawberries

(units per g FW)	CON	ORG	METHOD
Polyphenols (mg gallic acid)	1.22 B	1.37 A	Folin-Ciocalteu
Flavonoids (Abs 325 nm)	14.0 B	15.6 A	HCl-methanol
Anthocyanins (μmol)	319 B	350 A	HCl-methanol Pelargonidyn-3-glucoside

Source: Unpublished findings of Organic Center Fruit Quality Project

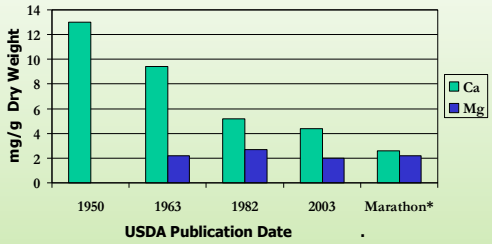
Conclusions from Apple and Strawberry Studies

- Organic yields are often lower and fruit size smaller, but fruit stores and tastes better
- Organic apples are as firm, or firmer and organic strawberries are sweeter
- Organic fruit has, on average, higher antioxidant activity and polyphenol content

The Dilution Effect

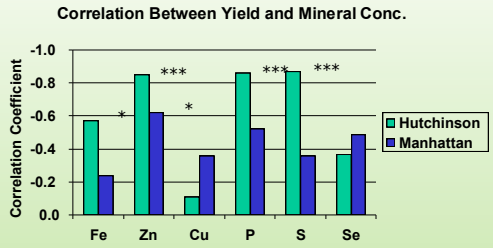
- Yield-enhancing methods tend to decrease nutrient concentrations
- Term first used in Jarrell WM, Beverly RB. Advances in Agronomy, 1981; 34:197–224

Calcium & Magnesium Trends in Broccoli



*Source: Farnham et al., J Amer Hort Sci, 2000; 125:344

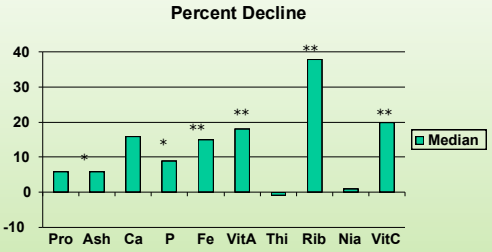
Dilution Effect in14 Wheats, Introduced 1873 to 1995



* P < 0.05
*** P < 0.001

Garvin, et al. poster, ASA/CSSA/SSSA meeting, 2002
Garvin, Welch & Finley, J. Sci. Food Agric., in press, 2006

Trends in 43 Garden Crops: 1950 to 1999



* P < 0.05
** P < 0.01

Davis et al., J Am Coll Nutr, 2004; 23:669

TOC Nutrient Content SSR: Summer 2007

Meta-analysis of 83 published Studies

Studies screened for experimental design and analytical method

Will help settle lingering debate over whether organic farming systems increase nutrient concentrations

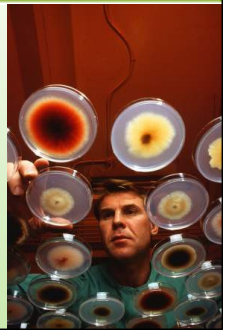
Food Safety Risks: Mycotoxins

Breaking the Mold: Impacts of Organic and Conventional Farming Systems on Mycotoxins in Food and Livestock Feed

September 2005

"Breaking the Mold" Findings

- Nine studies allow 24 direct comparisons, most involving wheat and DON
- Mycotoxins found in conventional samples about 50% more frequently at a little over twice the average level



"Breaking the Mold" Findings

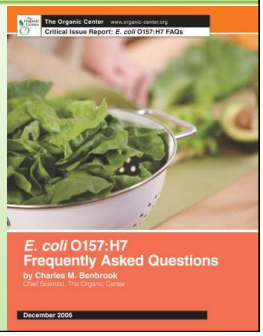
Organic systems can reduce fungal infections and mycotoxin formation –

- Lower N levels slow fungal growth
- Sublethal doses of fungicides trigger mycotoxin production
- Proper drying/storage key in all systems

E. Coli O157 Outbreak

September 2006 *E. Coli* O157 Outbreak

- 204 cases, three deaths
- Growers nationwide impacted
- Conventional Dole baby spinach packed on August 15 at NSF-leased plant
- Outbreak field on Paicines Ranch was in transition to organic



Causes of the Outbreak

Field directly adjacent to hundreds of acres of cattle pasture

O157 bacteria in cow manure could have reached field via irrigation water, dust, or wildlife

Dust gaining ground as the most plausible explanation

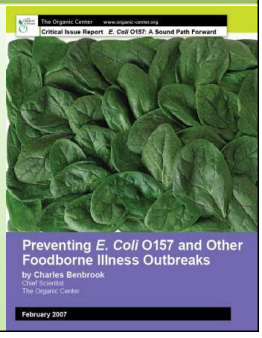
Known Outbreak Risk Factors

Irrigation systems impact risk of bacterial contamination

Runoff from dairies or CAFOs poses huge food safety risks if fresh cut vegetables are grown nearby

Preventing Future Outbreaks

- Separate cows and fresh cut fields by at least one-half mile
- Rigorously enforce stricter compost and soil amendment standards
- Plug big holes in the GAP Metrics
- Study and exploit potential of organic systems to prevent colonization and slow proliferation
- Adopt "firewall" testing programs in the processing plant

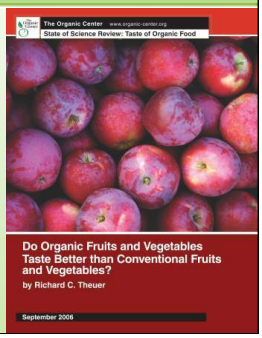


Taste

Taste

Organic apples most well studied – results consistently show higher organoleptic quality in organic apples

TOC-funded WSU strawberry fruit quality project found consistent – and positive – differences between organic and conventional berries



The Roots of Taste

More intense flavors in organic fruits and vegetables stems from higher levels of antioxidants, marginally lower yields

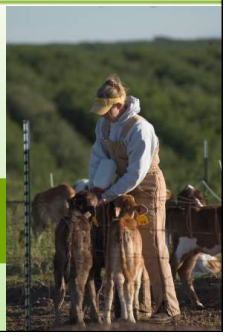
TOC studying the physiological basis of enhanced taste and nutrient density in organic food

For More Information

All Organic Center reports are free to download

Visit the Organic Center website: www.organic-center.org

Contact Chuck Benbrook
cbenbrook@organic-center.org
or call 541-828-7918



Organic Dairy Farming

Organic Dairy Farming

- "A production system that is managed to respond to site-specific conditions by integrating cultural, biological and mechanical practices that foster cycling of nutrient resources, promote ecological balance and conserve diversity"
- USDA National Organic Program

"True Believer" Recommended Practices

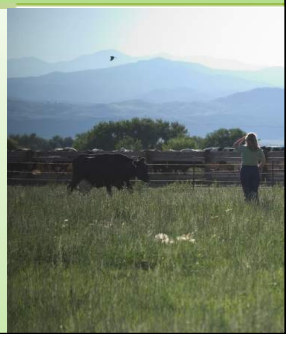
- Start with soil improvement (minerals and organic matter)
- Grazing based system, minimal grain feeding
- Traditional breeds of cattle
- 2X milking
- Natural supplements (kelp, mineralized salt)
- Optimize health of animals

Input Substitution Model

- No grazing or minimal grazing
- Conventional forage:concentrate ratios in an organic Total Mixed Ration
- Continuous conversion of heifers
- Holstein breed
- 3X milking
- Natural treatments or supportive therapy

Pesticides

Both organic models should equally reduce pesticide/herbicide exposure compared to conventional milk



Food Pesticide Residue Datasets

- FDA CFSAN – regulatory
- USDA PDP (Pesticide Data Program) – residues in food as eaten
- FDA TDS (Total Diet Study)- supermarket shopping
- FDA Feed Samples

Pesticides in Milk: 1996 to 2004

	1996	1998	2004
Average Residues per Sample	0.18	0.15	2.9

Why the big increase?

- More sensitive limits of detection
- Synthetic pyrethroid residues

Source: Organic Center analysis of USDA "Pesticide Data Program" results

Pesticides in Milk in 2004

Nearly all conventional ***and*** organic samples contained DDE (breakdown product of DDT) and diphenylamine (DPA)

DPA is an apple post-harvest fungicide – how did it get into virtually all milk (including organic milk)?

Used in making plastic and rubber products

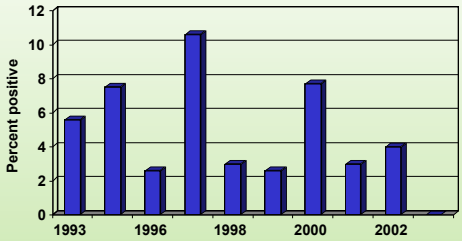
Contamination likely through milking machines, pipes, or equipment at the processing plant

Pesticides in Milk in 2004

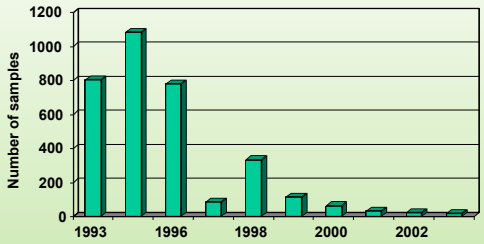
Over 24% of conventional samples had a synthetic pyrethroid residue Cyhalothrin (17.3%), permethrin (4.5%), three others

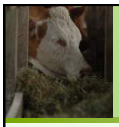
Endosulfan sulfate (Thiodan) in 18.1% of conventional samples Endocrine disruptor, persistent

CFSAN Pesticide Residues in Milk



CFSAN Pesticide Residues in Milk





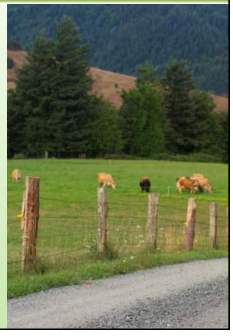
Feed Monitoring

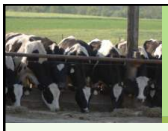
- 438 domestic samples
- 30.8% contained residues including 144 pesticides of 340 tested
- 8 samples contained 11 residues that exceeded limits
- Residues included lindane (breast cancer), chlorpyrifos, heptachlor, malathion and methoxychlor

Source: 2003 FDA

GMO and Antibiotic Exposure

- Both models reduce exposure of organic animals to GMO crops and antibiotics





Conventional Dairy Antibiotic Use

- 113 Pennsylvania conventional dairy herds
- 50% had treatment records
- 21% had written plans
- 93% antibiotics administered by farm personnel
- 24% always completed the course of antibiotics

Source: Sawant et al 2005

Conventional Dairy Antibiotic Use

- 381 herds in Washington state
- 23% at least one extra label use, only half with veterinarian's advice

Source: Raymond et al 2006

Conventional Calf Antibiotic Exposure

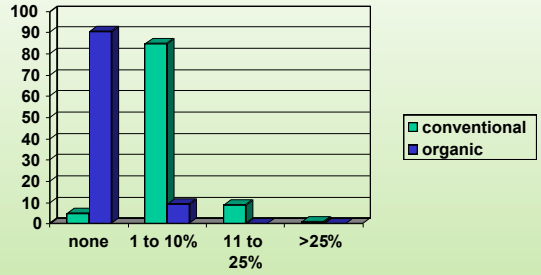
- 50% use medicated milk replacer subtherapeutic doses
- "Waste" milk contains pathogens and antibiotics used to treat them
- Dose-response antibiotic resistance in gut bacteria to penicillin (Langford 2003)

Antibiotic Resistance Cluster Patterns in Dairy Cattle

- 404 environmental bacteria from 93 California dairies
- Associated with non-mastitis antibiotic treatment

Source: Kirk et al 2005

Percent Antibiotic Use on Conventional vs Organic Farms

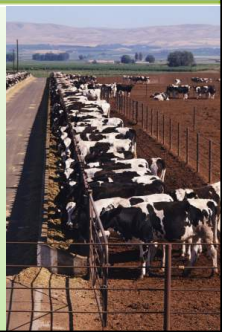


Source: Zwald et al 2004

Grazing and Animal Health

- Confined cows had 1.8 times more mastitis than grazed cows
- Confined cows were 8 X more likely to be culled compared to grazed cows.

Source: Washburn et al 2001



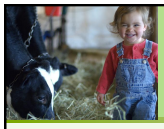
Nutrition of Animal Products

Grazing and minimizing grain intake contribute most to nutritional value

- CLA (congugated linoleic acid)
- Omega 3 fatty acids
- Vitamins (beta carotene, vitamin E)

Organic Milk Nutrition Aberdeen University

- 71% more omega 3 fatty acids
- 75% more beta carotene (= 1 serving Brussel Sprouts)
- 50% more vitamin E (17.5% RDA women)
- 2 to 3 X more lutein and zeaxanthine
- No difference in calcium or B12



Organic Meat and Dairy Linked to Better Quality Breast Milk

A diet in which 90% or more of dairy and meat products are organic is correlated with measurably higher levels of conjugated linoleic acid (CLA).

Source: *British Journal of Nutrition*, 2006

As little as 0.1% of dietary CLA inhibits development of mammary tumors in rats

One serving of milk and one serving of cheese per day from 100% grassfed cows

Ellis 2006

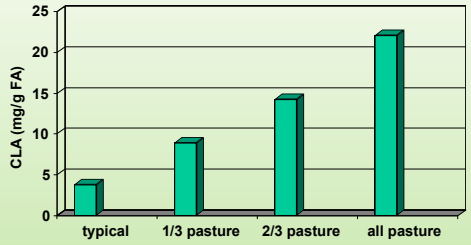
- 12 month longitudinal study of 17 organic and 19 conventional herds in UK
- More PUFA: monounstaured fat
- Alpha linolenic acid (ALA C18:3) significantly elevated in organic milk compared to conventional milk
- Lower O6:O3 ratio range 1.27-1.90 vs. 1.99-3.66
- No difference in CLA (C18:2 cis-9, trans-11) elevated in all herds thru the grazing season

CLA in Organic Milk

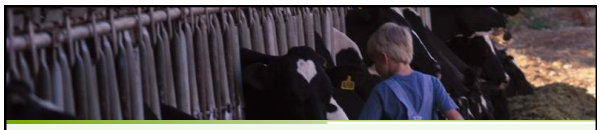
- Jahreis et al 1996 (Germany) and Bergamo et al 2003 (Italy processed milk samples)- significantly more in organic milk
- Toledo 2003 (Sweden 12 months on 31 farms) - no difference

50% of bovine milk fat is synthesized from plasma lipids and 88% from dietary sources (Grummer 1991)

CLA in Milk from Grazed Cows



Source: Dhiman 1999



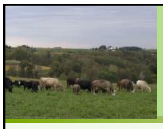
Daisies and Grass or Sunflower and Corn Oil (high O6)

A Recipe for Healthy Milk-
How to Feed the Cow

Dairy Products from Pastured Organic Cows should reduce exposure to pesticides, GMO, antibiotics, and increase exposure to valuable anticarcinogenic, heart-healthy nutrients

Beef Hormones and Male Reproductive Health

- Beef consumption by 387 mothers during pregnancy studied
- Focus on impacts of beef consumption on male reproductive health



Swan Study Findings

- High compared to low maternal beef consumption caused:
  - 24% drop in sperm concentration
  - Three-times the rate of subfertility based on WHO definition
- Anabolic steroids used in beef feedlots noted as likely cause of in utero developmental impairment

The View from Afar

The Roots of Nutrient Decline

- The "Dilution Effect"
  - Inverse relation between yield and nutrient concentrations (1940s on)
- More intensive input use can trigger an "environmental" dilution effect
- Changes in breeding priorities has created a "genetic" dilution effect

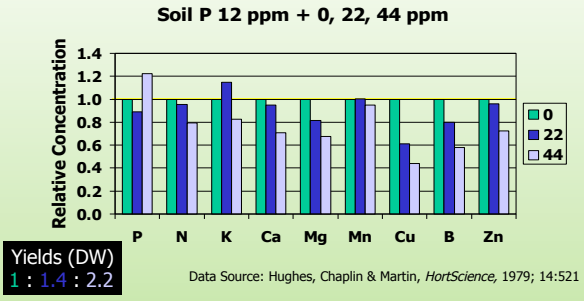
Source: Slides on nutrient decline are based on a presentation by Don Davis at the 2007 meeting of the American Society for Horticultural Science.

Nutrient Decline – Three Kinds of Evidence

- "Dilution Effect" studies on a given cultivar
- Declines in minerals, vitamins and protein in historical food composition data
- Side-by-side plantings of new and old cultivars, same levels of soil nutrients

Source: Presentation by Don Davis, 2007 meeting of the American Society for Horticultural Science.

Dilution Effect of Phosphorus in Red Raspberry Plants



Data Source: Hughes, Chaplin & Martin, *HortScience,* 1979; 14:521

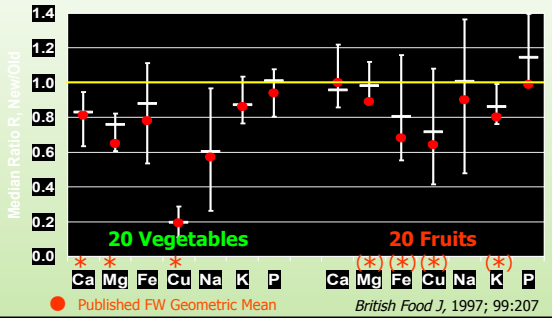
Changes in Historical Food Composition Data

- Mayer 1997, UK data
  - 20 vegetables, 20 fruits
- Davis, Epp & Riordan 2004, US data
  - 43 garden crops, mostly vegetables
- White & Broadley 2005, UK & US data
  - 26 veg., 38 fruits (UK), 18-50 US foods
- Group average changes

"R" Values, The Ratio of Nutrient Levels New/Old

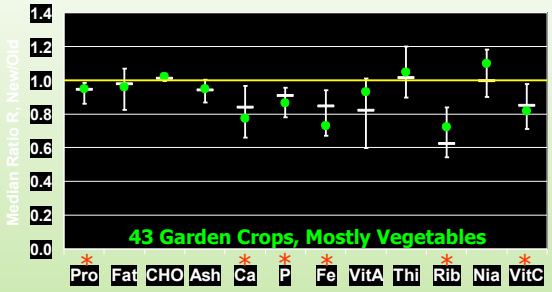
- Don Davis converted all measures to dry weight basis, and recalculated R Values
- Averaging is needed to improve reliability
  - Median R values preferred measure

Mayer UK Data, 1930s to 1980s (adjusted to DW basis)



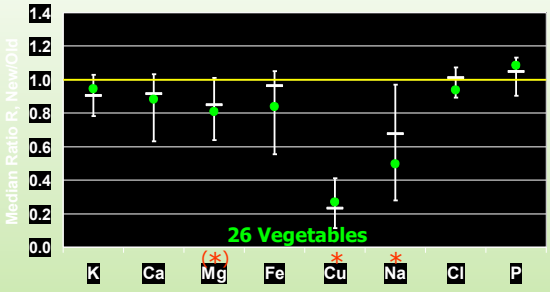
British Food J, 1997; 99:207

USDA Data, 1950 to 1999 -- Davis et al. Analysis



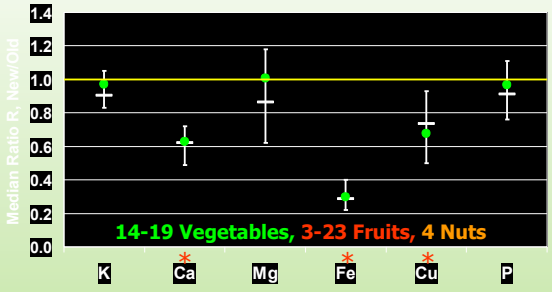
J Am Coll Nutr, 2004; 23:669

UK Data, 1930s to 1980s -- White & Broadley Analysis



J Hort Sci & Biotech 2005; 80:260

U.S. Data, 1930s to 2004 -- White & Broadley Analysis



J Hort Sci & Biotech 2005; 80:260

Side-By-Side Comparison of New and Old Cultivars

- Eliminates all uncertainties inherent in comparisons of historical data
- Applicable to single foods
- Unlimited choice of foods and nutrients

Four Side-By-Side Comparisons

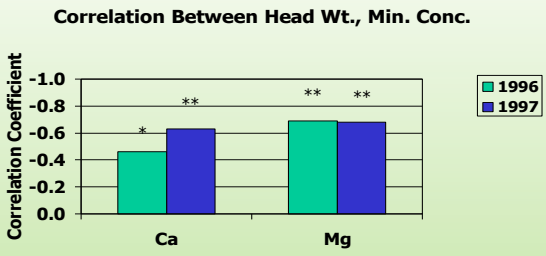
– Farnham, Grusak & Wang, 2000
- 27 commercial broccoli hybrids

– Garvin, Welch & Finley, 2002 & 2006
- 14 wheat cultivars, 1873 to 1995

– Scott, Edwards, Bell, *et al.,* 2006
- 45 corn cultivars, 1920 to 2001

– Mahmoud, Natarajan, Bennett, et al., 2006
- 18 soybean cultivars, 1917 to 2004

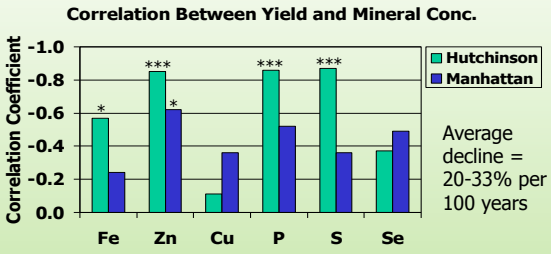
Decline of Calcium and Magnesium in Broccoli Hybrids



* $P < 0.05$
** $P < 0.01$

J Amer Soc Hort Sci, 2000; 125:344

Mineral Decline in 14 Wheats, 1873 to 1995

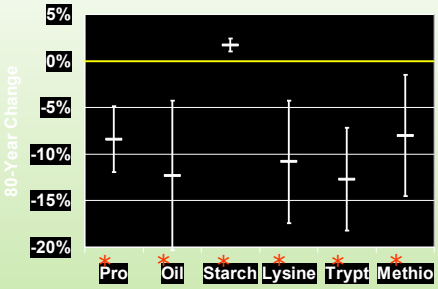


Average decline = 20-33% per 100 years

* $P < 0.05$
*** $P < 0.001$

Poster, ASA/CSSA/SSSA meeting, 2002
J Sci Food Agric, 2006; 86:2213

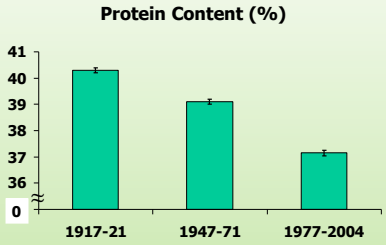
Nutrient Declines in 45 Corn Cultivars, 1920-2001



95% CI est. from published SE

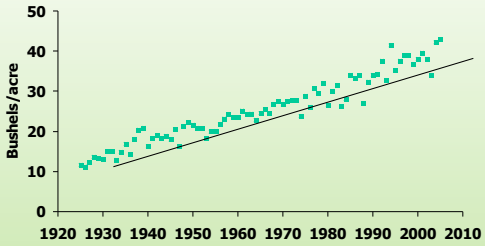
Maydica, 2006; 51:417

Protein Decline in 18 Soybean Varieties, 1917 to 2004



J Agr Food Chem, 2006; 54:3916

US Soybean Yields, 1924-2005



Data Source: USDA National Statistics Service Quick Stats

Key Insights on Nutrient Decline

- Don Davis analysis of nutrient declines in historical data sets
  - 3 studies, 47 nutrient comparisons
  - 77% of nutrients show decline, 30% statistically significant
- Strong evidence of the "dilution effect"

Source: Presentation by Don Davis, 2007 meeting of the American Society for Horticultural Science.

Key Insights on Nutrient Decline

- Gold-standard side-by-side comparisons
  - 4 crops, 22 nutrient comparisons
  - 100% of nutrients declined, 68% significantly
- Strong evidence of a "genetic dilution effect"

Source: Presentation by Don Davis, 2007 meeting of the American Society for Horticultural Science.

Reversing Nutrient Decline through Organic Farming

- Organic production systems often produce more nutrient dense food
  - Average 30% higher antioxidants in comparisons of organic and conventionally grown produce
  - Mineral levels meet or exceed historic levels, especially on long-term organic farms that have improved soil quality

Reversing Nutrient Decline through Organic Farming

- Key role of yield goals
  - Pushing plants for the last 10% of yield can dramatically dilute nutrients
  - Some studies show that yields on organic farms can meet or exceed conventional, without nutrient dilution, with very high quality soils