ORGANIC FOODS: IS THERE A BENEFIT?

Katie Price, PGY-3
What do I feed my baby?

Do I need organic formula?

Is organic baby food safe?

Is there a benefit to using organic foods over nonorganic foods?
OBJECTIVES

- Explore the qualities that make food “organic”
- Describe the current concerns that have brought about a rise in the purchase of organic foods
- Discuss research behind the value of choosing organic foods over nonorganic foods
- Review AAP statement regarding organic food choices
ORGANIC FOODS

- Foods grown or processed without use of synthetic fertilizers or pesticides
- Use natural matter for fertilizer
- Use biological methods for pest control
- No genetic engineering or irradiation used
- Livestock and poultry raised on organically grown feed, without antibiotics or hormones, and given access to outdoors
ORGANIC FOOD LABELS

100% organic vs Organic vs Made with organic ingredients
WHY THE GROWTH?

- Concern about the nutritional adequacy of foods grown by conventional agriculture
- Concern that pesticides and chemical fertilizers have adverse health effects
- Concert about environmental effects of pesticides and chemical fertilizers
- Concern about adverse developmental and health effects from ingesting animal products after being treated with antibiotics and hormones
Advocates claim

- Organic foods are nutritionally superior to conventionally grown foods.
- Natural fertilizers are better able to nourish plants and result in more nutritious foods.
- Organic foods produce more antioxidants as an adaptive response to fight off insect and fungal attacks.
Nutritional content of plant determined by

- genetic makeup
- climate
- soil conditions
- Length of time using organic methods
- maturity at harvest
- storage
- distribution time
NUTRITION

- Nutritional content usually similar regarding carbohydrates, vitamins, minerals, proteins, and lipids

- Possible Exceptions
  - Organic foods may have lower nitrate and protein content
  - They have higher iron, magnesium, vitamin C and phosphorus
  - Greater levels of antioxidants and phytochemicals
Nutritional composition of milk and dairy products vary due to dietary components of feed and time of year.

Milk has similar protein, vitamin, total lipids, trace minerals.

Several studies found significantly higher levels of total polyunsaturated fatty acids in organic milk.
American Journal of Clinical Nutrition

"Nutrition-related health effects of organic foods: a systematic review"

- 12 studies
- Lack of meta-analysis due to heterogeneity of studies
- Antioxidant activity was most commonly reported primary outcome
- Concluded that evidence of nutrition-related health effects from organic foods is lacking
- More controlled trials needed
Annals of Internal Medicine

“Are Organic Foods Safer or Healthier Than Conventional Alternatives?”

- Systematic Review
- 17 studies of human populations consuming organic vs conventional diets
- 223 studies comparing nutrients, bacterial or pesticide levels
- No significant differences in health benefits
- No consistent difference between vitamin content, protein or fat content (only caveat phosphorus and total phenols)
- 30% lower risk of pesticide contamination in organic
- Bacterial antibiotic resistance was higher in conventional products
<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Summary of All Identified Studies</th>
<th>Results of Meta-analysis</th>
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<tbody>
<tr>
<td></td>
<td>Studies, n</td>
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<tr>
<td>Ascorbic acid</td>
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<td>β-Carotene</td>
<td>16 23</td>
<td>6 3</td>
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<tr>
<td>α-Tocopherol</td>
<td>8 19</td>
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<td>Potassium</td>
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<tr>
<td>Fiber</td>
<td>8 11</td>
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<tr>
<td>Quercetin</td>
<td>13 50</td>
<td>16 2</td>
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<tr>
<td>Kaempferol</td>
<td>9 18</td>
<td>6 2</td>
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<tr>
<td>Total flavanols</td>
<td>5 22</td>
<td>7 6</td>
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<tr>
<td>Total phenols</td>
<td>34 102</td>
<td>36 12</td>
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</table>
HEALTH BENEFIT

- Lack of controlled trials on health benefits
- Consuming organic products during 1\textsuperscript{st} year of life has possible protective effect on development of atopic disease
- Results are not clear
- One observational study and 2 systematic reviews found no overall association
- Another study, a subgroup analysis, suggested a modestly lower risk for eczema consuming organic dairy products
HEALTH BENEFIT

Potential to diminish mutagenic action of toxic compounds and inhibit proliferation of certain cancer cell lines

- Organic strawberries block proliferation of HT29 color cancer cells and MCF-7 breast cancer cells more potently than conventional strawberries
- Organic vegetables suppressed 30-57% of mutagenic action of Benzo(a)pyrene while nonorganic only suppressed 5-30% of the activity
PESTICIDES

- World use: 5 billion pounds a year
- Total cost: $75 billion over 2 year period
- US accounts for 1.1 billion pounds annually
- Annual cost in US $12 billion
PESTICIDES

- Detrimental to food safety and health
- Organic foods often contain some pesticide residues due to cross-contamination
- All plants produce toxins that protect them from fungi, insects and predators as a natural pesticide
PESTICIDES

- Benefits of synthetic pesticides:
  - More abundant food supply
  - Increase crop yield and affordability of produce throughout the year
  - Prolong shelf life
  - Retard mold growth
PESTICIDES

- Adverse effects of synthetic pesticides:
  - Range from mild to severe
  - Dizziness
  - Nausea
  - Neurologic and developmental disorders
  - Reproductive disorders
- Children at increased risk of adverse effects in utero and in early childhood
**PESTICIDES**

- Regulated strictly by EPA, FDA, and USDA
- Tolerance established for all pesticides based on multigenerational animal studies
- Food Quality Protection Act (1996)- required EPA to review and reassess all existing pesticide tolerances to make them safer for infants and children
  - Required additional 10-fold margin of safety to pesticide assessments to address pre and postnatal toxicity
PESTICIDES

- Reduction in exposure
  - Start breakdown after application with exposure to sunlight and rain
  - Continue breakdown after harvest
  - Further reduction through washing, peeling, cooking, processing
  - Organic diet
PESTICIDES

- Pesticide Data Program of USDA
  - Organically raised foods had 1/3 amount of chemical residues compared to nonorganic foods.
  - Organic foods 10 times less likely than nonorganic foods to have 2 or more residues (2.6% vs 26%).
  - 82% of nonorganic fruits tested positive for insecticide residues versus 23% of organic fruits.
  - 65% of nonorganic vegetables versus 23% of organic.
PESTICIDES

Dirty Dozen 2015

+ Apples
+ Celery
+ Strawberries
+ Peaches
+ Spinach
+ Nectarines
+ Sweet bell peppers
+ Potatoes
+ Cucumbers
+ Cherry tomatoes
+ Imported snap peas
+ Grapes
PESTICIDES

Clean Fifteen

- Avocado
- Sweet corn
- Pineapples
- Cabbage
- Frozen sweet peas
- Onions
- Asparagus
- Mangoes

- Papayas
- Kiwis
- Eggplant
- Grapefruit
- Cantaloupe
- Cauliflower
- Sweet potatoes
PESTICIDES AND BABY FOOD

- 10 different pesticides detected on at least five percent of samples sold of peach baby food in U.S.
- 23% of samples of applesauce contained pesticide possibly associated with disrupting developing nervous system.
- 10% of samples of applesauce contained fungicide.
- 6 pesticides found in apple juice.
- Insecticide found in 25% of 175 U.S grape juices tested.
ENVIRONMENTAL IMPACT

- Organic farms do not release synthetic pesticides into atmosphere
  + Can be harmful to soil, water, wildlife
- Organic farms are better at sustaining diverse ecosystem because of farming methods such as crop rotation
  + Plants, insects, animals
- They use less energy
- They produce less waste
HORMONES, SEX STEROIDS, ANTIBIOTICS

- Major concern with livestock and poultry consumption
- Hormones
  - bovine recombinant growth hormone
  - Increased milk yield by 10-15%
  - Conventional milk does not contain significantly higher levels of bovine growth hormone
  - 90% of GH destroyed by pasteurization
  - Bovine GH biologically inactive in humans
Sex steroids

- Increases lean muscle mass
- Accelerates rate of growth to increase meat yield
- Suspected that ingested estrogen lead to earlier development of puberty and increased risk of breast cancer
- No studies have supported this hypothesis to date
Antibiotics

- Used in non-therapeutic doses to enhance growth, prevent disease and increase yield
- Presence of antibiotic-resistant bacteria in non-organic food related to routine use
- Organic farming prohibits non-therapeutic treatment
May cost 10-50% more than conventional foods

Higher cost due to smaller supply, increased cost of certification and labor intensity of growing organic foods, special requirements for post-harvest handling and storage

Shorter Shelf life
The Pure Facts About Organic Baby Formula

{Fighting Off the Chemical Grumps.}
HOW TO FIND THE BEST ORGANIC BABY FORMULA

A QUEST TO FIND THE BEST ORGANIC FORMULA FOR YOUR BABY
**Ingredients**

- 2 cups whole raw cow’s milk, preferably from pasture-fed cows
- 1/4 cup homemade liquid whey (See recipe for whey, below) Note: Do NOT use powdered whey or whey from making cheese (which will cause the formula to curdle). Use only homemade whey made from yoghurt, kefir or separated raw milk.
- 4 tablespoons lactose¹
- 1/4 teaspoon bifidobacterium infantis²
- 2 or more tablespoons good quality cream (preferably not ultrapasteurized), more if you are using milk from Holstein cows
- 1/2 teaspoon unflavored high-vitamin or high-vitamin fermented cod liver oil or 1 teaspoon regular cod liver oil³
- 1/4 teaspoon high-vitamin butter oil (optional)¹
- 1 teaspoon expeller-expressed sunflower oil¹
- 1 teaspoon extra virgin olive oil¹
- 2 teaspoons coconut oil¹
- 2 teaspoons Frontier brand nutritional yeast flakes¹
- 2 teaspoons gelatin¹
- 1-7/8 cups filtered water
- 1/4 teaspoon acerola powder¹ ²
INFANT FORMULA
INFANT FORMULA

- Multiple organic versions
  + Soy, lactose-free, DHA/ARA
- Prices vary from $0.95-1.28 per ounce
- Composition protein, fat, carbohydrates similar
### Earth’s Best Organic Formula

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Per 100 Calories (Normal Dilution) (5 fl oz)</th>
</tr>
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<tbody>
<tr>
<td>Protein</td>
<td>g 2.5</td>
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<tr>
<td>Fat</td>
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<tr>
<td>Carbohydrate</td>
<td>g 10.6</td>
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<tr>
<td>Water</td>
<td>g 134</td>
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<tr>
<td>Linoleic acid</td>
<td>mg 750</td>
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</table>

**Vitamins:**
- Vitamin A: IU 300
- Vitamin D: IU 60
- Vitamin E: IU 2
- Vitamin K: μg 8
- Thiamine (Vitamin B1): μg 80
- Riboflavin (Vitamin B2): μg 90
- Vitamin B6: μg 60
- Vitamin B12: μg 0.3
- Niacin: μg 1000
- Folic Acid (Folacin): μg 16
- Pantothenic Acid: μg 500
- Biotin: μg 3
- Vitamin C (Ascorbic Acid): mg 12
- Choline: mg 24
- Inositol: mg 6

### Enfamil Newborn

<table>
<thead>
<tr>
<th>NUTRIENTS</th>
<th>Per 100 Calories (5 fl oz)</th>
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<tbody>
<tr>
<td>Protein, g</td>
<td>2.1</td>
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<tr>
<td>Fat, g</td>
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<td>Carbohydrate, g</td>
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<tr>
<td>Water, g</td>
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<tr>
<td>Linoleic acid, mg</td>
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</table>

**Vitamins:**
- A, IU: 300
- D, IU: 60
- E, IU: 2
- K, μg: 8
- Thiamin (Vitamin B1), μg: 80
- Riboflavin (Vitamin B2), μg: 140
- B6, μg: 60
- B12, μg: 0.3
- Niacin, μg: 1000
- Folic acid (Folacin), μg: 16
- Pantothenic acid, μg: 500
- Biotin, μg: 3
- C (Ascorbic acid), mg: 12
- Choline, mg: 12
- Inositol, mg: 6
### Earth’s Best Organic Formula

<table>
<thead>
<tr>
<th>Minerals</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Calcium</td>
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<tr>
<td>Magnesium</td>
<td>mg 11</td>
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<tr>
<td>Iron</td>
<td>mg 1.8</td>
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<tr>
<td>Zinc</td>
<td>mg 1.2</td>
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<tr>
<td>Manganese</td>
<td>µg 25</td>
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<tr>
<td>Copper</td>
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<tr>
<td>Iodine</td>
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<tr>
<td>Selenium</td>
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<tr>
<td>Sodium</td>
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<tr>
<td>Potassium</td>
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<td>Chloride</td>
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<table>
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<th>Minerals</th>
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<td>Calcium</td>
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<td>Phosphorus</td>
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<td>Iron</td>
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<tr>
<td>Zinc</td>
<td>1 mg</td>
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<tr>
<td>Manganese</td>
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<td>Copper</td>
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<td>Iodine</td>
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<td>Selenium</td>
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<tr>
<td>Sodium</td>
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<tr>
<td>Potassium</td>
<td>108 mg</td>
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<tr>
<td>Chloride</td>
<td>63 mg</td>
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INFANT FORMULA

- Concern for high arsenic content in organic formula sweetened with organic brown-rice syrup
- High doses - deadly poison
- Chronic low doses - increase risk of cancer and heart disease, also has been linked to lower IQ and poor intellectual function
- Regulation on arsenic content in drinking water but not food
Environmental Health Perspectives

“Arsenic, Organic Foods, and Brown Rice Syrup”

- 2 of 17 formulas had OBRS as main ingredient
- 15 formulas without OBRS had low concentrations of arsenic
- 2 formulas with OBRS had >20 times the arsenic concentrations than the other formulas and 6 times higher than drinking water standard
- Standards are needed in U.S. to regulate the content in food
INFANT FORMULA AND ARSENIC CONTENT
AAP REPORT SUMMARY

- Organic diets expose consumers to fewer pesticides
- Nontherapeutic use of antibiotics in livestock contributes to emergence of resistant bacteria
- Organic foods contain more of certain vitamins and minerals but there is no direct evidence that it provides a meaningful benefit
- No well-powered human studies showing demonstrating health benefits or disease protection
AAP REPORT SUMMARY

- Recommends diet rich in fruits and vegetables, whole grains, lean meats, and low-fat/fat-free dairy products, whether organic or conventional
- Food safety measures are most important
“Vitamins, minerals and fiber have much better research and documented health benefits than does choosing organic.”
REFERENCES

- Demory-Luce, Debby. “Organic foods and children.” *UpToDate*.
- “Differences in Organic, Natural, and Health Foods.” *Healthychildren.org*
- “EWG’s 2015 Shopper’s Guide to Pesticides in Produce.” *EWG.org/foodnews/summary*
- “Is It Important to Feed Kids Organic Foods?” *Healthychildren.org*
- “Organic Foods: Worth the Price?” *Healthychildren.org*
- “The Pure Facts About Organic Baby Formula.” *Incredibleinfant.com*
- Walsh, Bryan. “Oh, Baby: There May be Arsenic in your Formula.” *TIME.com*