Is organic food more healthful than conventional food?

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Background
• The USDA definition of organic production prohibits the use of synthetic, sewage sludge, genetically modified organisms, irradiation, and antibiotics.
• Over 50 million hectares in 179 countries were cultivated organically in 2015 (certified and transition).
• The growth of organic production is partly in response to increasing market demand, where among consumers, health is a dominant reason for purchasing organic.
• Organic foods are claimed to offer superior nutritional benefits and to reduce risk of pesticide exposure, but concerns about organic food safety also exist due to the use of compost and manure.

Objective
Review the scientific literature on the healthfulness of organic compared to conventional food.

Methods
A literature search for US and international comparative studies, systematic reviews, and meta-analyses was conducted using PubMed and the Cornell University Libraries database. Out of the fifteen publications selected, information from eight were synthesized for this report. Seven were omitted due to poor selection methods or study designs.

Results
Nutrients in Crops:
• Nutrient levels are subject to a variety of factors, including plant genetics, plant part and tissue, fruit size, plant maturity, environmental disease and pest conditions, soil conditions, fertilization, irrigation, pesticide application, and climatic conditions.
• Organic crops have been found to have lower cadmium and nitrate levels, but also lower amino acid levels1.
• Dietary nitrate is only biologically active after endogenous conversion to nitrite and nitric oxide3. Excessive nitrite exposure through water contamination and processed meats is associated with methemoglobinemia and cancer3.
• Organic crops tend to have higher carbohydrates and vitamin C levels, but also higher phosphate levels5.
• Chronically high phosphate intake is associated with bone impairment and aging6.

Phytochemicals in Produce:
• The concentration of antioxidants, such as flavonoids and polyphenolics, are higher in organic produce4. One study found a 14-26% increase7, while another reported 20-46%.
• Increased phytochemicals may be due to lower mineral fertilization and higher pest and disease damage in organic production. These protective compounds may develop as survival adaptations for plants7.

Pesticide Contamination in Crops:
• Organic crops were found to contain 1% of the pesticide residues found in conventional crops, and 8% of the pesticide residues found in IPM (integrated pest management) crops8, 9. Another study found that organic crops had 1% of the pesticide residues in conventional crops.
• Organic diet reduces exposure to pesticides, especially among children9.

Conclusions
• Organic produce contains higher concentrations of phytonutrients, vitamin C, and phosphate, and lower concentrations of nitrates and cadmium.
• Dairies and beef produced in organic, grass-based systems tend to have lower 3-PUFA levels.
• Synthetic pesticide residue exposure is reduced in organic crops.
• It is difficult to separate the effects of lifestyle from the effects of diet on overall health, as organic consumers tend to live healthier lives10.
• The nutritional value of single foods, whether organic or conventional, must also be contextualized within the overall nutritional quality of a dietary pattern11.

Future Research Questions
• Are differences in nutrient and phytochemical levels biologically meaningful?
• To what extent are differences between organic and conventional diets due to soil nutrient management?
• What effects do botanical inputs and allowed synthetics have on health?
• How can the US and EU implement a method to differentiate organic from conventional foodborne illnesses?
• Which comparison study design provides the most consistent and reliable results?

Literature Cited