Nutrient content and sustainable food

There are a variety of reasons that people choose sustainably produced foods over conventional foods. Though organic foods are just one category of foods under the sustainability umbrella, a 2006 survey by the consumer research firm, Hartman Group, found that health reasons and nutritional needs are primary reasons that consumers choose to buy organic foods, but consumers also want to avoid pesticides, chemicals, antibiotics and genetically modified organisms.[1] Is the consumer correct in believing that organic and other sustainably produced foods offer a nutritional edge over their conventionally produced counterparts?

As one might suspect, there is not a simple answer. How healthy a food is for a person depends on their overall diet and state of health. The quality of a food's nutrition depends on many factors including how and for how long it is stored and whether it has been processed in any way. Whether a food is fresh, whole, frozen, thawed, steamed, dried or combined with additional ingredients (salt, fat, sugar, added vitamins and minerals) can all impact nutrition quality. In short, whole, fresh, in season, unprocessed foods are generally more nutritious than packaged and processed foods. Beyond that, the method by which the food is raised (local, organic, grass-fed, etc) may also have some effect on nutrient content.

Plant Foods

When it comes to sustainable plant foods most of the debate about the nutritional value stems from whether or not a plant food was organically grown. A number of studies have examined the question of whether organic foods are healthier with conflicting results.

The researchers at the Organic Center (TOC)—an American nonprofit that conducts scientific research on organic products—say that organically produced fruits and vegetables are on average more nutritious than their conventionally produced counterparts. According to TOC's 2008 review of the current literature there appear to be two mechanisms responsible for the difference.

1. **Pest Pressure**[2,3,4,5,6] - When plants are under stress from pests, they produce a diverse array of natural chemicals called secondary plant metabolites (SPMs), many of which are antioxidants. SPMs also are responsible for giving fruit and vegetables their bright coloring and distinctive flavors. Plants on organic farms typically have to deal with higher levels of pests than plants on conventional farms, where pesticides are routinely applied. For this reason, plants on organic farms more fully engage their innate defense mechanisms, and in doing so, elevate antioxidant concentrations.

2. **Dilution Effect**[7,8] - Antioxidant levels tend to be higher in organic fruit and vegetables because plants on organic farms tend to grow slower and mature at a smaller size than fast-growing, heavily fertilized conventional produce. This explanation has its roots in the "dilution effect," which is the tendency for vitamins, minerals and antioxidant levels to be reduced – or diluted – in large, fast-growing and high-yielding crops.

In contrast to TOC's review, a 2009 study[9] funded by the United Kingdom's Food Standards Agency (FSA) —a British government department—reviewed the same pool of literature as TOC but used different methodology and came to markedly different conclusions. The FSA study concluded that there are no significant differences in the nutritional quality of organic and conventional food.

How is it that two groups of scientists can look at the same set of research and come to different conclusions? TOC claims that one of the main differences is in antioxidants. Antioxidants are substances that may protect cells against the effects of free radicals. Free radicals are produced normally in the body but also by exposures to things in the environment such as radiation or tobacco. Free radicals can cause cell damage and may play a role in disease processes such as cancer.

While the TOC review included total polyphenols and total antioxidant content -- two measures of the amount of antioxidants in foods -- the FSA chose not to include those measures. Do varying antioxidant levels make all the difference in the debate over the nutrient content of sustainable foods? More research is needed on the human health impacts of consuming products with higher levels of plant antioxidants and on organic and conventionally raised foods before that can be answered with certainty. For now many who do not find the current nutrient research convincing still choose organically grown produce over conventional produce for other reasons such as avoiding pesticides and genetically modified organisms, and protecting the environment.

Animal Foods

While there have been years of controversy surrounding nutrition and sustainable plant foods, there tends to be much more consensus about the nutritional superiority of sustainably produced animal foods.

Beef

The most comprehensive study to date on the nutritional benefits of grass fed beef was a 2009 collaboration of researchers at the USDA and Clemson University. Their study found that grass fed beef is lower in total fat, higher in beta-carotene, higher in vitamin E (alpha-tocopherol), higher in the B-vitamins thiamin and riboflavin, higher in the minerals calcium, magnesium, and potassium, and higher in total omega-3s. Additionally, they found that grass fed beef contains a healthier ratio of omega-6 to omega-3 fatty acids and is lower in the saturated fats linked with heart disease.[10]

Eggs

Eggs from chickens that have been raised on pasture have been found to contain 10% less fat, 34% less cholesterol, 40% more vitamin A, and four times more omega-3 fatty acids compared to the standard values reported by the USDA for commercial eggs.[11] Additionally, Penn State researcher Heather Karsten found that when she compared chickens raised on pasture to chickens raised on an industrial diet that there was "about twice as much vitamin E and 40 percent more vitamin A in the yolks of pasture-fed birds than in the caged birds. The longer the animals were on pasture, the more vitamins they produced."[12]

Dairy

As with nutrient differences that have been observed in the meat of grass fed cows versus grain fed cows, researchers have observed similar differences in their milk and dairy products. This is due to the fact that living grass is far richer in vitamins E and A, and in the antioxidant beta-carotene than the typical grain based diet of dairy cows.[13] It is important to note that not all organic milk comes from grass fed cows. Requirements for organic milk state that cows must have "access to pasture." However, this standard does not require a specific length of time in pasture. Thus a cow can graze in pasture for a limited time and still produce milk that is certified organic. Also, like the dilution effect seen with nutrients in plant foods that are forced into high yields, some researchers have found a similar effect with milk of cows treated with hormones to increase their milk production. Thus, the more milk a cow produces, the more diluted the vitamin content of her milk becomes.[14]

When exploring the topic of nutrition content and sustainable foods it is important to remember that levels of vitamins, minerals, fats, antioxidants and other nutrients should not be where the conversation ends. Sustainable foods have benefits for the environment, for farmers and farm workers, pesticide reduction, for fighting antibiotic resistance and for taste, all of which impact our health and collective well-being.

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