Time for change

Benefits of a plant-based diet

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We humans do not need meat. In fact, we are healthier without it, or at least with less of it in our diets. The Adventist Health Studies provide solid evidence that vegan, vegetarian, and low-meat diets are associated with statistically significant increases in quality of life and modest increases in longevity.[1] The world that we inhabit would also be healthier without the commercial meat industry. Factory farms are a waste of resources, environmentally damaging, and ethically indefensible.[2] It is time to accept that a plant-predominant diet is best for us individually, as a race, and as a planet.

Health issues

Obesity. Epidemiologic studies[3-5] report 62.1% of the entire Canadian population to be overweight and 25.4% to be obese. A total of 32% of Canadian children and youth aged 5 to 17 years are overweight or obese. Overall, 40% of men and 29% of women aged 18 and older are overweight, with 27% of men and 25% of women being obese. Vegetarians and vegans, irrespective of age, sex, and geography, are leaner than omnivores,[1,6] with a much lower prevalence of obesity (<6%).

Unhealthy cholesterol levels. Although cholesterol is essential for human health, high levels of cholesterol in the bloodstream can lead to atherosclerosis and cardiovascular disease. In Canada,[7] 6% of 6- to 19-year-olds, 12% of 20- to 39-year-olds, and 40% of 40- to 59-year-olds have high levels of low-density lipoprotein cholesterol. Obese children have up to 9 times more cholesterol in their blood than do healthy normal-weight children, with this tracking through to adulthood. Dietary cholesterol comes only from animal products—meat, fish, eggs, and milk. A cross-sectional analysis of a sample of 424 meat eaters, 425 fish eaters, 423 vegetarians, and 422 vegans demonstrated that serum concentrations of total and non–high-density lipoprotein cholesterol and apolipoprotein B were significantly lower in vegans ($P<.001$).[8]

Diabetes. Type 2 diabetes mellitus (T2DM) is increasing worldwide in children and youth, typically developing at or after puberty. This disorder is associated with serious comorbidities including hypertension, nonalcoholic fatty liver disease, and dyslipidemia. Over the longer term, vascular complications (peripheral vascular disease, coronary artery disease, and cerebrovascular disease) are likely.[9] In 2010 the incidence of T2DM was 1.54 cases per 100 000 Canadian children younger than age 18 per year, or at least 113 new cases of childhood T2DM every year. The average age of diagnosis was 13.7 years, with 8% younger than 10 years. Overall, 95% of the children with newly diagnosed T2DM were obese, 45% had measurable dyslipidemia, and 28% had hypertension. In the longer term, statistics show that 6% to 7% of all Canadians and two-thirds of obese adult Canadians will develop T2DM. Only 15% of those with T2DM are of normal weight.[10-12] Vegetarians and vegans are about half as likely to develop T2DM as nonvegetarians are.[1,13]

Cancer. In 2015, the World Health Organization reviewed the evidence linking intake of red and processed meat with colorectal cancer.[14] A meta-analysis of 10 cohort studies reported a statistically significant dose-response relationship between meat consumption and colorectal cancer risk, with a 17% increased risk (95% CI 1.05% to 1.31%) per 100 g per day of red meat, and an 18% increased risk (95% CI 1.10% to 1.28%) per 50 g per day of processed meat. There was sufficient evidence in humans to classify processed meats (sausages, bacon, ham, beef jerky, corned beef, and other smoked, salted, fermented, or cured meats) as group 1 carcinogens. Vegans and vegetarians, of course, do not eat meat.

Dietary awareness required. Increased dietary awareness and some education is required if one does decide to follow a primarily plant-based diet. However, as per the Academy of Nutrition and Dietetics,

> appropriately planned vegetarian, including vegan, diets are healthful, nutritionally adequate, and may provide health benefits for the prevention and treatment of certain diseases. These diets are appropriate for all stages of the life cycle, including pregnancy, lactation, infancy, childhood, adolescence, older adulthood, and for athletes.[15]

All vegans should take adequate vitamin B12 and vitamin D supplements, and must ensure proper calcium and iron intake.

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Environmental issues

Food animals today are predominantly raised in large or very large facilities called *animal feeding operations* and *confined animal feeding operations*. These industrial systems each contain many thousands of animals and collectively produce 74% of the world's poultry (chicken and turkey), 50% of pork, 43% of beef, and 68% of eggs.[16]

Resource use. The 60 billion animals per year used for human consumption use enormous planetary resources.[17] A total of 55% of US-produced corn, 40% of the worldwide grain harvest, and more than 85% of soybeans produced worldwide end up as animal feed. Similarly, almost 50% of the world's yearly forage fish catch—which amounts to 37% of the total yearly fish harvest—is used as feed (fish oil, fish meal) in the aquaculture (46%), pork (24%), and poultry (22%) industries. Much of the land, energy, and water used to grow feed crops for intensively produced animals could be more efficiently used to grow food that is directly consumed by people.

Emissions. Global livestock production is currently responsible for 18% of human-induced greenhouse gas emissions, a higher proportion than global transport (14%). Livestock production is responsible for 37% of global methane emissions, 65% of global nitrous oxide emissions, and 9% of global carbon dioxide emissions. In addition, 64% of ammonia emissions originate in livestock production and contribute to air, soil, and water pollution, acid rain, and damage to the ozone layer.[18]

Inefficiency. Meat production is very inefficient.[17] The production of 1 kg of edible meat by typical industrial methods requires 20 kg of feed for beef, 7.3 kg of feed for pork, and 4.5 kg of feed for chicken. The production of just 1 kg of beef, as a global average, consumes nearly 15500 L of water, the equivalent of 90 full bathtubs. This is nearly 12 times the quantity needed to produce 1 kg of wheat. The same 1 kg of beef requires 15 times as much land as the production of 1 kg of cereals and 70 times as much land as the production of 1 kg of vegetables. Production of 1 kg of pork uses more than 6 times as much land as 1 kg of cereals and 30 times as much land as 1 kg of vegetables.

Scarcity. The demand for feed grain is increasing the ecologic pressure on already scarce grazing land.[17,18] Animal operations are moving into marginal land, where overgrazing leads to desertification and deforestation. In South America, soybean production for factory farms in Europe and elsewhere is resulting in loss of tropical rain forests. This animal production–induced damage to wildlife habitats is a substantial threat to biodiversity globally.

Worldwide up to 2 billion people experience water scarcity.[19] Livestock production already uses 15% of all irrigation water, with this projected to increase by 50% by 2025. Increasing meat consumption has been identified as the main cause of the worsening water scarcity in China. By reducing the proportion of animal-based food and increasing that of plant-based food in the diet, one can almost halve their individual water footprint.

Pollution. Animal manure and the excessive quantities of fertilizers used to produce animal feed are environmentally toxic.[20] The high nitrogen and phosphorous content of run-off (from manure-fertilized fields) and spills is considered causal in the widespread eutrophication (overenrichment with nutrients) and subsequent algae blooms that have proliferated in lakes and estuaries in the past 30 to 40 years. Large areas (famously the Gulf of Mexico) have effectively become dead zones because eutrophication reduces oxygen to levels insufficient to support aquatic life. Livestock production can additionally pollute freshwater with sediment (through soil erosion), pesticides, antibiotics, heavy metals, and pathogens such as *Salmonella, Campylobacter,* and *Escherichia coli.*

Conclusion

What we eat greatly influences our personal health and the environment we all share. The prototypical North American diet is strongly linked to obesity, diabetes, cardiovascular disease, unhealthy cholesterol levels, hypertension, Alzheimer disease, and certain cancers.[1,13] The opposite association occurs with properly followed vegetarian and vegan diets.

Changing our societal reliance on meat-based farming to a whole-plant agrarian system has many ecologic benefits. It results in more efficient land use; less greenhouse gas production; less air, soil, and water pollution; less need for clear cutting; less damage to wildlife habitats; and less agricultural water use. Reducing meat consumption will eventually reduce meat production. This would enable many developed countries to move away from intensive cereal production (used for animal feed) in favour of crop rotations that benefit the soil and end their dependence on energy-intensive and polluting synthetic nitrogen fertilizers.

We humans are ultimately responsible for individual, societal, and planetary health. Physicians are ideally placed to advocate lifestyle changes as a personal health and epidemiologic tool. By decreasing dependence on meat products, individually and globally, we can move toward a worldview that is healthier and certainly more sustainable.

Such a journey begins with the first step. Take yours—reduce your meat intake, open your mind to the interconnectedness of human choices and planetary health, and, most important, eat your fruits, grains, and vegetables!

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Competing interests
None declared

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