

Original Article

Can food variety add years to your life?

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The traditional food habits of Greeks and Japanese differ widely, yet both populations have the longest life expectancies in the world. Food variety is one feature common to both food cultures. By eating a wide variety of foods, numerous chemicals that give rise to the diverse range of colours, tastes, textures and smells of different foods are consumed. Many of these naturally occurring chemicals are likely to play a role in health. Within the broad scope of foods available, foods for thought include fish, legumes and nuts. These foods are also likely to protect older adults against some of the diseases more prevalent with ageing such as coronary heart disease and cancer.

Key words: Dietary habits, fish, food variety, legumes, nuts.

Introduction

Improvements in life expectancy are likely to occur as a result of improvements in socioeconomic factors and advances in medical care. However, food variety is also likely to play an important role in survival. Several studies examining the degree of food variety in different populations have found that those with the highest intake of variety tend to live the longest. Interestingly, the Japanese have the longest life expectancy in the world,¹ and promote dietary guidelines that suggest 30 or more different kinds of food should be eaten daily. Food variety has been shown to correlate (positively) with nutritional quality,^{2–4} and this probably contributes, at least in part, to health and longevity.

Survival studies

In the National Health and Nutrition Examination Survey Epidemiologic Follow-up, a study of more than 10 000 community-based adults living in the USA, it was found that there was an association between food variety and subsequent mortality. Men and women consuming two or fewer food groups per day had 1.5- and 1.4-fold greater risk of mortality, respectively, compared with those consuming five food groups.⁵ More recently, a prospective cohort of more than 42 000 women participating in a breast-cancer screening study found that women in the highest quartile of dietary quality (based on a recommended food score) had an approximately 30% lower risk of mortality compared with those in the lowest quartile.⁶

Prospective studies among ageing populations in Greece,⁷ and Denmark,⁸ have shown that the probability of survival is greatest among those with higher dietary scores, compared with those with lower dietary scores. These dietary scores, although based on a particular dietary pattern (Mediterranean), are also likely to reflect food variety.⁹

Intervention studies that have taken a food-based approach (with variety) have also shown favourable outcomes in terms of health and survival. In the Dietary Approaches to Stop Hypertension study, the group that

added low-fat dairy products to a diet that was high in fruit and vegetables showed greater improvements in blood pressure than the group that emphasized only the fruit and vegetable aspect of the overall diet.¹⁰ The Lyon Heart study, another food-based intervention study, found patients surviving a myocardial infarct were at lower risk of subsequent mortality if they followed a Mediterranean-type diet compared with a diet that presumably followed a more 'prudent' western format.¹¹ Although, both diet patterns have the potential to include a wide variety of foods, one study involving French adults, found individuals consuming diets consistent with key USA dietary guidelines were the least varied.⁹

Common causes of death with advancing years

In Australia, malignant neoplasms and coronary heart disease, the major causes of death, account for almost half of the total deaths registered.¹² However, coronary heart disease (CHD) is the largest single cause of death.¹³ Death rates from CHD increase sharply with age, with two-thirds of all deaths from CHD occurring in those aged 75 years and over. Certain dietary patterns are associated with an increased risk of coronary heart disease and the development of certain cancers.¹⁴

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Australian Nutrition Survey

On the whole, Australians have access to, and eat, a variety of foods in terms of the five major food groups (cereals, fruits, vegetables, meat and milk products). However, when it comes to legumes and nuts, less than 12% and 8%, respectively, of those interviewed for the 1995 National Nutrition Survey reported eating these foods (Table 1).¹⁵ More than 80% of Australians reported consuming some form of meat and poultry on the day of the survey, whilst less than 20% reported eating fish or seafood. Incorporating fish, legumes and nuts into the food habits of Australians (and other western populations with similar food habits) has the potential to enhance the level of food variety eaten.

Fish: health and survival

Studies

The interest in the link between heart disease and fish consumption began in the early 1970s, when diet and heart disease among Eskimos was examined more closely.¹⁶ Since then, a number of studies have been carried out among different populations (usually middle-aged men) to investigate this association. A review of 11 prospective cohort studies examining the association between fish intake and CHD mortality was recently performed to examine the strength of the evidence. From this review, there was convincing evidence to show that fish consumption was protective in populations at high risk of CHD mortality.¹⁷ Furthermore, one study among older men and women living in the Netherlands was able to demonstrate that the protective effect of fish on CHD mortality persisted with age.¹⁸

Several clinical trials indicate that the intake of fish or fish oil can reduce CHD mortality, or favourably influence established risk factors. In the DART study, men assigned to a diet including two to three fatty-fish meals per week had a 29% reduction in all-cause mortality.¹⁹ In the GISSI-Prevenzione trial, subjects surviving a myocardial infarction had a 20% decrease in cardiovascular death, non-fatal myocardial infarction, and non-fatal stroke in those taking the n-3 PUFA supplements, compared to the controls.²⁰ Fish intake in combination with a weight-reducing diet, has been shown to reduce ambulatory blood pressure (a major risk factor for CHD) to a greater extent than weight-loss alone, suggesting fish consumption has an independent and additive effect.²¹

Cardio-protective properties of fish

There are number of nutrients in fish that could have cardio-protective effects (Table 2). The omega-3 fats in fish have received the most attention in terms of potential health-protective properties. These fats may protect against sudden death from CHD by preventing arrhythmias.²² Omega-3 fats have been shown to reduce blood pressure, reduce triglycerides, inhibit platelet aggregation, reduce fibrinogen concentrations and improve endothelial function, factors that can favourably affect cardiovascular function.²³ Fish is also a good source of other nutrients that may protect cardiovascular function, including calcium, coenzyme Q₁₀ (or ubiquinone), vitamin D, selenium and taurine.²⁴

Other potential health-protective effects of fish

The anti-inflammatory effects of omega-3 fatty acids may protect against rheumatoid arthritis and osteoporosis.²⁵ Fatty fish with edible bones are a good source of calcium and vitamin D nutrients, which are important in bone health and fracture risk (Table 2).²⁶ Finally, there is some evidence to suggest the intake of fish appears to be associated with a lower risk of depression,²⁷ certain cancers,^{28,29} and may protect against diabetes.³⁰

Legumes: health and survival

Studies

Several reviews examining the research on soy and other legumes suggest that these foods have the potential to reduce the risk of certain cancers and coronary heart disease.³¹⁻³³ Since these reviews were carried out, two recent studies provide further evidence that legumes are associated with health and survival. When the food habits of five ageing cohorts from different cultures (including Asian and western cultures) were analysed in terms of survival, legumes were the only food associated with a reduced risk of death. This follow-up study found that for every 20 g increase in legume intake, the risk of death was reduced by approximately 8%, after controlling for age, gender, smoking, ethnicity and/or location.³⁴ A study of a large cohort of adults in the USA, followed for an average of 19 years, found that the frequency of legume consumption was inversely associated with the subsequent risk of CHD. After adjusting for numerous confounding factors, those who consumed legumes at least four or more

Table 1. Percentage of Australians consuming certain foods reported in the 1995 National Nutrition Survey¹⁵

Selected major food groups	≥65 years (%)	≥19 years (%)
Milk products and dishes	95.1	93.3
Cereal and cereal products	94.5	98.5
Vegetable products and dishes	91.6	88.8
Meat, poultry and game products and dishes	81.9	81.2
Fruit products and dishes	73.0	56.3
Alcoholic beverages	30.8	33.0
Fish and seafood products and dishes	19.4	18.3
Confectionery	14.0	20.8
Seed and nut products and dishes	9.3	12.4
Legume and pulse products and dishes	5.8	7.3

times per week had a 20% lower risk of CHD, compared to those who consumed them less than once a week.³⁵

A meta-analysis of 38 studies investigating the effects of soy protein on serum lipids found the consumption of soy was associated with a significant decrease in total serum cholesterol, low density lipoprotein cholesterol and triglycerides.³⁶ Other factors in legumes that may have a favourable impact on heart disease include soluble dietary fibre, folate, magnesium, potassium, calcium and certain phytochemicals (Table 3).³⁷⁻³⁹

A report published by the World Cancer Research Fund in Association with the American Institute for Cancer Research found that there was insufficient or inconsistent evidence to demonstrate a protective effect of legumes on the risk of cancer.¹⁴ However, the report suggested it was biologically plausible that diets high in legumes might be protective against cancer because legumes contain a diverse range of potentially anti-carcinogenic compounds. These include dietary fibre, oligosaccharides, folate, phytoestrogens,

phytosterols, phytic acid, protease inhibitors, saponins and a number of other phenolic compounds (Table 3).

The prevalence of non-insulin dependent diabetes rises with age. Legumes have a low glycaemic index and, as such, may be important in the management of diabetes and the health risks associated with this condition.³³ Retrospective studies have shown that good blood glucose control reduces the risk (and severity) of stroke, cardiovascular disease, visual loss, nephropathy, infections, as well as cognitive dysfunction.⁴⁰

Nuts: health and survival

Studies

The frequent consumption of nuts has been associated with a reduced risk of coronary heart disease in a number of large epidemiological studies. In 1992, Fraser *et al.* showed that among a large cohort (34 000) of Seventh-Day Adventists living in California, those who consumed nuts more than four times a week had almost half the risk of fatal or

Table 2. Potential protective properties of fish

Condition	Potential protective fish properties	Possible mechanisms
Heart disease	Omega-3 fats	Prevent arrhythmias (abnormal heart beat); platelet aggregation; reduce triglycerides (a type of blood fat); reduce blood pressure; improves elasticity; anti-inflammatory.
	Selenium	Antioxidant (oxidation of lipids → atherosclerosis); dampens thromboxane production.
	Vitamin D	Important in cell differentiation; therefore, it may play a role in dampening down atherogenesis, a process that has proliferative features.
	Calcium	Potential role in reducing blood pressure
	Coenzyme Q ₁₀	Antioxidant (oxidation of lipids → atherosclerosis).
Rheumatoid arthritis	Taurine	Reduces serum cholesterol.
	Omega-3 fats	Anti-inflammatory.
Cancer	Omega-3 fats	Reduces availability of certain cancer promoting fatty acids (by competing).
	Selenium	Immuno-enhancing.
	Coenzyme Q ₁₀	Antioxidant.
Depression	Omega-3 fats	Unknown
Osteoporosis	Omega-3 fats	Lowers production of PGE ₂ , LTB ₄ and various pro-inflammatory interleukins, factors known to promote bone loss (resorption).
	Vitamin D	Regulation of parathyroid hormone

Table 3. Potential protective properties of legumes

Condition	Potential protective legume properties	Possible mechanisms
Heart disease	Vegetable protein	Reduces total cholesterol and LDL cholesterol, reduces triglycerides.
	Dietary fibre (soluble)	Cholesterol lowering.
	Folate	Protects against elevated homocysteine concentrations.
	Isoflavones	Antioxidant (oxidation of lipids → atherosclerosis).
	Phytosterols	Cholesterol lowering.
Cancer	Phytoestrogens	Antioxidant (protects against DNA damage), gene expression, hormone regulation, angiogenesis, apoptosis.
	Oligosaccharides	Substrate for colonocytes, substrate for bifidobacteria.
	Phytic acid	Chelating agent, antioxidant (protects against DNA damage).
	Saponins	Antioxidant (protects against DNA damage), binds bile acids.
	Folate	Cell differentiation.
	Carbohydrate	Low glycaemic index.
Diabetes	Carbohydrate	Low glycaemic index.

Table 4. Potential protective properties of nuts

Heart disease	Potential protective nut properties	Possible mechanisms
Macronutrients	Protein (arginine) Dietary fibre (soluble) Fat	Precursor to nitric oxide. Cholesterol lowering. Favourable effect on lipid status (unsaturated fat), precursor (α -linolenic acid) to long-chain omega-3 fatty acids (EPA, DHA) → antiarrhythmia, reduced platelet aggregation and adhesion.
Micronutrients	Vitamin E Folate Magnesium Copper	Antioxidant, anti-inflammatory. Protects against elevated homocysteine concentrations. Protects against myocardial irritability. Protects against adverse changes in lipid status.
Other bio-active compounds	Lignans	Antioxidant.

non-fatal coronary heart disease events, compared to those who rarely ate nuts.⁴¹ In the Iowa Women's Health Study, frequent nut consumption in another large cohort (34 846 women), was associated with a 40% lower risk of death from coronary heart disease.⁴² Findings from the Nurses' Health Study, a study of more than 86 000 women followed for 14 years, showed that coronary risk was 34% lower in women who ate nuts at least five or more time per week compared with women who almost never ate nuts.⁴³ Interestingly, the protective effect of nut consumption also remains significant among those over the age of 84 years.⁴⁴

Interventions

There have been a number of studies examining the effect of nut consumption on serum lipids. Results from these studies suggest most types of nuts have a favourable effect on total cholesterol and LDL cholesterol, including walnuts,^{45–47} pistachio nuts,⁴⁸ macadamia nuts,⁴⁹ peanuts,⁵⁰ almonds⁵¹ and pecans.⁵² Generally the lipid lowering effects of nuts has been attributed to their fatty acid composition. Investigators using equations to predict the effects of fatty acids on blood cholesterol concentrations were able to show that, in subjects consuming experimental diets that included nuts, the observed lipid-lowering effect was approximately 25% more potent than expected.⁵³ This finding left the investigators to postulate that the additional effects were probably due to other components found in nuts.

The cardio-protective effect of nuts is probably due to a combination of factors that go beyond lipid lowering. Nuts are a good source of arginine, a precursor of nitric oxide. Nitric oxide is an effective vasodilator and it may have other antiatherogenic properties.⁵⁴ Other protective properties of nuts include vitamin E (functioning as antioxidant, and an anti-inflammatory agent),⁵⁵ magnesium (to protect against myocardial irritability),³⁹ copper (preserve favourable lipid profiles),⁵⁶ and folate, a nutrient that can help lower homocysteine, an independent risk factor in CHD.⁵⁷ There is also a range of other biologically active compounds that may also play a role (Table 4).

Conclusion

Fish, nuts and legumes have been associated with a lower risk of CHD, a leading cause of death in most western

countries. All three foods contain constituents that potentially protect against CHD and that are also likely to protect against other conditions associated with ageing. These foods would add variety to the food habits of most Australians (including populations of similar food cultures) and in doing so, the evidence would suggest, enhance longevity.

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