Current Therapeutics

Food Variety as Nutritional Therapy

GAYLE S. SAVIGE
Monash University
Department of Medicine

BRIDGET HSU-HAGE
Monash University
Department of Medicine

MARK L. WAHLQVIST
Monash University
Department of Medicine,
Monash Medical Centre,
Clayton, Victoria

Consuming a diet containing an adequate variety of foods has been shown to be associated with improved health outcomes. Moreover, evaluating an individual's food variety is a simple task that provides a key component of a more wide-ranging nutritional assessment. The results of this assessment can then be used in counselling patients about their food intake and implementing nutritional therapy.

In an affluent society there is usually an enormous variety of foods available for consumption. Despite this variety, individuals may choose foods which supply an excessive amount of one or more nutrients, such as fat, salt and alcohol.[1] As a consequence, affluence has been associated with increases in non-communicable diseases that can in part be attributable to diet and sedentary lifestyles.

Food Variety

Definition

Food variety can be defined in a number of ways. It can relate to the intake of foods that are biologically diverse, such as bananas and carrots, or that are nutritionally distinct from each other. The five food groups are broad categories of foods which differ nutritionally. Even within these groups, however, food processing can alter the characteristics of a food such that the same food can be classified differently according to how it is processed. For example, soya beans can be cooked and eaten whole, consumed as a fermented paste (miso), or eaten in the form of beancurd (tofu).

Public Health Implications

Many developed countries, including Australia, Germany, Netherlands, Sweden and Japan, have established their own sets of dietary guidelines. These guidelines are intended to encourage intake of foods (and sometimes nutrients) that will assist in the maintenance of good health, and to discourage food intake that will not. Eating a wide variety of foods is

SALIENT POINTS

- **Despite the enormous variety of foods available in affluent societies, individuals in these societies may choose potentially harmful diets characterised by low food variety**
- **Encouraging the consumption of a wide variety of foods is a feature common to all dietary guidelines**
- **Eating a wide variety of foods lessens the likelihood of consuming excessive amounts of potentially toxic substances and increases the likelihood of receiving an adequate and well-balanced intake of essential nutrients**
- **Several studies have shown food variety to be an important predictor of health outcomes**
- **Dietary food variety can be measured with a food diary or a food variety checklist completed for 7 days**
- **Particular care is needed when assessing and advising individuals who may be at increased risk of receiving inadequate nutrition, such as the elderly, vegetarians, people with medical conditions such as coronary heart disease, and the obese**
- **A comprehensive nutritional assessment of any individual can be made by elucidating his or her medical history, food intake (including food variety score), physical status, and the results of appropriate investigations**

one dietary guideline that is common in each of these countries.[2] The basis for such a guideline relates to a number of factors, of which perhaps the most important relates to nutritional adequacy. Most nutrition experts would agree that a nutritionally adequate diet (after the first few months of life) is best achieved by consuming a diverse range of foods. This concept has been supported by the results of a number of studies that have assessed nutritional quality through a food variety approach.[3–5]

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Food variety may also lessen the likelihood of consuming an excess of substances that may be potentially toxic.[6] Moreover, it increases the likelihood that individuals will receive an adequate and well balanced intake of essential nutrients.[7]

Measurement of Food Variety

Several approaches have been taken to measure food variety in diets. A numerical score can be given for each food consumed that differs according to the criteria used to define food variety. Each type of food consumed is scored once over a set time period such as a day, a week, a month, or a year. The score is tallied and used to assess the nutritional quality of a diet. An intake of 15 or more different foods per week or more than 12 foods in one day usually characterises a diet adequate in essential nutrients.[8]

Food variety has also been scored by counting the number of food groups eaten over one day and then scoring additional points for the number of serves consumed within each group. Once the desirable number of serves has been reached, scoring ceases.[9]

Food Variety as a Predictor of Clinical (Health) Outcomes

Several studies have shown food variety to be an important predictor of health outcomes. For example, food variety has been associated with less macrovascular disease. In a study exploring the variance in arterial wall compliance with food variety in subjects with type II diabetes and their healthy controls, a more favourable relationship was found among those consuming the greatest food variety.[10]

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A lack of food variety measured simply by food groups alone has been associated with an increased risk of mortality. Findings from the National Health and Nutrition Examination Survey (NHANES) I Epidemiologic Follow-up Study (NHEFS) showed that, in men, the age-adjusted mortality from cardiovascular disease, cancer and other causes was inversely related to their food variety. In women, a similar association was found in relation to cardiovascular disease and other causes, but not cancer.[11]

In a cohort study involving elderly, rural Greek subjects, higher food variety scores were significantly associated with a reduction in overall mortality. The risk of death was reduced by 17% in subjects with an increase in diet score of one and by 50% in those with an increase of four.[12] This study demonstrated that the sum of the diet was greater than its parts – another feature of a diet characterised by variety since such a diet will be more likely to realise synergy among food components. For example, combined intake of phyto-oestrogens and calcium may achieve more for bone health than would be expected from the aggregate effect of each by itself.

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Clinical Applicability of Indices of Food Variety

Assessing food variety is a quick, simple and, in most cases, accurate method for determining the nutritional adequacy of a diet.

Two approaches that will help doctors and other health professionals measure food variety are use of a food diary or a food variety checklist over a 7-day period. Seven days is a useful length of time to measure food intake as this generally reflects usual intake. The choice of method will depend on time considerations, the information required and the willingness of the patient.

A 7-day food diary record will highlight meal patterns but will require a certain degree of cooperation by the patient. Accurate and full descriptions of foods eaten (such as low-fat, fried) and the quantities consumed (in household measures) will provide useful information, especially if counselling is needed. If a food record is used, the food variety score can be calculated by scoring one point for every different food that appears over the 7-day food record period. Table I shows a food record sample in which a food variety score of 35 was achieved over 3 days.

While a food variety checklist (Table II) omits useful information, it requires little patient effort and can be filled in (and assessed) immediately. Patients using the checklist are asked to tick (once only) all the foods they remember consuming in the past week and then total the score.

Table I. Sample food record (only three days shown)

	Day 1	Score	Day 2	Score	Day 3	Score
Breakfast	Corn Flakes (cup)	1	Weet-Bix × 2	*	Muesli (½ cup)	1
	Banana × 1	1	Milk (½ cup)	*	Milk (½ cup)	*
	Milk (½ cup)	1	Sugar (1 teaspoon)	*	Stewed apple (¼ cup)	*
	Sugar (1 teaspoon)	1	Toast × 2	*	Toast × 2	*
	Toast (white) × 2	1	Margarine (2 teaspoons)	*	Margarine (2 teaspoons)	*
	Margarine (2 teaspoons)	1	Poached egg × 1	1	Vegemite (1 teaspoon)	1
	Jam (1 tablespoon)	*	Coffee and milk	*	Coffee and milk	*
	Coffee and milk	1				
Snack	Coffee and milk	*	Coffee and milk	*	Coffee and milk	*
	Sweet biscuit × 1	*			Peanuts (small packet)	1
Lunch	Ham (1 slice)	1	Baked beans (½ cup)	1	Salmon (2 tablespoons)	1
	Tomato (½ medium)	1	Toast × 2	*	Salad roll (white)	*
	Bread × 2 (wholemeal)	*	Carrot cake (1 slice)	*	Beetroot (2 slices)	*
	Flavoured milk (small carton)	*	Tea and milk	*	Tomato (4 slices)	*
	Apple × 1	1			Lettuce (2 leaves)	*
	Tea	*			Onion (2 rings)	*
	Milk	*			Orange juice (1 glass)	*
					Small packet of sultanas	*
					Tea and milk	*
Snack	Coffee and milk	*	Coffee and milk	*	Coffee and milk	*
	Yoghurt (acidophilus) tub	1	Biscuit & cheese	*	Apple × 1	*
			(1 slice)	*		
Dinner	Water	1	Chicken (1 × breast)	1	Beer (1 glass)	*
	Steak (120g)	1	Stir-fried vegetables:		Spaghetti (1½ cups)	1
	Potato (1 medium)	1	- Onion (½ small)	1	Bolognaise sauce (⅔ cup)	*
	Pumpkin (½ cup)	1	- Carrots (½ cup)	*	Lettuce (2 leaves)	*
	Broccoli (2 stalks)	1	- Snow peas (× 6)	*	Tomato (½ medium)	*
	Peaches (2 halves)	1	- Spinach (½ cup)	1	Cucumber (5 slices)	*
	Ice cream (2 tablespoons)	*	- Mushrooms (× 3)	1	Celery (1 stalk)	1
	Wine (1 glass)	1	Rice (1.5 cups)	1	Dressing (1 dessertspoon)	*
	Coffee and milk	*	Strawberries (× 8)	1	Pear × 1	1
			Yoghurt (tub)	*	Custard (⅔ cup)	*
			Coffee and milk	*	Coffee and milk	*
Snack	Orange × 1	1	Grapes (× 20)	1	Sweet biscuit	*
	Tea and milk	*	Tea and milk	*	Tea and milk	*
Totals		**19**		**9**		**7**

Food variety score in 3 days = 35

*Repeated food variety item: no score

Table II. Food variety check-list*

Grains and cereals
Wheat (includes ready-to-eat cereals such as Weet-Bix, Bran Flakes, and wholemeal or white bread)
Rye (includes ready-to-eat products)
Barley (includes ready-to-eat products)
Oats (includes ready-to-eat products)
Rice (includes ready-to-eat products)
Corn (includes ready-to-eat products)
All other grains and cereals (e.g. buckwheat, millet, quinoa, sago, semolina, tapioca, triticale)

Fruit
Stone fruit (e.g. apricot, avocado, cherries, nectarine, olive, peach, plum, prune)
Citrus (orange, lemon)
Apples
Bananas
Berries (e.g. raspberry, strawberry)
Grapes (including raisin, sultana)
Melons (e.g. honeydew, rock melon, watermelon)
Pears, nashi
Tropical fruit (e.g. guava, jackfruit, lychee, mango, papaya, pineapple, star fruit)
Date, kiwi fruit, passionfruit

Vegetables
Root (e.g. carrots, sweet potatoes, potatoes, bamboo shoots, beetroot, ginger, parsnip, radish, water chestnut)
Leafy greens (e.g. spinach, cabbage, brussels sprouts, silverbeet)
Marrow-like (e.g. cucumber, eggplant, marrow, pumpkin, squash, swede, turnip, zucchini)
Flowers (e.g. broccoli, cauliflower, endive, chicory, lettuce)
Stalks (e.g. celery)
Onion (e.g. spring onion, garlic, leek)
Peppers (e.g. capsicum)
Tomatos, okra

Legumes/pulses
Beans (e.g. green beans, snow peas, snap beans, peas/dried)
Adzuki, baked beans, haricot, black beans, black-eye beans, borlotti beans, cannellini beans, chickpeas, kidney beans, lentils, lima beans, lupins, mung beans (sprouts), pinto beans, soya beans (sprouts), soya milk, bean curd

Nuts and seeds
Almond, brazil nut, cashew nut, chestnut, coconut, hazelnut, peanuts, peanut butter, pecan nut, pine nut, pistachio nut, pumpkin seed, sesame seed, tahini, hommus, sunflower seed, walnut

Meats
Pork (including ham and bacon)
Lamb, beef, veal
Poultry (e.g. chicken, turkey, duck)
Game (e.g. quail, wild duck, pigeon)
Game (e.g. kangaroo, rabbit)
Liver, brain, all other organ meats

Seafood
Shellfish and mollusc (e.g. mussels, squid, oysters, scallops)
Crustaceans (e.g. prawns, lobster, crab, shrimps)
Fatty fish (e.g. anchovies, tuna, salmon, sardines, herring, mackerel, kipper, pilchards)
Fish (saltwater)
Fish (freshwater)
Roe (caviar)

Dairy
Milk, yoghurt (without live culture), ice-cream, cheese
Live cultures (yoghurt with live culture, e.g. acidophilus, bifidobacteria)

Eggs
All varieties

Fats and Oils
Oils
Hard/soft spreads

Fermented foods
Miso, tempeh, soya sauce
Sauerkraut
All other variety

Beverages
Non-alcoholic (tea, coffee, cocoa)
Alcoholic

Herbs and spices
Use regularly

Yeast
For example, Vegemite, Marmite, brewer's yeast

Fungi
All varieties

Sugar/confectionary
All varieties (including soft drinks)

Water
Including mineral

*Score 1 point for each food category eaten from. The maximum score for this check list would be 57. Quantities smaller than 1–2 tablespoons (except for fats, oils and vegemite) do not represent a sufficient quantity to rate a score (e.g. a slice of tomato in a hamburger)

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Table III. Relationship between food variety score and dietary adequacy

Total food variety score	Dietary adequacy*
>30/week	Very good
25–29/week	Good
20–24/week	Fair
<20/week	Poor
<10/week	Very poor

*The concept of dietary adequacy embraces that of essential nutrient adequacy but also takes into account other food components and food properties. It can be noted that consumption of about 60% of available variety is very good, and about 40% fair, from health risk and outcome points of view

Additional Considerations

A number of groups in the community may be at risk of poor nutrition. These include the elderly, vegetarians, those with medical conditions such as coronary heart disease (CHD), and the obese.

A good food variety score should reduce the risk of nutritional deficiencies in elderly individuals, provided sufficient energy is consumed

The Elderly

As energy expenditure declines with age, less food may be consumed. While nutritional adequacy becomes more difficult to achieve if energy intakes are small, a good food variety score should reduce the risk of developing nutritional deficiencies in this group, provided sufficient energy is being consumed.

Vegetarians

Vegetarians who avoid all animal products should be aware that cereals and legumes or nuts and/or seeds should be consumed with each meal to ensure the plant protein they consume is of adequate quality. Iron is in the non-haem form in plant foods and is therefore not absorbed easily. Iron absorption can be improved by consuming a vitamin C-containing food with meals, for example, sliced tomato on toast, strawberries on Weet-Bix.

Coronary Heart Disease

A number of studies have examined the relationship between fish consumption and CHD. In individuals who consume a small amount of fish there is a protective effect in relation to CHD.

Obesity

Exchanging intake of high energy-dense foods with a variety of low energy-dense foods should assist in weight loss and/or control.

When assessing food intake, it is important to ask about appetite, meal patterns and dietary issues of specific relevance to health problems

Nutritional Assessment

Nutritional assessement should be carried out in the following stepwise manner.

1. Take a medical history to establish a health profile and priorities in the context of which nutritional decisions must be considered
2. Assess food intake to establish food patterns and identify any nutritionally-related health problems. The patient should be asked about:
   - Appetite and meal patterns
   - Specific issues relating to health problems, such as fat intake and obesity, cardiovascular diseases and diabetes; calcium intake and osteoporosis.

   A food variety score should be calculated as a measure of dietary adequacy. Table III shows how food variety score can be related to overall dietary adequacy using a semi-quantitative approach, where the maximum score is about 50/week (see Table II)
3. Perform a physical examination, including anthropometry for body composition, height, weight, waist:hip ratio, and circumference and skinfold measures (calf and arm)
4. Choose investigations that will substantiate or confirm deductions made on the basis of the history (medical and food) and examination findings. In particular, they should clarify nutritional causality and pathogenesis and/or provide variables for monitoring progress. Examples include:
   - Haematological investigations – haemoglobin, red cell indices, lymphocyte count
   - Biochemical investigations – iron, ferritin, zinc, B12, folate
   - Immunological investigations – delayed hypersensitivity reaction, immunoglobulins
   - Physiological investigations – dark adaptation, muscle strength.

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Professor Mark L. Wahlqvist *is Professor and Head of Medicine, Monash University at Monash Medical Centre; National Chairperson of the Australian Nutrition Foundation; and Chairperson, International Union of Nutrition Sciences Committee of Nutrition and Ageing. His research interests are in clinical and public health nutrition. The directorship of the Clinical Nutrition and Metabolism Unit at Monash Medical Centre and the editorship of the Asia Pacific Journal of Clinical Nutrition reflect his clinical interests, which also extend to general medicine and to endocrinology and diabetes.*

Ms Gayle S. Savige *is a research dietitian within the Department of Medicine, Monash University at Monash Medical Centre. Her research interests are in nutrition in the elderly. She is currently completing a PhD exploring factors influencing geriatric nutritional status and possible strategies that may be used to improve this area.*

Dr Bridget Hsu-Hage *is Senior Lecturer in the Department of Medicine. Her research interests are in ethnic food and health in the Asia Pacific Region and in health promotion. She is also a regular contributor to the SBS radio Mandarin programme 'Healthy Lifestyle'.*

Authors' address: *Professor Mark L. Wahlqvist, Monash University Department of Medicine, Monash Medical Centre, Clayton, VIC 3168*