

(alpha-linolenic acid) and fish (eicosapentaenoic and docosahexaenoic acids).<sup>66,67</sup> For example, extra virgin olive oil contains between 30 and 40 different anti-oxidant compounds (including vitamin E) which may protect against cancer and heart disease.<sup>68</sup>

So what dietary changes can we make, even in later life, which will translate into improved health and longevity and, hopefully, successful ageing:

1. Increase food variety — eat a little bit of everything. Aim to eat at least 20 biologically distinct foods a week drawing from all food groups (fruits, vegetables, grains, nuts, meats, dairy, fish, oils, herbs, spices) (Table 3). An easy way to increase food variety is to include healthy dishes from other cuisines (e.g. tofu and leafy greens from Asia, tomato/legume dishes from the Mediterranean).

2. Vegetables — eat at least two cups per day and include three different colours. Choose a variety of brightly coloured vegetables, especially dark green leafy vegetables. Experiment with vegetables from Asia (e.g. bok choy) and the

Mediterranean (e.g. purslane, chicory, endive) which are high in omega 3 fatty acids). Try to include onion and garlic in your daily meals.

3. Fruit — eat at least two daily; fruit juice should count for no more than one serve per day as it does not contain everything you would get from whole fruit.

4. Cereals such as bread, pasta, rice — eat approximately five serves daily. Reduced salt bread and wholegrain products are preferred. Bread is the major source of salt in the diet.

5. In order to increase the intake of phytoestrogens, any of the following should be eaten on a regular basis: two to four slices of soy enriched bread, two 200 mL soy drinks, one tablespoon of linseed and one tablespoon of soy grits on cereal, one to two tofu burgers, a bowl of chickpea soup, or a snack of roasted chickpeas with sultanas.

6. Milk and milk products — eat at least two serves of low-fat products daily and eat fermented milk/yoghurt regularly. Non-milk sources of calcium include calcium fortified soy milk, fish with soft bones (e.g. sardines, salmon, pilchards)

**Table 3.** Weekly food variety score<sup>84</sup>

Biologically distinct food groups	Score	Biologically distinct food groups	Score
1. Eggs (all variety)		30. Water (including mineral)	
Dairy		31. Tea, coffee, herbal teas, wine, beer, spirits	
2. Milk, ice-cream, cheese		Fermented foods	
Live cultures		32. Miso, tempeh, soy sauce	
3. Yoghurt (e.g. acidophilus, bifidobacteria)		33. Sauerkraut	
Yeast		34. All other varieties	
4. Vegemite		Sugar/confectionery	
Fish (+ canned)		35. All varieties (including soft drinks)	
5. Fatty fish (tuna, anchovies, salmon, sardines, herring, mackerel, kipper)		Vegetables(canned, frozen)	
6. Saltwater fish		36. Root (potato, carrot, sweet potato, beetroot, parsnip, bamboo shoot, ginger, radish, water chestnut)	
7. Freshwater fish		37. Flowers (broccoli, cauliflower)	
8. Fish roe (caviar salad)		38. Stalks (celery, asparagus)	
9. Shellfish (mussels, oysters, squid)		39. Onion (spring, garlic, leeks)	
10. Crustaceans (prawns, lobster)		40. Tomatoes, okra	
Meat		41. Beans (green, snow peas)	
11. Ruminants (lamb, beef, veal)		42. Leafy greens (spinach, silverbeet, endive, kale, chicory, parsley, lettuce)	
12. Monogastric (pork, ham, bacon)		43. Peppers (capsicum, chillies)	
13. Poultry (chicken, duck, turkey)		44. Marrow (zucchini, squash, cucumber, turnip, eggplant, swede, pumpkin)	
14. Game (quail, wild duck, pigeon)		45. Fungi (e.g. mushrooms)	
15. Game (kangaroo, rabbit)		46. Herbs/spices	
16. Liver		Nuts and seeds	
17. Brain		47. Almond, cashew, chestnut, coconut, hazelnut, peanut, peanut butter, pine nut, pistachio, pumpkin seed, sesame seed, tahini, walnut	
18. All other organ meats		Fruit	
Legumes (+ canned)		48. Stone (peach, cherry, plums, apricot, avocado, olive, prune)	
19. Peas (fresh, dried, split peas); chickpeas (dried, roasted); beans (haricot, kidney, lima, broad); lentils (red, brown, green); soy products (tofu, milk).		49. Apples	
Cereals		50. Pears, nashi	
20. Wheat (bread, pasta, ready-to-eat)		51. Berries (strawberries)	
21. Corn (cornflakes, polenta)		52. Grapes (and raisins, sultanas)	
22. Barley (bread, barley, cereal)		53. Bananas	
23. Oats (porridge, cereal, bread)		54. Citrus (orange, lemon)	
24. Rye (bread; ready-to-eat)		55. Melon (honeydew, watermelon)	
26. Rice (grain, ready-to-eat)		56. Kiwi, date, passionfruit	
27. Other grains (millet, linseed)		57. Tropical (mango, pineapple)	
Fats and oils		Total weekly variety score = 1–57	
28. Oils			
29. Hard/soft spreads			
Beverages			

Instructions: A score of one is given to each food only once if consumed (> two tablespoons) over a 7-day period. Score of biologically different foods consumed in a week: < 20 marginal; 20–24 fair; 25–29 good; ≥ 30 very good.

unhulled sesame seed paste, almonds, pistachio nuts, soy beans, dried figs and apricots, pumpkin and dark green vegetables (e.g. broccoli, bok choy).

7. If eating red meat, use as a condiment (e.g. Asian style dishes). Choose lean cuts and limit these to less than 80 g/day or larger serves to approximately two times per week. Game meats and other non-domesticated (lean) animals are preferable. When cooking, use relatively low temperature methods, such as steaming, boiling, poaching, stewing, braising, baking, microwaving or roasting. Limit the use of grilling, pan frying and barbecuing to avoid formation of carcinogenic compounds.

8. Include meals high in plant proteins (e.g. legume, tofu or nut-based meals) on a regular basis, that is, approximately two times per week.

9. Include fish and seafood meals one to three times per week, especially fatty fish (e.g. fresh tuna, salmon, sardines, mackerel).

10. Include unroasted nuts as a snack — eat a handful of nuts (especially walnuts, pecans, almonds) at least a few times a week or spread pure nut pastes on bread instead of butter or margarine.

11. Avoid animal fats — choose low fat milk products and lean meats, and avoid high-fat fast food and commercial cakes and biscuits.

12. Use margarine sparingly on bread; reserve added fats (preferably a variety of unrefined liquid oils such as cold pressed canola or the flavoursome extra virgin olive oil) for your cooked meals, vegetables and salads. A little oil (one to two tablespoons/day) will improve the flavour of plant foods and will also aid the absorption of fat soluble vitamins (vitamin A and E,  $\beta$ -carotene) and phytochemicals (e.g. lycopene) from the vegetables.<sup>64</sup> Use herbs such as parsley, mint, basil, dill and paprika to provide more flavour to vegetables and meats.

13. Limit the consumption of table sugar or sugar-rich products. A high (as opposed to moderate) intake of sugar has been linked with lower intakes of nutrients, particularly in 'small eaters' or when diets are limited in calories. Sugar also increases the excretion of chromium, which may contribute to the onset of diabetes.<sup>69</sup> Dietary sources of chromium includes nuts, raisins, mushrooms, blackstrap molasses, brewer's yeast, egg yolk, cheese, liver, barley and other wholegrain cereals, meat, apple peel, some beer and wine. Dark honey is now thought to contain anti-oxidant phytochemicals and therefore it may be desirable to replace some table sugar with pure honey.<sup>70</sup>

14. Limit alcoholic beverages to one to two standard drinks per day and preferably consume with meals. However, since many adverse effects of alcohol consumption clearly exist (especially with breast/upper gastrointestinal cancers and stroke), a moderate alcohol intake is considered an optional rather than an essential component of the diet.<sup>59</sup>

15. The consumption of several small non-fatty meals daily (five to six episodes of eating) appears to be associated with greater food variety and with lower body fat, blood glucose and blood lipids, especially if food intake is curtailed in the evening hours (i.e. it is preferable to have the main meal for lunch and a light snack for dinner rather than the reverse).<sup>71</sup>

16. Remain physically active (e.g. 30–60 min of walking daily) and include strength exercises 2–3 times a week in

order to achieve an adequate intake of nutrients and phytochemicals and to maintain muscle strength and balance.

17. Last but not least is the need for an adequate fluid intake. As we age there is a blunted ability to defend ourselves against dehydration. This occurs because of the reduced sensation to thirst and a decline in kidney function.<sup>72</sup> In order to avoid dehydration (and constipation), it is advisable to consume at least four large cups of water or other fluids such as tea (which has the added benefit of containing anti-oxidant phytochemicals) irrespective of thirst. Consuming foods with a high-water content, such as fruit, will also help hydration status.

### Food versus supplements?

Dietary supplements are widely used among older women (45–80%), and to a lesser extent men (35–60%), in the United States, Canada, Australia and New Zealand.<sup>34</sup> Supplement manufacturers often target older people, claiming their products prevent disease or promote longevity. Unfortunately the nutrients most often taken as supplements are rarely those in shortest supply in the diet; furthermore, the people who regularly take supplements generally tend to be those who make healthier food choices anyway.

The consensus amongst nutritionists is that, in most situations, nutrients are best obtained from foods rather than from supplements.<sup>66</sup> Foods supply a range of essential nutrients and other potentially beneficial substances in amounts which, in contrast to many supplements, generally carry no risk of toxic effects or adverse nutrient interactions. Adverse nutrient interactions refer to the reduction in the level of utilization of one nutrient that can occur as a result of a high (usually supplement-derived) intake of another. Interactions among minerals and trace elements are common. For example, the reduction in copper utilization that occurs with the use of zinc supplements can lead to the development of copper deficiency. Other potential concerns are the risk of supplement interference with drug absorption in an age group that heavily consumes both prescription and over-the-counter drugs, and some evidence suggesting that vitamin A may be toxic at lower levels in older, as opposed to younger, adults.

There are, nevertheless, some situations in which supplement use by older adults is advisable. Vitamin D is an important example which has already been mentioned; however, care is required since this nutrient can be highly toxic if taken in levels above those recommended. Other appropriate uses include calcium supplements for bone health in those who have lactose intolerance or a cows' milk allergy. However, lactase-treated milk and yoghurt are available and are excellent calcium sources, as well as being rich in a host of other nutrients. Furthermore, those calcium supplements based on bonemeal, dolomite or oyster shells are not recommended due to potential contamination with toxic metals such as lead, arsenic, cadmium or mercury. Recommended dietary allowance (RDA) level multivitamin and mineral supplements may be helpful for those more frail and inactive older adults with very low food intakes (i.e. less than 5000 kJ per day). Recent recommendations are for a daily RDA level vitamin B12 supplement for all older adults. This recommendation reflects the findings that the reduction in stomach acid production that commonly occurs in older adults results in lowered dietary vitamin B12 absorption.<sup>15</sup>

Nevertheless, a well-balanced diet will provide most healthy older people with most of the nutrients they need and for those whose food intakes are very low, the more important priority is to identify and try to correct any underlying physical or psychosocial reasons for the existence of eating problems or for a poor nutritional state.

### Recommended levels of physical activity

Physical activity can fall into two broad categories. It may include everyday activities such as gardening, cleaning, and shopping, as well as more vigorous and structured type activities such as playing sport and participating in planned exercise programs. The latter are usually repetitive and performed with the intention to improve health and fitness. In the Risk Factor Prevalence Study,<sup>73</sup> the prevalence of both vigorous and less vigorous exercise declined progressively with age and this pattern appears to have changed little in recent years.<sup>74</sup> As mentioned previously, ageing is usually associated with a decline in function. However, whether this decline in function is an inevitable phenomenon of ageing or whether it relates to changes over which we may have some control requires further investigation. Fiatarone<sup>75</sup> states that "ageing as we know it in modern society is, in many ways, an exercise deficiency syndrome, implying that we may have far more control over the rate and extent of the ageing process than we previously thought."

Similar to the age-related loss of bone mass, the loss of muscle mass (sarcopenia) that occurs with age is more marked in women and it has been shown that reduced muscle mass is a direct cause of the age-related decrease seen in muscle strength.<sup>76,77</sup> Furthermore, this decline in muscle strength is responsible for much of the disability observed in older adults and, in the old elderly, muscle strength is a crucial component of walking ability.<sup>78,79</sup>

The two principal forms of physical activity or exercise important in promoting health and well-being include endurance exercise and strength training. Endurance activity improves heart and lung fitness while strength training enhances muscle size and strength. Strength training in older adults seems particularly promising in reducing or preventing the decline in muscle mass observed with ageing.<sup>47</sup> It can improve walking ability and balance and its associated risk for falls.<sup>80</sup> Strength training also contributes to improved tendon and ligament strength, bone health<sup>81</sup> and improvements in blood sugar levels.<sup>82</sup> Additionally, the benefits of physical activity, such as strength training, should make activities of daily living easier for older people. Such activities might include climbing stairs, getting out of a chair, pushing a vacuum cleaner, carrying groceries and crossing a road with sufficient speed.

As the level of physical activity is low among many older Australians, it is important that suitable, regular, physical activity programs that (preferably) include both an endurance (e.g. daily walk of 30 min duration or three bouts of 8–10 min)<sup>83</sup> and strength training component are undertaken by older adults in order to maintain health and quality of life. The level of physical activity required to achieve optimal health benefits for older adults has not been established but studies show that very frail and old elderly can still derive benefits from participating in physical activity.<sup>47</sup>

### Conclusion

Eating a wide variety of foods improves the nutritional adequacy of most diets and appears to be protective against many chronic diseases associated with ageing. Food variety, combined with appropriate levels of physical activity, will also assist in preserving muscle mass and function and help to ensure ageing is a successful and enjoyable period in one's life.

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