Fruits and Vegetables: Avoid them at your peril

Fruit and vegetables are indeed the guardians of our health

The information explosion in the science of nutrition very often creates the impression that available information is contradictory. Consequently, it is no longer easy to distinguish between fact, misinformation and fiction. The Division of Human Nutrition, Faculty of Medicine and Health Sciences, Stellenbosch University act as a reliable and independent source of nutrition information.

Fruit and vegetables are the only foods which ***collectively*** have been ***consistently*** associated with risk reduction in several diseases such as cancer, heart disease, diabetes, hypertension and age related macular degeneration. Additionally, some new data is emerging to support a protective role for fruits and vegetables in the prevention of cataract formation and chronic obstructive pulmonary disease.

In a landmark study, an international panel of experts, which reviewed more than 4500 research studies to determine the relationship between food, nutrition and cancer, estimated that cancer rates would decrease with as much as 20%, if people would eat five or more servings of fruit and vegetables per day.

Consuming a diet rich in a variety of plant foods provides a mixture of phytochemicals, “non- nutritive” substances in plants that possess health protective benefits. Fruit and vegetables contain an abundance of phenolic compounds, terpenoids, pigments and other natural antioxidants that have been associated with protection from and treatment of chronic diseases such as heart disease, cancer, diabetes and hypertension. Yet, despite their complex composition some of which is known (more is unknown or is being studied), we have tended to simplify their value in the daily diet. Indeed, we have often erroneously assumed that they can be “replaced” with pills of single or multiple known nutrients.

What is the dietary composition or the so-called “magic compounds” of fruit and vegetables in general?

Dietary Fibre

Dietary fibre consists of the structural and storage polysaccharides and lignin in plants that are not digested in the stomach and small intestine. Servings of commonly consumed grains, fruits, and vegetables contain 1 to 3 g of dietary fibre. For instance, a large apple with the skin contains 3.7 g and half a cup of cooked spinach contains 2.8g of fibre. A wealth of information supports, on balance, the protective role of dietary fibre in the treatment and prevention of diseases such as cancer, heart disease, diabetes mellitus, constipation and diverticulosis. Recommended intakes of 20-38 g/day for healthy adults and age plus 5 g/day for children are not being met, because consumption of good sources of dietary fibre, such as fruits, vegetables, whole and high-fibre grain products, and legumes is inadequate. A diet adequate in fibre-containing foods is also usually rich in micronutrients and “non-nutritive” ingredients that have additional health benefits. A fibre-rich meal is processed more slowly, which promotes earlier satiety, and is frequently less energy dense, lower in fat and added sugars. All of these characteristics are important elements of a dietary pattern to treat and prevent obesity.

Phytochemicals

Plant foods contain large amounts of “non-nutrient” compounds called phytochemicals, which are biologically active, natural occurring chemical compounds (Table 1). Phytochemicals act as natural defence systems for their host plants protecting them against infection and microbial invasions. The phytochemicals also provide the colour, taste and aroma to fruits and vegetables. More than 2000 plant pigments are considered phytochemicals and include flavonoids, carotenoids and anthocyanins. Research has identified a host of active substances in fruit and vegetables, which are being investigated and some of them are thought to protect against disease.

Table 1: Some phytochemicals and their sources

Phytochemical	Sources
Anthocyanins	Strawberries, cherries, cranberries, raspberries, blueberries, grapes and black currents
Butyrate	Fruit, vegetables and legumes
Carotenoids	Dark yellow, dark orange and deep green vegetables and fruit
Diallyl sulfite	Onions, garlic, scallions, leeks and chives
Flavonoids and phenols	Parsley, carrots, citrus fruits, broccoli, cabbage, cucumbers, squash, tomatoes, eggplant, peppers, berries, potatoes, broad beans, pea pods, coloured onions, onions, apples
Indoles	Cabbage, cauliflower, broccoli, Brussels sprouts, spinach
Isothiocyanates	Cabbage, cauliflower, broccoli, Brussels sprouts, horse radish, radishes
Flavonoids	Fruit, vegetables, wine, onions, kale, beans
Limonene	Citrus
Lycopenes	Tomatoes, red grapefruit, guava, dried apricots
Organosulfuric compounds	Garlic, onions, chives, citrus fruits, broccoli, cabbage, cauliflower, Brussels sprouts
Terpenes and monoterpenes	Citrus fruits, parsley, carrots, celery, broccoli, cabbage, cauliflower, cucumbers, squash, tomatoes, eggplant, peppers

In relation to cancer, phytochemicals in fruit and vegetables help metabolise drugs, toxins, carcinogens and mutagens. These overlapping and complementary mechanisms include the neutralizing free radicals, inhibiting enzymes that activate carcinogens and inducing enzymes that inactivate carcinogens. They therefore act as blocking or suppressing agents and reduce the risk of cancer.

The antioxidant, vitamin C, vitamin E, selenium and phytochemical content in fruits and vegetables is thought to be primarily responsible for disease prevention. This has lead to an explosion in the food supplement market of supplements containing one or more of these compounds for the protection and treatment of the so-called diseases of lifestyle. In the process, the collective contribution and complex interaction of these compounds has been overlooked, and at times, indeed ignored. The available scientific experience indicates that the so-called “pill-popping” is not only ineffective, but it could also be dangerous depending on the dose in the pill and the duration of

the “pill” consumption. For instance, a study in Finland of male smokers who received either α-tocopherol, β-carotene, both or placebo revealed a 16% higher incidence of lung cancer associated with high dose β-carotene supplementation. Effective and useful as supplements may be in certain situations, they nevertheless remain a poor substitute for the complex composition of fruits and vegetables.

Macronutrients and Micronutrients

Fruit and vegetables are low in fat or virtually fat free, high in carbohydrates moderate in protein and excellent sources of vitamins and minerals. For instance, a serving of vegetables (1 cup raw or half a cup cooked vegetables) provides on average 5 grams of carbohydrates, 2 grams of protein, 0 grams of fat and 120 kJ in energy. A serving of starchy vegetables (potato, sweet potato, corn, pumpkin, peas) provides on average 15 grams of carbohydrate, 3 grams of protein, 0 grams of fat and 300 kJ in energy. A serving of fruit provides on average 15 grams of carbohydrate, 0 grams of protein, 0 grams of fat and 250 kJ in energy. Diets high in fruit and vegetables are therefore higher in fibre and micronutrients, but lower in fat and energy, which protects against the so-called diseases of lifestyle such as obesity, heart disease and cancer.

Vitamins and minerals

Fruit and vegetables are by far the best dietary sources of antioxidants, folate, vitamin C, manganese, beta carotene and potassium. It is also a good dietary source of vitamin E, pantothenic acid, biotin, choline, vitamin K, calcium, magnesium, iron (non-haeme), chromium, molybdenum and selenium.

Fruit and vegetables and disease prevention – why it is wise to eat at least five to six portions every day?

Cancer

Epidemiologic evidence of a protective role for fruit and vegetables in cancer prevention is substantial. A report commissioned by the World Cancer Research Fund and the American Institute for Cancer Research, estimated that diets high in fruits and vegetables (more than 400g per day) could prevent at least 20% of all cancer incidence (Table 2).

Table 2: Dietary factors associated with the different cancers

Organ	**ASSOCIATED RISK**	
	INCREASED RISK (excessive practices)	**DECREASED RISK (increased consumption)**
Breast	• Energy intake • Overweight • Alcohol	• Fruit and vegetables
Prostate	• Animal fat • Red meat	• Lycopene • Vit E supplementation
Colorectal	• Red and processed meat • High fat intake • Overweight in men • Physical inactivity • Alcohol	• Fruit and vegetables
Oesophagus	• Alcohol • Very hot drinks • Charcoal broiled, fried and smoked foods • Deficiencies of niacin, riboflavin, zinc and selenium • Mycotoxins	• Fruit and vegetables
Stomach	• Smoked, pickled and fried foods • High salt intake	• Fruit and vegetables • Green tea
Lung	• High fat intake in men	• Fruit and vegetables

Fruit and vegetables are most effective against those cancers that involve epithelial cells such as cancer of the lung, cervix, oesophagus, stomach, colon and pancreas. A recent study from Greece involving 2 400 woman noted that vegetable and fruit intakes were independently associated with significant reductions in the incidence of breast cancer. Woman who consumed at least 4-5 servings of vegetables per day had a 46% lower risk of breast cancer than women who had an intake of less than two servings per day. Women with the highest intake of fruit (6 servings per day) had a 35% lower risk than women who had the lowest intake of fruit (less than 2 servings).

The exact mechanism that explains the protective role of fruit and vegetables in cancer is yet to be determined, but is likely to be multifactorial. **Anti-oxidant nutrients** (e.g. vitamin C, vitamin E, beta-carotene and selenium) have been in the news for quite some time now regarding their role in cancer prevention. Theoretically, these nutrients should protect the body against the development and progression of cancer. However, there is no conclusive scientific evidence regarding anti- oxidants, specifically, being the only active substances in fruit and vegetables which provide the protection against cancer. The results of many studies continue to suggest a much more complex role for specific micronutrients and "non-nutritive" substances, an area which is being actively and intensively investigated. It should also be borne in mind that fruit and vegetable consumption may also be an index, which reflects differences between individuals who eat or do not eat correctly rather than having any protective role against cancer.

Research has identified a host of active substances in foods that protect against cancer. These include allyl sulfates in garlic and onions; phytates in grains and legumes; glucarades in citrus, grain and solaceous vegetables; lignans in flax and soyabeans; isoflavones in soyabeans, saponins in legumes; indoles, isothiocyanates and dithiolthione in cruciferous vegetables; ellagic acid in grapes, strawberries, raspberries and nuts and a whole range of flavonoids, carotenoids and terpenoids in various plants (Table 2).

Table 3. Classes of vegetables

What are?

Cruciferous vegetables: cabbage, cauliflower, broccoli, Brussels sprouts, kale, kohlrabi, mustard, rutabaga and turnips

Solanaceous vegetables: tomatoes, peppers and eggplant

Umbelliferous vegetables: carrots, celery, cilantro, parsley and parsnips

Allium vegetables: garlic, onions, shallots, chives and leeks

Cucurbutaceous vegetables: pumpkin, squash, cucumber, muskmelon and watermelon

Some of the phytochemicals are widespread, whereas others are characteristic of particular classes of vegetables and fruit. For example (Table 3), cruciferous vegetables, such as broccoli, cauliflower, Brussels sprouts, and cabbage, are unique in their high content of dithiolthiones and isothiocyanates; these are organosulfur compounds that have been shown to increase the activity of enzymes involved in the inactivation of carcinogens and other foreign compounds. Cruciferous vegetables also contain indole-3-carbinol, which has been shown to affect oestrogen metabolism. The allium vegetable family includes onions, garlic, scallions, leeks, and chives and is notable for its content of compounds such as diallyl sulfide and allyl methyl trisulfide. Allium compounds have been shown to induce enzymatic detoxification systems. Furthermore, the antibacterial activity of these compounds may serve to inhibit the bacterial conversion of nitrate to nitrite in the stomach, thereby reducing the amount of nitrite available for reaction with secondary amines to form nitrosamines, which may be carcinogenic, particularly in the stomach.

Citrus fruit is known for its high content of vitamin C, which, as an antioxidant, may protect cell membranes and DNA from oxidative damage. Vitamin C may further help prevent cancer via its ability to scavenge and reduce nitrite, thereby reducing substrate for the formation of nitrosamines. Vitamin C also plays a role in the synthesis of connective tissue protein, such as collagen; a deficiency of vitamin C may, therefore, affect the integrity of intercellular matrixes and have a permissive effect on tumour growth or hinder tumour encapsulation. Citrus fruit also contains coumarins (also found in some vegetables) and D-limonene (found specifically in citrus fruit oils), which have been shown to increase the activity of glutathione transferase, a detoxification enzyme.

Green leafy vegetables contain **lutein,** a carotenoid, and **xanthophyll** pigment that has no vitamin A activity, but that, as an antioxidant, may protect against cancer via its ability to block damage by free radicals. Green leafy vegetables are also a rich source of folic acid, a deficiency of which may lead to chromosomal damage at sites thought to be relevant to specific cancers.

Orange vegetables, such as carrots, sweet potatoes, winter squash, and pumpkin, are rich sources of beta carotene, as are some fruits, including papaya, mango, and cantaloupe. Beta- carotene, like other carotenoids, is an antioxidant and through this function it may protect against free radical damage. Beta-carotene can also be metabolized to vitamin A (retinol), which plays a role in differentiation of normal epithelial cells. Because lack of differentiation is a feature of cancer cells, adequate intake of vitamin A (from either carotenoids or retinol) may help avoid the development of cancer. Tomatoes are particularly rich in a red pigment, lycopene, another antioxidant carotenoid.

Other potentially anticarcinogenic substances are not limited to one type of vegetable or fruit but are more widespread. For example, **selenium** is found in produce in amounts proportional to the selenium content of the soil in which it is grown. Selenium functions as a cofactor for glutathione peroxidase, an enzyme that protects against oxidative tissue damage. Selenium may further alter the metabolism of carcinogens via its role in the mixed function oxidase system in the liver. Vegetables also contribute vitamin E to the diet (although the major sources are vegetable oils and margarine); vitamin E is an antioxidant that protects polyunsaturated fatty acids in cell membranes from oxidation. Vitamin E further keeps selenium in the reduced state, thus facilitating the antioxidant capacity of selenium. Additionally**, vitamin E** has been shown to decrease the formation of nitrosamines in the stomach.

Flavonoids, such as **quercetin and kaempferol**, are polyphenolic antioxidants that occur in vegetables and fruit (tea and wine are also important sources). In addition to being antioxidants, flavonoids may defend cells against carcinogens.

Fruit, vegetables, and legumes are major sources of **dietary fibre**, which has been widely hypothesized to be protective against colon cancer. Dietary fibre may increase fecal bulk and decrease transit time; thereby, via dilution and a shorter period of contact, fibre may reduce the interaction between carcinogens and the intestinal epithelium. Fibre may also bind carcinogens and bile acids. Furthermore, certain types of dietary fibre are fermented by microflora in the colon, which leads to the production of short-chain fatty acids, one of which – butyrate – has been shown to be antineoplastic. The presence of short-chain fatty acids also lowers colonic pH and, subsequently, inhibits the conversion of primary to secondary bile acids, which stimulate colonic cell proliferation and are thought to promote carcinogenesis.

The fruit, vegetables and herbs with the highest anticancer activity include garlic, soybeans, cabbage, ginger and the umbelliferous vegetables. Onions, flax, citrus, turmeric, cruciferous vegetables and solanaceous vegetables have a modest protection against cancer.

Heart disease

Epidemiologic evidence is growing for a protective role of fruit and vegetables in coronary heart disease. **Vitamin C, vitamin E, beta-carotene, selenium, flavonoids** and **magnesium** are all dietary compounds that are known to decrease LDL oxidation, slowing the atherogenic process and protecting the vessel walls. **Carotenoids** found in yellow-orange fruit and vegetables are powerful antioxidants that act to quench free radicals and provide protection against oxidative damage. The many flavonoids in fruit and vegetables have antioxidant properties and protect LDL cholesterol from oxidation and also inhibit platelet aggregation. **Quercetin** is a major flavonol in red and yellow onions, kale, broccoli, red rapes, cherries, French beans and apples and inhibits LDL oxidation. The Zuptphen study of elderly men in the Netherlands found that flavonoid intake was inversely associated with heart disease and incidence of heart attack over a 5-year period. Those

who had the highest consumption of flavonoids had 60% less mortality from heart disease than low flavonoid consumers.

Phenolic antioxidant compounds found in grapes and unfermented gape juice and phenolic flavonoids found in red wine and grape juice also protect against LDL oxidation and inhibit platelet aggregation.

Folic acid found widely in fruits and vegetables such as dried beans, green leafy vegetables, melons and oranges and vitamin B6 and Vitamin B12 help to lower blood homocysteine, a known risk factor for heart disease.

Cholesterol: Several **dietary fibre** sources lower blood cholesterol levels, specifically that fraction transported by low density lipoproteins (LDL). Fibers that lower blood cholesterol levels include foods such as apples, barley, beans and other legumes, fruits and vegetables, oatmeal, oat bran and rice hulls; and purified sources such as beet fiber, guar gum, karaya gum, konjac mannan, locust bean gum, pectin, psyllium seed husk, soy polysaccharide and xanthan gum. Several studies over the past 20 years have shown that persons who daily consume about 30-60g of soy for at least 4 weeks can decrease total cholesterol and LDL cholesterol with as much as 10% to 20% when their initial blood cholesterol levels are elevated. The blood lipid response tends to be more pronounced in younger individuals and those individuals who have a greater initial cholesterol level. A meta-analysis of 38 controlled clinical trials found that and average intake of 47 g soy protein per day produced an average 13% decrease in LDL cholesterol and a 10% decrease in triglyceride levels.

As components in foods are digested and absorbed from the small intestine, fibre becomes a major component in the gut lumen with resultant increase in luminal viscosity. This viscosity interferes with bile acid absorption from the ileum. In response, LDL cholesterol is removed from the blood and converted into bile acids by the liver to replace the bile acids lost in the stool. Some evidence also indicates that changes in the composition of the bile acid pool accompanying ingestion of some viscous fibers dampen cholesterol synthesis. Because endogenous synthesis accounts for about three-quarters of total body cholesterol pool, slowing the synthesis could have a favorable impact on blood cholesterol concentrations. Increasing soluble fiber intake by consuming a wide variety of foods may or may not have a hypocholesterolemic effect; this variability in response may depend on the composition of the rest of the diet.

Anthocyanins are water soluble, reddish pigments found in many fruits such as strawberries, cherries, raspberries, blueberries, grapes and black currents. The anthocyanins in these fruits inhibit HMGO-CoA reductase (enzyme needed for endogenous cholesterol synthesis) and thereby lower serum cholesterol levels.

Hypertension: A meta-analysis found that high dietary potassium may help control and prevent hypertension. Dietary potassium and blood pressure are inversely related, the higher the potassium, the lower the blood pressure. Tomatoes, apricots, potato, banana and citrus fruits are good dietary sources of potassium.

The Dietary Approaches to Stop Hypertension (DASH) intervention study, a large (412 participants) randomized trial, studied the effect of different levels of dietary sodium, in conjunction with the DASH diet, which was rich in vegetables (at least 4 portions per day), fruits (at least 4 portions per day), and low-fat dairy products, in persons with and without hypertension. Within the assigned diet, participants ate foods with high, intermediate, and low levels of sodium for 30 consecutive days each, in a random order. The authors documented that hypertensive individuals had a clinically significant reduction in blood pressure while consuming a combination diet which included twice the average number of fruit, vegetables and low fat dairy products, one third the usual intake of beef, pork and ham and half the usual intake of fat, sweets and snacks.

Stroke: Potassium intake had also been related to stroke mortality. In a large study a 10 mmol daily increase in potassium intake (one or two extra servings of fruit or potato) was related to a

40% decrease in the incidence of stroke related death. Data from the NHANES survey also suggests that low dietary potassium intake is associated with an increase risk of stroke. Newer data from a Dutch prospective study suggest that low levels of dietary flavonoids are associated with higher risk of stroke.

Gastrointestinal disease

Diverticulosis: A diet high in fruit and vegetables protect against diverticulosis. Diverticulosis is one of the most common medical conditions in industrialized nations. It occurs when small outpouches, called diverticula, develop in the wall of the large intestine or colon. High fiber diets, which help to increase stool bulk and moisture reduce transit time through the gastrointestinal tract, provide defense against the development of diverticulosis. Insoluble fibre may be the type of fibre most responsible for this protective role. Fruit and vegetables are high in cellulose, which is an insoluble fibre. A high-fibre diet is standard therapy for diverticular disease of the colon. Formed diverticula will not resolve by a diet adequate in fiber, but the bulk provided by such a diet will prevent the formation of additional diverticula, lower the pressure in the lumen, and reduce the chances that one of the existing diverticula will burst or become inflamed.

Constipation: A diet high in fruit and vegetables is higher in fibre. The large intestine responds to the larger and softer mass of residue produced by a higher fibre diet by increasing peristaltic movements, which move the contents towards excretion. Fibre in mixed diets, legumes, fruit and vegetables and whole grain products are particularly effective promoters of normal laxation.

Eye Disease

Cataracts: A unique, relatively newly identified protective role for fruits and vegetables is in cataract prevention. Cataracts are one of the world's major causes of blindness: an estimated 50 million people in the world are blind because of cataracts. Cataracts are most common among the elderly. Substantial evidence suggests that consumption of high levels of antioxidants—vitamins C and E and carotenoids—is associated with delayed development of the various forms of cataracts. There is some epidemiologic evidence that the same beneficial relationship exists for fruits and vegetables.

A significant 5-fold reduction in relative risk of cataracts was demonstrated among individuals who consumed more than 1.5 daily servings of fruits, vegetables, or both fruits and vegetables. In another case-control study of middle-aged and older residents of Beaver Dam, Wisconsin, dietary sources of folic acid, fiber, and carotenoids (particularly lutein and zeaxanthin), from vegetables, were associated with lower risk of cataracts, especially in men. In a cohort study of women 45 to 67 years of age followed for 8 years, Hankinson et al found that a high dietary carotenoid intake, particularly from green vegetables, was associated with a lower risk of cataract extraction. Women who consumed high levels of carotenoids were noted to have a 39% lower risk of cataract extraction than low consumers.

Age-related macular degeneration (AMD): Age-related macular degeneration together with cataracts, are the leading causes of visual impairment and acquired blindness. Macular degeneration involves damage to the macula, an area of the retina in the back of the eye responsible for the sharp central vision needed to read, drive and perform most daily activities. One of the Eye Disease Case Control Studies, found a significant lower risk for developing eye disease in people with high amounts of lutein and zeaxanthin in their blood. These are both carotenoids found in dark green leafy vegetables, broccoli, orange peppers, corn, peas and tangerines. Dietary studies confirmed the association between frequent intake of spinach or collard greens and lower AMD risk. The Third National Health and Nutrition Examination Survey (NHANES III) confirmed that consuming 6 mg per day of lutein and zeaxanthin was associated with reduced risk for developing AMD.

Chronic Obstructive Pulmonary Disease (COPD)

COPD (common examples of COPD are asthma and bronchitis) is a collection of diseases that affect the airways in the mucous membranes of the respiratory tract which obstructs the small bronchial tubes.

Five epidemiologic studies examined the role of fruits and vegetables in COPD. In a cross- sectional study Cook and colleagues reported improved lung function in children who consumed fresh fruits more than once a day compared with those who did not. Consumption of salad and green vegetables in this group of British school-aged children (8 to 11 years old) was also associated with a beneficial effect on lung function, but it was weaker than the effect of fresh fruits. Strachan et al found that consumption of winter fruits had a protective effect on lung function in British adults in comparison with those who never drank fruit juice and only ate fresh fruits less than once a week. This association was true across ages (participants ranged in age from 18 to 69 years) and among current non-smokers and those who had never smoked. In the cohort Zutphen study, consumption of fruit, in particular solid fruits, was found to be protective against COPD, including asthma, among a group of middle-aged Dutch men followed up for 25 years. La Vecchia et al reported a high vegetable intake, but not fruit intake, to be protective against bronchitis and bronchial asthma. A study of more than 3 000 men in Finland, The Netherlands, and Italy showed that men with high fruit and vegetable intakes (median daily intakes of 105 to 160 grams of fruits and 45g to 174 grams of vegetables) had the best lung function.

The findings of these studies suggest that a high intake of fruits and vegetables enhances ventilatory function, thereby reducing the risk for COPD. A possible explanation for the findings is the high level of flavonoids, such as quercetin, available widely in fruits and vegetables. Although flavonoids are found in high concentrations in almost all fruits and vegetables, fruits generally contain greater amounts than vegetables. The outer layers of fruits and vegetables are the richest sources. Vitamin C intake has also been singled out as a possible dietary component to explain these results. Both flavonoids and vitamin C are strong antioxidants, properties which are thought to impart the protection.

RECOMMENDATIONS

Eat at least five portions fruit and vegetables per day every day! HERE, MORE IS BETTER!

- Try to eat at least 5-6 portions of fruit and vegetables per day. Pure fruit juice or vegetable juice can be used to decrease the bulk of the diet or according to personal preference. Approximately ¾ a glass of fruit juice and ¾ of a class of vegetable juice is equal to one portion of fruit or vegetable.
- Choose at least one yellow-orange and one dark green vegetable daily.
- Buy vegetables in season, since they are more affordable.
- Eat a variety of fruit and vegetables including: Try a new vegetable and fruit each week.
- Cruciferous vegetables: cabbage, cauliflower, broccoli, Brussels sprouts, kale, kohlrabi, mustard, rutabaga and turnips.
- Solanaceous vegetables: tomatoes and peppers and eggplant.
- Umbelliferous vegetables: carrots, celery, cilantro, parsley and parsnips.
- Allium vegetables: garlic, onions, shallots, chives and leeks.
- Cucurbutaceous vegetables: pumpkin, squash, cucumber, muskmelon and watermelon
- Be creative and start a vegetable garden to have access to fresh vegetables all the time.
- Always wash raw fruit and vegetables in clean / safe water.
- Discoloured and spoiled parts should be discarded.
- Eat the skins where possible.
- Double your normal serving of vegetables and fruits. Try a banana with breakfast, a salad and an apple with your lunch and two vegetables with supper.

- Use vegetables in your egg, rice or samp and pasta dishes e.g. onions, tomatoes and mushrooms
- Store vegetables and fruit in a cool place or the refrigerator to maximize shelf-life.
- Correctly home prepared and commercial frozen vegetables are also healthy and can be used as a substitute for fresh vegetables.
- Do not leave cut vegetables and fruit in water long before cooking.
- Boil vegetables for a short time in very little water to retain the vitamins. Eat as soon as possible! Also bake, stir-fry or steam vegetables for better nutrient retention.
- Most people do not consume an optimal amount of all vitamins by diet alone. Pending strong evidence of effectiveness from randomized trials, it appears prudent for all adults to take vitamin supplements. A multivitamin (containing all the vitamins) and mineral supplement, providing 100%-150% of the recommended daily intake per tablet is advisable, but cannot replace a healthy diet high in phytochemicals. It should be used with a healthy diet, high in fruit and vegetables and provide at least 400ug folic acid.
- **ENJOY!**

For further, personalized and more detailed information, please contact a dietitian registered with the Health Professions Council of South Africa.

References from the scientific literature used to compile this document are available on request.

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