Cancer Association of South Africa (CANSA)

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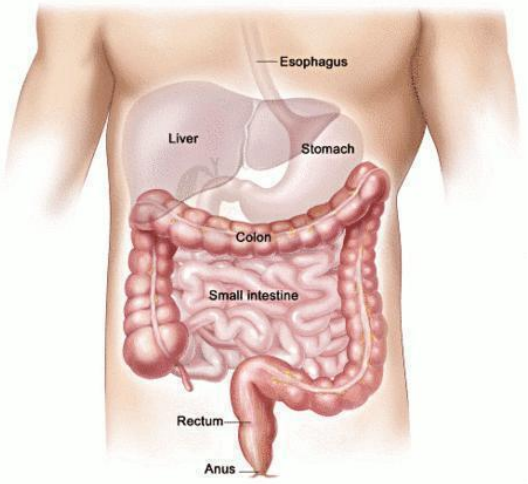
Nutritional Guidelines for Individuals Diagnosed with Cancer of the Stomach

Introduction

The stomach is a muscular, hollow, dilated part of the digestive system which functions as an important organ of the digestive tract. It is involved in the second phase of digestion, following mastication (chewing of food).



[Picture Credit: Stomach]

The stomach can be found between the oesophagus and the duodenum (the first part of the small intestine). It secretes protein-digesting enzymes called proteases and hydrochloric acid (HCl), also referred to as gastric acid to aid in food digestion. Mechanical digestion occurs mainly through smooth muscular contractions of the digestive system. From the stomach the partially digested food (chyme) passes through to the small intestine.

Prado, C.M., Pucell, S.A. & Laviano, A. 2020.

"Many patients with cancer experience poor nutritional status, which detrimentally impacts clinical outcomes. Poor nutritional status in cancer is primarily manifested by severe muscle mass (MM) depletion, which may occur at any stage (from curative to palliative) and often co-exists with obesity. The objective of this article was to discuss gaps and opportunities related to the role of nutrition in preventing and reversing low MM in cancer. It also provides a narrative review of relevant nutritional interventions for patients capable of oral intake. The impact of nutrition interventions to prevent/treat low MM in cancer is not well understood, potentially due to the limited number of studies and of clinically viable, accurate body composition assessment tools. Additionally, the type of study designs, inclusion criteria, length of intervention, and choice of nutritional strategies have not been optimal, likely underestimating the anabolic potential of nutrition interventions. Nutrition studies are also often of short duration, and interventions that adapt to the metabolic and behavioural changes during the clinical journey are needed. We discuss energy requirements (25-30 kcal/kg/day) and interventions of protein (1.0-1.5 g/kg/day), branched-chain amino acids (leucine: 2-4 g/day), β-hydroxy β-methylbutyrate (3 g/day), glutamine (0.3

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g/kg/day), carnitine (4-6 g/day), creatine (5 g/day), fish oil/eicosapentanoic acid (2.0-2.2 g/day EPA and 1.5 g/day DHA), vitamin/minerals (e.g. vitamin D: 600-800 international units per day), and multimodal approaches (nutrition, exercise, and pharmaceutical) to countermeasure low MM in cancer. Although the evidence is variable by modality type, interventions were generally not specifically studied in the context of cancer. Understanding patients' nutritional requirements could lead to targeted prescriptions to prevent or attenuate low MM in cancer, with the overall aim of minimizing muscle loss during anti-cancer therapy and maximizing muscle anabolism during recovery. It is anticipated that this will, in turn, improve overall health and prognostication including tolerance to treatment and survival. However, oncology-specific interventions with more robust study designs are needed to facilitate these goals."

Kubota, T., Shoda, K., Konishi, H., Okamoto, K., Otsuji, E. 2020.
Patients with gastric cancer are often malnourished during tumor progression. Malnutrition is a risk factor for postoperative complications and a poor prognosis. Early evaluation and management of nutrition can improve these outcomes. Various combined indices in which albumin is the primary component are used to evaluate the nutritional status, including the Prognostic Nutritional Index, Glasgow Prognostic Score, and Controlling Nutritional Status score. Both the American Society for Parenteral and Enteral Nutrition and the European Society for Clinical Nutrition and Metabolism guidelines recommend immediate and early oral/enteral nutrition. However, few reports have described the additional effects of preoperative immunonutrition on clinical outcomes of gastric cancer surgery. Gastrectomy types and reconstruction methods that consider the postoperative nutritional status have been used when oncologically acceptable. Total gastrectomy has recently tended to be avoided because of its negative impact on nutritional status. New findings obtained from the emergence of continuous glucose measurement, such as glucose fluctuation and nocturnal hypoglycemia, may affect nutritional management after gastrectomy. Some prospective clinical studies on perioperative nutritional intervention have set postoperative body weight loss as a primary endpoint. It seems important to continue oral nutritional supplement, even in small doses, to reduce body weight loss after gastrectomy. Evidence generated by prospective, well-developed randomized controlled studies must be disseminated so that nutritional therapy is widely recognized as an important multimodal therapy in patients undergoing gastric cancer surgery.

Eating Tips Before, During and After Cancer Treatment
There is no way to know if one will have eating problems and, if so, how bad they will be. One may have just a few problems or none at all. In part, this depends on the type of cancer one has, where it is in one's body, what kind of treatment one has, how long treatment lasts, and the doses of treatment one receives.

Things to do and think about before starting cancer treatment
Until treatment starts one will not know what, if any, side effects or eating problems one may have. If you do have problems, they may be mild. Many side effects can be controlled. Many problems go away when cancer treatment ends.

- Think of the cancer treatment as a time to get well and focus just on self.
- Eat a healthy diet before treatment starts. This helps to stay strong during treatment and lowers one's risk of infection.
- Go to the Dentist. It is important to have a healthy mouth before starting cancer treatment.

- Ask the Doctor, Professional Nurse, or Registered Dietitian about medicine that can help with anticipated eating problems.
- Discuss fears and worries with the Doctor or Professional Nurse. He or she can discuss ways to manage and cope with these feelings.
- Learn about cancer of the stomach and its treatment. Many people feel better when they know what to expect.

Ways to get ready to eat well

- Fill the refrigerator, cupboard, and freezer with healthy foods. Make sure to include items you can eat even when you feel sick.
- Stock up on foods that need little or no cooking, such as frozen dinners and ready-to-eat cooked foods.
- Cook some foods ahead of time and freeze in meal-sized portions.
- Ask friends or family to help you shop and cook during treatment. Maybe a friend can set up a schedule of the tasks that need to be done and the people who will do them.
- Talk with a Doctor, Professional Nurse, or Registered Dietitian about what to expect.

Ways to get the most from foods and drinks during cancer treatment

During treatment, one may have good days and bad days when it comes to food. Here are some ways to manage:

- Eat plenty of protein and kilojoules when possible. This helps one keep up one's strength and helps rebuild tissues harmed by cancer treatment.
- Eat when one has the biggest appetite. For many people, this is in the morning. One might want to eat a bigger meal early in the day and drink liquid meal replacements later on.
- Eat those foods that one can, even if it is only one or two items.
- Stick with these foods until one is able to eat more.
- One might also drink liquid meal replacements for extra kilojoules and protein.
- One must not worry if one cannot eat at all some days. Spend this time finding other ways to feel better, and start eating when one can.
- Inform the treating Doctor if unable to eat for more than 2 days.
- Drink enough liquids. It is even more important to get plenty to drink on days when no feeling like eating. Drinking a lot helps one's body get the liquid it needs.
- One should take between 30 and 35ml of fluid per kilogram body weight per day. Environmental factors such as heat may affect the amount of fluid needed.

Taking special care with food to avoid infections

Some cancer treatments can make one more likely to get infections. When this happens, one needs to take special care in the way one handles and prepares food. Here are some ways:

- Keep hot foods hot and cold foods cold. Put leftovers in the refrigerator as soon as one has done eating.
- Scrub all raw fruits and vegetables before eating them.

- Do not eat foods (like raspberries) that cannot be washed well. One should scrub fruits and vegetable which have rough surfaces, such as melons, before cutting them.
- Wash hands, knives, and counter tops before and after preparing food. This is most important when preparing raw meat, chicken, turkey, and fish.
- Use a different cutting board for meat and one for fruits and vegetables.
- Thaw meat, chicken, turkey, and fish in the refrigerator or defrost them in the microwave immediately before preparing them. Do not leave them sitting out.
- Cook meat, chicken, turkey, and eggs thoroughly. Meats should not have any pink inside. Eggs should be hard, not runny.
- Do not eat raw fish or shellfish, such as sushi and uncooked oysters.
- Make sure that all of juices, milk products, and honey are pasteurised.
- Do not use foods or drinks that are past their freshness date.
- Do not buy foods from bulk bins.
- Do not eat at buffets, salad bars, or self-service restaurants.
- Do not eat foods that show signs of mould. This includes mouldy cheeses such as bleu cheese.

Special diets, vitamins, minerals and supplements

- Talk with the treating Doctor, Professional Nurse, or Registered Dietitian before going on a special diet or taking any vitamins, minerals or supplements.
- To avoid problems, be sure to follow their advice.

Gastric Juices and Digestion of Food

A bolus (a small rounded mass of chewed up food) enters the stomach through the oesophagus. The stomach releases proteases (protein-digesting enzymes such as pepsin) and hydrochloric acid, which kills or inhibits bacteria and provides the acidic pH of two for the proteases to work. Food is churned by the stomach through muscular contractions of the wall called peristalsis. The chyme slowly passes through the pyloric sphincter at the lower end of the stomach into the duodenum of the small intestine, where the extraction of nutrients begins. Depending on the quantity and contents of the meal, the stomach will digest the food into chyme anywhere between forty minutes and a few hours. The average human stomach can comfortably hold about a litre of food.

Gastric juice is a thin, strongly acidic (pH varying from 1 to 3), almost colourless liquid secreted by the glands in the lining of the stomach. Its essential constituents are the digestive enzymes pepsin and rennin, hydrochloric acid, and mucus.

Pepsin converts proteins into simpler, more easily absorbed substances; it is aided in this by hydrochloric acid, which provides the acid environment in which pepsin is most effective. Rennin aids the digestion of milk proteins. Mucus secreted by the gastric glands helps protect the stomach lining from the action of gastric juice. Gastric secretion is stimulated by a number of hormones and chemical substances, by the presence of food in the stomach, and by a number of psychological factors, such as the smell of a favourite food.

A decrease or total absence of gastric juice secretion may be a congenital abnormality or a concomitant of advanced age. Certain cells of the stomach lining secrete a substance known as

intrinsic factor, which is necessary for the absorption of vitamin B_{12}; absence of this substance results in pernicious anaemia, or Vitamin B_{12} deficiency.

Although absorption of foodstuffs mainly occurs in the small intestine, some absorption of certain small molecules does occur in the stomach through its lining.

This includes:

- Water, if the body is dehydrated
- Medication, like aspirin
- Amino acids
- 10–20% of ingested ethanol (from alcoholic beverages)
- Caffeine
- Water soluble vitamins

Certain cells of the stomach are responsible for producing intrinsic factor, which is necessary for the absorption of Vitamin B_{12}. Vitamin B_{12} is used in cellular metabolism and is necessary for the production of red blood cells, and the functioning of the nervous system.
(InfoPlease.com).

Digestion and Gastrointestinal Hormones

The following table provides information on the effects and stimuli for the release of the major gastrointestinal hormones.

Hormone	Major Activities	Stimuli for Release
Gastrin	Stimulates gastric acid secretion and proliferation of gastric epithelium	Presence of peptides and amino acids in gastric lumen
Cholecystokinin	Stimulates secretion of pancreatic enzymes, and contraction and emptying of the gall bladder	Presence of fatty acids and amino acids in the small intestine
Secretin	Stimulates secretion of water and bicarbonate from the pancreas and bile ducts	Acidic pH in the lumen of the small intestine
Chrelin	Appears to be a strong stimulant for appetite and feeding; also a potent stimulator of growth hormone secretion	Not clear, but secretion peaks prior to feeding and diminishes with gastric filling
Motilin	Apparently involved in a distinct pattern of electromechanical activity observed in motility in the smooth muscle of the stomach and small intestine during the periods between meals	Not clear, but secretion is associated with fasting
Gastric inhibitory polypeptide	Inhibits gastric secretion and motility and potentiates release of insulin from beta cells in response to elevated blood glucose concentration	Presence of fat and glucose in the small intestine

Stomach Cancer and Nutrition

No two patients diagnosed with stomach cancer are alike. The need for an individualised approach to nutrition therapy and metabolic support is, therefore, no exception. The amount of food each stomach cancer patient can take in and tolerate is also different.

Enteral nutrition - if one undergoes surgery for stomach cancer, he/she may need to receive enteral nutrition (i.e., nourishment provided through a feeding tube). This type of nutrition for stomach cancer patients enables patients to receive critical nourishment, avoid malnutrition and stay hydrated.

[Picture Credit: Enteral Nutrition]

The feeding tube can be permanent or temporary. How long a patient will need the feeding tube will be determined after he/she had a number of weeks to heal. It is dependent on how well the digestive tract functions and whether the patient is able to take food orally.
To implant the feeding tube, the surgical oncologist will first remove as much of the cancer as possible. Depending on the extent of the surgery (e.g., a total gastrectomy or a partial gastrectomy), the surgical oncologist or gastroenterologist will insert the tube into either the stomach (i.e., a gastrostomy) or part of the small intestine (i.e., a jejunostomy). The tube extends through the skin so that a clinician or caregiver can administer a special formula (i.e., a liquid mixture of vitamins, minerals, protein, carbohydrates, and fats) through the tube.

The surgical oncologist, dietitian and other members of the care team will teach the patient about the feeding tube and the nutrition that will be receive. The patient will also be taught how to care for the tube and administer feedings at home.

Parenteral nutrition - for some patients, the most appropriate option for receiving nutrition may be through intravenous feeding (IV parenteral nutrition). To receive this alternative form of nutrition therapy, a thin plastic tube called a catheter is first inserted into a large vein in the arm or chest. Once in place, the catheter can remain for as long as the patient needs to receive parenteral nutrition. For stomach cancer patients, the catheter allows the patient to receive a liquid mixture of vitamins, minerals, protein, carbohydrates and fats. Each patient's optimal mixture may differ - and will be developed by the nutrition therapy team.

[Picture Credit: Parenteral Nutrition]

If a patient receives parenteral nutrition while undergoing stomach cancer treatment, the dietitian will work with the doctors to support the patient and monitor his/her nutrition status. The care team will review laboratory test results daily and make modifications to the nutrition formula the patient receives.

Total gastrectomy - If the patient undergoes a total gastrectomy (total removal of the stomach), he/she will have to alter his/her eating patterns and diet considerably. The digestive tract may continue to function, but the patient will have minimal storage capacity. The dietitian will help the

patient to cope with these changes. He or she will help the patient determine which foods may be easiest to consume and digest. Also, the dietitian will show the patient how to adjust to the new diet by eating smaller amounts of food on a more frequent basis (Cancer Treatment Centers of America).

Dumping Syndrome

Dumping syndrome is a condition that can develop after surgery to remove all or part of one's stomach or after surgery to bypass one's stomach to help one lose weight. Also called rapid gastric emptying, dumping syndrome occurs when food, especially sugar, moves from the stomach into the small bowel too quickly.

Most people with dumping syndrome develop signs and symptoms, such as abdominal cramps and diarrhoea, 10 to 30 minutes after eating. Other people have symptoms one to three hours after eating, and still others have both early and late symptoms. Generally, one can help prevent dumping syndrome by changing one's diet after surgery. Changes might include eating smaller meals and limiting high-sugar foods. In more-serious cases of dumping syndrome, one may need medications or surgery.

General Nutritional Tips

The information provided below indicates which foods are generally better or less tolerated by individuals following gastrectomy. The foods in the 'Better Tolerated Foods' list are less likely to cause dumping syndrome than the foods in the 'Less Tolerated Foods' list.

Food Group	Better Tolerated Foods	Less Tolerated Foods
Breads and Grains	Whole grain breads, muffins, bagels, and crackers; unsweetened dry or cooked cereals, rice pasta, barley, potatoes, pretzels, and popcorn	Doughnuts, sweet rolls, muffins, coffee cake, pastries, and sugary cereals
Fruits	Fresh fruit, frozen or canned fruit without heavy syrup or added sugar, fresh-frozen fruit	Dried fruits, canned fruits in syrup, sweetened juice, canned pie fillings
Vegetables	All fresh, frozen or canned vegetables	Vegetables with added sugar or sweetened sauces
Meats and Protein	Meats, poultry, fish, seafood, peanut butter, nuts, dried peas and beans, eggs, cheese, cottage cheese, milk, buttermilk, diet pudding, light or plain yogurt	None
Fats and Oils	Butter, margarine, oil, salad dressing, mayonnaise, cream, cream substitutes, sour cream, cream cheese, bacon	Honey
Sweets and Desserts	Sugar-free pudding, sugar-free gelatine, sugar-free jellies, sugar-free syrup, plain cake and cooking 9No frosting), no sugar added ice cream, artificial sweetener, sugarless gum, fruit preserves and low sugar jelly	Regular ice cream and popsicles, cakes, pies, frostings, cookies, jellies, jams, syrup, gelatine, high sugar desserts, sherbet, sugar, candy, molasses, sweetened toppings
Beverages	Water, milk, coffee, tea, soup, broth, artificially sweetened carbonated beverages and flavoured drinks	Sugar-sweetened beverages, regular soda, lemonade, chocolate milk and milkshakes

Good nutrition is especially important if one has cancer. Cancer and cancer treatments can also affect the way one's body tolerates certain foods and uses nutrients. The nutrient needs of people with cancer vary from person to person. The cancer care team can help patients identify their nutrition goals and plan ways to help them meet their goals. Good nutrition is essential – it helps patients to:

- Feel better
- Keep up strength and energy
- Maintain a good weight (mass)
- Better tolerate treatment-related side effects
- Lower the risk of infection
- Heal and recover faster

If able and allowed to eat, eat as healthy as possible as allowed by the digestive system - Fruits, vegetables, lean protein, and whole grains are all nutrient dense foods. Nutrient dense foods are foods that contain protein, complex carbohydrates, healthy fat, vitamins, and minerals all needed by the body to function optimally. Consult a registered dietitian for specific recommendations based on one's level of food tolerance. Refer to the table above.

No single food will supply all the nutrients a body needs, so good nutrition means eating a variety of foods. It is important to eat foods from each group at each meal every day.

Foods are divided into five main groups:

- Fruits and vegetables (oranges, apples, bananas, carrots, and spinach)
- Whole grains, cereals, and bread (wheat, rice, oats, bran and barley)
- Dairy products (milk, cheese, and plain yogurt)
- Meats and meat substitutes (fish, poultry, eggs, dried beans, and nuts)
- Fats and oils (oil, butter, and margarine)

It is important to eat foods from each food group at each meal every day. Meals and snacks should include starch/grains, protein, dairy, fruits, vegetables and fats. By eating foods from each food group at each meal, an individual ensures that the body has a proper balance of all nutrients it needs to function. Eating meals and snacks at regular times is also necessary for controlling blood sugar levels.

Eat whole grain foods when possible - Cereals, breads, brown rice, whole wheat pasta, and crackers are good whole grain choices. Whole grain foods will have "whole grain flour," "whole wheat flour," or "oats" as one of the first 3 ingredients. Take cognisance of the possibility of 'dumping syndrome'. A registered dietitian can provide guidelines.

Avoid excess sugar and sweets - Since sugary foods can be a cause of 'dumping syndrome' one should be careful in consuming sugary foods and drinks.

If excessive weight loss becomes an issue, one's body may need more kilojoules and it is fine if some of them come from sugar as long as one is able to tolerate sweet foods. It is important to consult a registered dietitian in this regard.

Be as active as possible - Exercise may help to stimulate the digestive system. Being able to eat more and having an enhanced feeling of wellbeing will make one's treatments more bearable.

If able, or allowed to take in food per mouth, take in sufficient fluids to avoid dehydration - Choose beverages that contain nutrients and kilojoules. A good starting point is to strive for several glasses of nutritious beverages per day. Only take small sips to avoid excessive bloating, gas or feeling too full to eat.

A registered dietitian can provide recommendations for which liquid nutrition supplement and how much is best.

Avoid all alcoholic beverages - Alcohol is a Group 1 cancer causing agent according the International Agency for Research on Cancer (IARC) and is best avoided.

Keep a journal - Record eating times, foods consumed, and any effects to track and determine which foods are best tolerated.

Take all medications as prescribed – It is essential to take medicines regularly as prescribed.

Maintain a good mass (weight) - It is normal to lose some weight after being diagnosed (and treated) for cancer of the stomach. If losing more than ½ to 1Kg per week continuously, consult a registered dietitian immediately for recommendations on increasing kilojoule intake.

If there are any specific questions regarding any of the guidelines, please contact a registered dietitian.

Medical Disclaimer

These Nutritional Guidelines are intended to provide general information only and, as such, should not be considered as a substitute for advice, medically or otherwise, covering any specific situation. Users should seek appropriate advice before taking or refraining from taking any action in reliance on any information contained in these Guidelines. So far as permissible by law, the Cancer Association of South Africa (CANSA) does not accept any liability to any person (or his/her dependants/estate/heirs) relating to the use of any information contained in these Guidelines.

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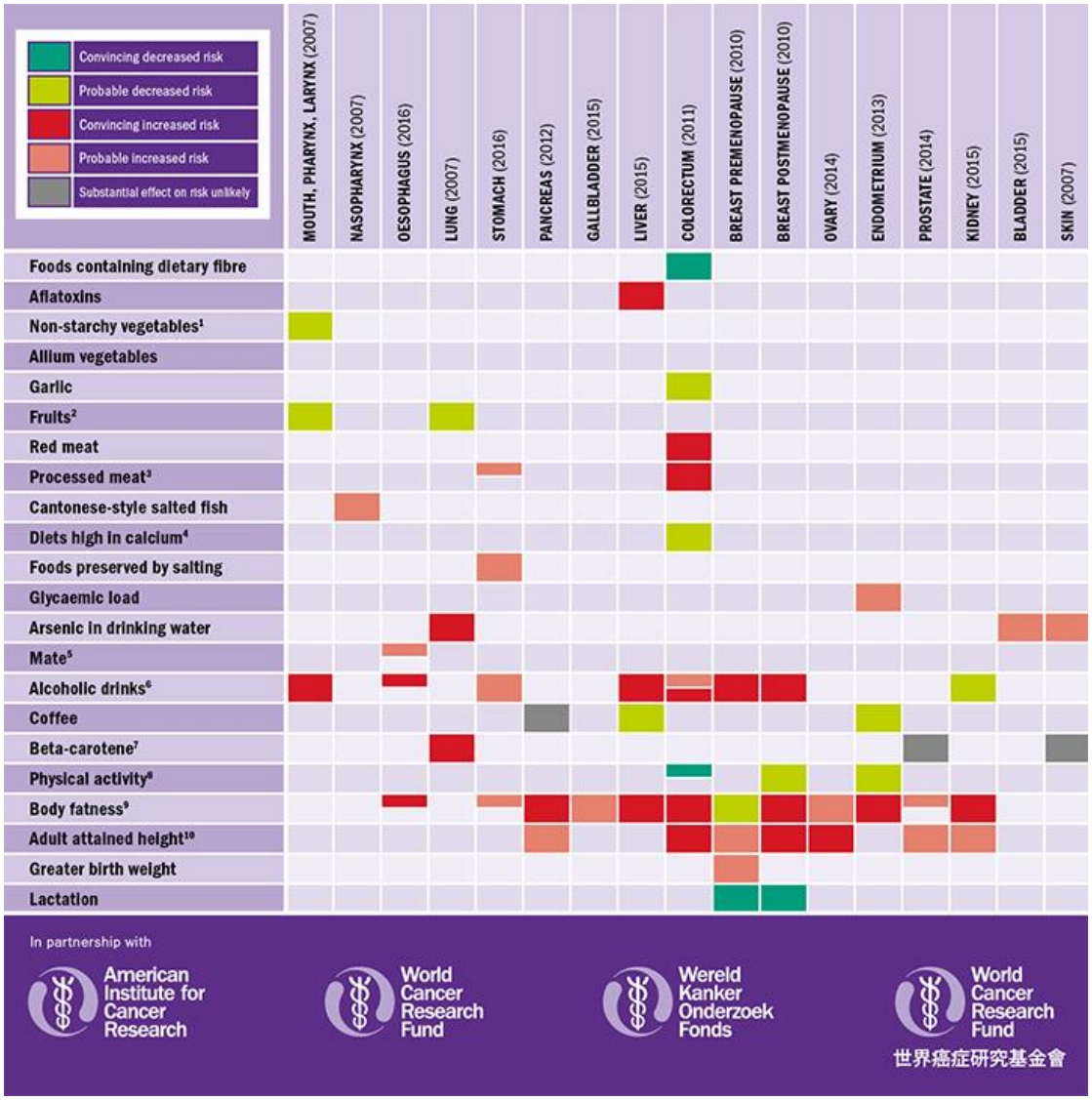
ADDITIONAL SUPPORT

For individualised nutritional advice, consult a registered dietitian in your area by visiting: http://www.adsa.org.za/Public/FindARegisteredDietitian.aspx

Summary of Strong Evidence on Diet, Nutrition, Physical Activity and Cancer Risk Reduction



1 Includes evidence on foods containing carotenoids for mouth, pharynx, larynx. 2 Includes evidence on foods containing carotenoids for mouth, pharynx, larynx and lung.
3 For stomach, probable increased risk of non-cardia cancer only. 4 For colorectum, evidence is from milk and studies using supplements.
5 Probable increased risk for oesophageal squamous cell carcinoma only.
6 For oesophagus, convincing increased risk for oesophageal squamous cell carcinoma only. For liver and stomach, based on evidence for alcohol intakes above around 45 grams per day (about 3 drinks a day). For colorectum, convincing increased risk for men and probable increased risk for women. For kidney, based on evidence for alcohol intakes up to 30 grams per day (about 2 drinks a day).
7 For lung, evidence is from studies using high-dose supplements in smokers. 8 Convincing decreased risk for colon not rectum.
9 For oesophagus, convincing increased risk for adenocarcinoma only. For stomach, probable increased risk of cardia cancer only. For prostate, probable increased risk for advanced prostate cancer only.
10 Adult attained height is unlikely to directly influence the risk of cancer. It is a marker for genetic, environmental, hormonal and nutritional factors affecting growth during the period from preconception to completion of linear growth.

(World Cancer Research Fund International).

Sources and References Consulted or Utilised

American Cancer Society
www.cancer.org/acs/groups/cid/documents/webcontent/002903-pdf.pdf

Bowen, 2006
http://arbl.cvmbs.colostate.edu/hbooks/pathphys/endocrine/gi/overview.html

Cancer Treatment Centers of America
http://www.cancercenter.com/stomach-cancer/nutrition-therapy/

Enteral Nutrition
www.bionixmed.com/MED_Pages/DeClogger_How.html

InfoPlease.com
http://www.infoplease.com/encyclopedia/science/gastric-juice.html

Kubota, T., Shoda, K., Konishi, H., Okamoto, K., Otsuji, E. 2020. Nutrition update in gastric cancer surgery. *Ann Gastroenterol Surg*. 2020 Jun 8;4(4):360-368.

Mayo Clinic
http://www.mayoclinic.org/diseases-conditions/dumping-syndrome/basics/definition/con-20028034

National Cancer Institute
Eating Hints: Before, During and After Cancer Treatment. US Department of Health and Human Services. National Institutes of Health. National Cancer Institute. January, 2011.

No Stomach for Cancer
https://www.nostomachforcancer.org/about/life-without-a-stomach/special-concerns/what-foods-should-i-eat

Parenteral Nutrition
http://www.unidosporlanutricionclinica.cl/es/como-se-aplica-la-nutricion-parenteral-0

Prado, C.M., Pucell, S.A. & Laviano, A. 2020. Nutrition interventions to treat low muscle mass in cancer. *J Cachexia Sarcopenia Muscle*. 2020 Apr;11(2):366-380.

Stomach
https://www.healthtap.com/topics/burning-sensation-in-intestines

Wikipedia
https://en.wikipedia.org/wiki/Stomach

World Cancer Research Fund International
http://www.wcrf.org/int/research-we-fund/continuous-update-project-findings-reports/continuous-update-project-cup-matrix