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DIETARY TREATMENT OF CANCER PATIENTS

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.

CANCER COULD BE KNOCKING AT YOUR DOOR

Cancer is second only to heart disease as a cause of death in Westernised countries. It is projected to be the number-one cause of early death in the next century, in part because as people live longer the risk of developing cancer increases.

HOW DOES CANCER AFFECT NUTRITIONAL STATUS?

The physiological effects of cancer can cause increased nutritional requirements and a reduced food intake. The nutritional consequences depend on the severity, location and treatment of the cancer. These consequences can be severe and may be compounded by effects of the cancer treatment regimens employed. The result is often a profound depletion of nutrient stores. Current research data strongly suggest an association between weight loss and shortened survival and, therefore, imply a relationship between nutritional status and the outcome of cancer.

CANCER CACHEXIA

This syndrome affects about two-thirds of persons with cancer and is defined by a >5% weight loss/month or >10% weight loss over 6 months. It is categorised by loss of appetite, inadequate food intake, progressive weight loss, malnutrition, increased and altered metabolism and wasting (loss of muscle).

Poor food intake combined with increased nutrient requirements lead to muscle wasting and general poor health, which diminishes food intake further. The body continues to deplete its nutrient stores at an accelerated rate whilst the resulting malnutrition compromises the quality of life and may lead to complications and early death.

Cancer cachexia is also associated with

- Decreased immunity and increased risk of infections
- Decreased resistance to side effects of treatment
- Breakdown / dysfunction of organs
- Poor tolerance for treatment with increased risk of development of additional illness and death

LOSS OF APPETITE

Factors that contribute to a loss in appetite in persons with cancer include early satiety and nausea, fatigue, pain, fever, psychological stress, obstruction in the mouth or oesophagus by the tumour and changes in taste / smell.

NUTRIENT LOSSES

Depending on the location and type of cancer as well as its treatment(s), the individual may experience nutrient losses due to inadequate digestion, malabsorption, vomiting and/or diarrhoea. Excessive nutrient losses can contribute to a deteriorating nutritional status.

METABOLIC CHANGES

Some types of cancers induce increased metabolism, while others do not. In all cases, metabolic pathways (of protein, carbohydrates and fat) are altered and nutrients are used inefficiently. Extra

energy is required, vital proteins are wasted and fat stores are mobilised. Many develop insulin resistance and hyperglycaemia (high blood sugar), which interferes with the availability of energy fuels to the cells.

Additionally, cancer and its treatment tax the immune system, increasing the likelihood of infections, which raise energy and nutrient needs even further.

CANCER TREATMENTS AND ASSOCIATED NUTRITIONAL CONSIDERATIONS

The main aim of cancer treatment(s) is to annihilate cancer cells, relieve pain and prevent further tumour growth. Through the use of available treatment regimens, cancer can sometimes be arrested, but ironically, these treatments can also threaten the health and nutritional status of the individual by interfering with their ability to ingest, digest and absorb their food adequately.

Treatments that are used include:

- Radiation therapy
- Chemotherapy
- Surgery
- Immunotherapy
- Any combination of the above
- Transplantation (e.g. leukaemia can be treated with bone marrow transplant).

RADIATION THERAPY

Radiation therapies disrupt DNA replication and, as a result, cell division as well. By doing this, radiation damages all actively dividing cells (normal body cells as well as tumour cells). Because cancer cells divide more rapidly than normal cells, they are damaged more severely by radiation and recover more slowly. The treatment is thus usually quite effective because of this reason.

Side effects associated with radiation therapy vary according to the region irradiated and usually occur within 10 - 17 days after initiation of therapy and are usually transient, resolving within 2 - 4 weeks after completion of the treatment.

Radiation therapy side effects associated with the different cancer sites:

	Head and neck area	**Chest area**	**Abdomen area**
Side effects	Food ingestion problems: • Sore throat • Mouth dryness • Infection in the mouth • Dental and gum destruction • Altered taste and smell	Swallowing difficulty: • Infection in the oesophagus • Obstruction in the oesophagus	• Stomach infection • Nausea, vomiting • Diarrhoea • Loss of appetite • Malabsorption

The above side effects generally result in loss of appetite, fatigue, malabsorption and weight loss.

CHEMOTHERAPY

Chemotherapy, also used to interrupt cell division, is often effective but also has undesirable side effects. Chemical agents or medications are used systemically and therefore, affect the whole body, as opposed to radiation therapy and surgery, which are used to treat the cancer locally (at the site of the cancer only). As a result, major organ toxicities and other side effects are seen with chemotherapy, and dietary and nutritional status is severely affected. Side effects are dependent on the specific agent used, dosage, duration of treatment, accompanying drugs and individual response.

Nutrition related side effects associated with chemotherapy include:

- Taste abnormalities
- Infection in the oral cavity and oesophagus
- Tissue breakdown and urinary loss of protein, potassium and calcium
- Diarrhoea and malabsorption
- Nausea, vomiting and loss of appetite
- Constipation
- Inhibition of intestinal movement
- Anaemia

SURGERY

It is the primary mode of treatment for patients with gastrointestinal cancers (cancers of the stomach or intestine). Surgery may be combined with chemo- or radiation therapy before or after surgery to prevent new tumour growth. The side effects depend, again, on the location of the tumour and its size as well as the surgical procedure.

Possible nutrition related effects at the different sites of surgery:

Head and neck	• Chewing / swallowing inability or difficulty
Oesophagus	• Decreased stomach acid secretion • Reduced stomach movement and digestion • Steatorhoea (fat malabsorption) • Obstruction • Fistula formation (abnormal connection between 2 hollow organs)
Stomach	• Diarrhoea • Malabsorption • Low blood sugar • Decreased / lack of stomach acid • Vitamin B12 malabsorption
Intestinal surgery	• Diarrhoea • Fluid and electrolyte imbalance • Malabsorption • High oxalic acid and kidney stones • Steatorhoea (fat malabsorption) • Vitamin B12 deficiency (surgery of terminal ileum)
Pancreas	• Diabetes • Malabsorption

IMMUNOTHERAPY

Biologic response modifiers are natural products that are made through cloning and genetic engineering. This treatment has a direct toxic effect on the tumour or helps the body's immune system to identify and attack cancer cells. Most common nutrition related side effects are nausea and vomiting, fatigue, chills, fever, flu-like symptoms, fluid retention, diarrhoea and low blood pressure, all of which can lead to decreased food intake and eventually malnutrition.

BONE MARROW TRANSPLANT

This method is used to treat certain types of cancer and blood disorders. With a bone marrow transplant, the individual's diseased bone marrow is replaced with healthy bone marrow from a donor, usually a close relative. Accompanying this treatment is chemo- and/or radiation therapy and the use of immunosuppressive drugs to avoid the body rejecting the transplanted bone marrow.

Nutritional consequences:

- Relating to the preparatory procedures:
  - Loss of appetite
  - Inflammation of mucus membranes

- Taste changes
- Nausea and vomiting

These symptoms usually diminish within 24 - 48 hours.

- After transplantation:

Severe diarrhoea and malabsorption resulting in excessive fluid losses

Delayed effects during the first month after transplantation include infection in the oral cavity and oesophagus, taste changes, fatigue and gut damage. Patients typically have little or no oral intake during the first few weeks. Alternative feeding methods are then used, e.g. tube feeding.

The use of immunosuppressive drugs may lead to:

- Nitrogen and calcium imbalances
- Sodium and fluid retention
- Osteoporosis
- Muscular weakness
- Glucose intolerance

ALTERNATIVE TREATMENTS

Alternative treatments for cancer are divided into 7 categories according to the office of Alternative Medicine:

- Diet and nutrition
- Mind-body techniques
- Bioelectromagnetics
- Traditional and folk medicine
- Pharmacological and biological treatments
- Manual healing treatments
- Herbal medicine

Some complementary/alternative medicines (CAM) are promoted not to compliment mainstream medicine, but to replace it. The popularity of these treatments is usually related to the social and cultural context. With severe illness the approach is often to “leave no stone unturned” which results in the use of these other options.

Studies show no difference in survival rates between individuals following complementary therapies and those receiving conventional treatment alone. Those who follow complementary therapies, however, do report psychological benefits such as feeling of hope and optimism. Persons with cancer should have enough information about the possible advantages and disadvantages before embarking on strict CAM.

Potentially harmful practices relating to CAM include the following and should be used as a warning against these therapies:

- Discontinuing a prescribed therapy to replace it with an unproven remedy
- Using herbal remedies that may be contaminated
- Taking large dosages of vitamins and minerals that can be toxic
- Following a diet that restricts any of the major food group(s)

Diet and nutrition as an unproven alternative treatment:

Conventional medicine has come to recognize that dietary factors can reduce the risk of developing cancer; however, alternative cancer diets go further – often claiming, without any substantiated scientific evidence, that the diet can cure cancer. A few examples of such diets:

Macrobiotic diet

This is a diet with the following proposed composition: 50 - 60% of its calories to be from whole grains, 25 - 30% from vegetables and the remainder from beans, seaweed and soups. The diet

avoids meat and certain vegetables and promotes soybean consumption. It contains inadequate amounts of certain vitamins and the diet is still being investigated for possible cancer-preventative effects.

Antioxidants

These micronutrients (Vitamin C, Vitamin E, Selenium, carotenoids and folic acid) are believed to play a role in cancer prevention and are currently under extensive investigation for possible therapeutic effects.

NUTRITIONAL CARE OF THE CANCER PATIENT

Although nutrition cannot cure cancer, it does very often play a supportive, yet essential role in cancer therapy. Nutrition can help prevent or reverse poor nutritional status and its associated complications. It is insufficiently recognised that, depending on the type of cancer, some persons die because of severe malnutrition rather than the malignancy per se. It is also important to realise that weight loss and nutritional depletion of the person with cancer may interfere with anticancer treatment. Those individuals who lose weight may have a reduced tolerance to treatment (including poor recovery after surgery) owing to poor wound healing and an increased susceptibility to infection. Weight loss may also contribute to a poor quality of life. Nutritional support of persons with cancer should be an integral part of any treatment.

Individuals with cancer can suffer from numerous eating difficulties, arising from the presence of the disease and/or treatments. If attention is paid to these problems by early dietary intervention, some symptoms can be relieved and they need not lose a great amount of weight. A person with cancer and a good nutritional status, when compared to a similarly afflicted malnourished person, feels better, eats better, is more active and stronger, resists infection better and overall enjoys a better quality of life.

Early nutrition intervention soon after a diagnosis has been made can address dietary problems and prove overall very beneficial in the longer-term management of the individual.

NUTRITIONAL NEEDS

ENERGY:

Persons with a normal nutritional status have an increase of 110 – 130% of the usual energy requirement. However, if the individual is malnourished, 130 – 150% of normal energy requirement is needed.

PROTEIN:

If the person with cancer has a normal nutritional status, the protein requirement is 1 - 1.25 g/kg body weight (current weight) compared to the malnourished person's need of 1.5 – 2 g/kg.

VITAMINS AND MINERALS:

Needs for specific vitamins and minerals are highly variable, depending on the type of therapy used and the presence and the severity of complications e.g. vomiting and malabsorption. All individuals should be carefully monitored for early signs of nutrient deficiencies. Although it is generally prudent to recommend a multivitamin/mineral supplement in most persons with cancer, one should guard against excessive supplementation, which could prove harmful and should therefore be avoided.

WHAT METHOD OF FEEDING SHOULD BE USED?

The oral route is the preferred mode of feeding, but may be resisted by persons who experience eating difficulties or food-related problems. Oral intake therefore needs to be encouraged with modifications in the type and consistency of food and its presentation according to individual needs.

- The **timing of food presentation** deserves consideration as persons with cancer often complain about decreased ability to eat as the day progresses. This may be attributed to slow digestion and delayed emptying of the stomach as a result of decreased production of digestive

secretions and intestinal damage that might occur. **Frequent, small meals, with emphasis on morning feedings**, are suggested.

- The **timing** of meals or snacks **relative to anti-cancer therapy** should be considered. Learned food aversions may develop when specific foods are associated with unpleasant symptoms such as nausea and vomiting. A **"scapegoat" food** or beverage can be used just before treatment to reduce the incidence of treatment-related aversions to foods in the individual's usual diet.
- Use **sip-feeds** and **supplementary** food and drinks with energy and protein (see *additional general dietary guidelines* below).
- Alter **consistency** according to symptoms.

ENTERAL FEEDING

If the oral route fails and food intake remains inadequate or is inappropriate due to the site of the cancer, alternative feeding methods are available. If the gut is functional, enteral feeding (tube feeding) is an option. The doctor or dietician should make the decision to initiate enteral feeding.

PARENTERAL NUTRITION

This mode of feeding involves the administration of concentrated nutrient solutions via infusion into a large-diameter vein. This method is used when the gastrointestinal tract is not functioning. Intense monitoring and specialised care is required for these persons.

Dietary guidelines for adjusting the diet to treat symptoms associated with anti-cancer treatment:

PROBLEM	POSSIBLE SOLUTION	REDUCE/AVOID INTAKE OF
Decreased appetite	• Smaller more frequent meals - 5-6 instead of three main meals • Meals should be appetizing in appearance and taste and provide enough energy and protein	• Low energy- and nutrient dense foods and beverages
Nausea and vomiting	• Eat small, frequent meals • Food is best tolerated at cool or room temperature • Eat dry, salty crackers, pretzels, biscuits and cookies • Simple foods such as rice, scrambled eggs, toast, noodles, bananas, mashed potatoes, custards may be better tolerated • Clear, cold non-acidic liquids • Light low-fat foods • Enough liquids • Allow plenty of fresh air in the house • Disperse cooking odours	• Milk products • Cream soups • Fatty / fried foods • Sweet desserts • Avoid lying down immediately after eating
Sore mouth or throat	• Eat soft, moist food at cool or room temperature (mashed potatoes, macaroni and casseroles) • Drink through a straw	• Spicy, salty or acidic foods • Carbonated beverages • Juice, especially citrus • Bananas • Crisp or raw foods • Hard / tough meats • Textured or granular foods • Coarse bread products • Extremely hot or cold foods.

Dry mouth	• Eat foods with a high moisture content (serve with gravies / sauces, casseroles, chicken, fish, vegetables with sauces) • Have liquids at mealtime with the food • Drink extra liquids between meals • Chewing of sugarless gum or sucking of mints may help • Concentrate on good oral hygiene	• Thick liquids • Thick hot cereals • Dry foods, bread products, tough meats, crackers • Excessively hot foods • Alcohol
Mouth blindness	• Strongly flavoured / spicy foods and supplements • Emphasis on aroma and texture	• Bland foods • Plain meats • Unsalted foods
Taste alterations	• Include many cold foods and milk products • Experiment with foods • Increase use of flavouring and seasoning • Fruit-flavoured supplements	• Red meats • Chocolate • Coffee, tea
Early satiety	• High-calorie diet with calorically dense foods • Meat, fish, poultry, eggs, whole milk, cheese, cream soups, ice cream, whole-milk yoghurt, creamed vegetables, rich desserts • Small, frequent feedings • Use of calorically dense supplements	• Low-fat or non-fat milk products • Broth-based soups • Green salads • Steamed, plain vegetables • Low calorie beverages
Diarrhoea	• Eat smaller more frequent meals • Fluid replacement is very important to prevent dehydration. Try and drink water or re-hydration drinks after every loose stool. (Home recipe for oral rehydration therapy (remember hygiene): 1 litre of cooled cooked water, 8 teaspoons of sugar and 1/2 teaspoon of table salt). • A low fat and low dairy diet may be indicated (damaged to the surface of the gut may cause intolerance to lactose; drinking milk or eating milk products can cause cramps, abdominal distress and diarrhoea in some people). • Moderate the intake of fibre. Concentrate on **soluble fibre** (fruit, oats, and legumes). • Limit the intake of fructose (fruit sugar) by avoiding pear juice as well as grapes, honey, dates, nuts, figs and soft drinks. • Eat bananas, potatoes, fish, meat and drink apricot juice, tomato juice to replenish sodium (salt) and potassium. • Eat foods that have been brought to room temperature.	• Avoid gas forming foods and drinks (e.g. peas, lentils, cabbage, cauliflower, broccoli, onion, nuts, cucumber, beans and bran, garlic, beer). • Avoid alcohol and caffeine, since both may have a dehydrating effect.
Constipation	• Regular diet with fibre added (whole grains, dried fruit such as prunes - even prune juice, bran, etc.). Fibre-enriched supplements / bulking agents may be beneficial • Extra fluids and exercise can be beneficial	• Gas-forming foods and beverages

ADDITIONAL GENERAL DIETARY GUIDELINES

- **Increase Energy and Protein Intake:** Commercially available high energy and protein drinks (balanced in terms of micro- and macronutrients) may be used effectively to meet the increased requirements.
- Household ingredients, such as sugar, vegetable oil, peanut butter, eggs and non-fat dry milk powder can be used in porridge, soups, gravies, casseroles or milk based drinks to increase the protein and energy content without adding to the bulk of the meal.

- At least 500 - 750 ml of whole milk or yoghurt should be consumed daily (use in porridge and in the preparation of food: custards, puddings, cream soups).
- Add generous amounts of sugar, butter, peanut butter, margarine, cheese, mayonnaise and cream to foods (if tolerated).
- Use honey or jam on bread
- Dairy products are a good protein source. Cultured dairy products like yogurt are easier to digest than milk. If milk causes cramps or a feeling of fullness it is best to avoid it in the diet, but it is quite possible that yogurt and sour milk will be tolerated.
- Beans, seeds and peas are good sources of protein and cheaper than meat, eggs and milk products.

- **Vitamin and minerals:** Try to eat at least 5-6 portions of fruit and vegetables per day. Pure fruit juice can be used to decrease the bulk of the diet. Approximately 1/2 a glass of fruit juice is equal to one portion of fruit.

- **Alcohol** should be avoided.

- Ensure the **safety of the food**. Foods should be well-cooked - eliminate foods that could potentially be contaminated with pathogenic organisms. Avoid raw fish, meats, mould-containing, unpasteurised cheeses, raw unwashed fruit and vegetables, unpasteurised honey, commercial creamed-filled pastries requiring refrigeration, dry / fresh spices added after cooking and herbal supplements.

CHILDREN WITH CANCER

Children also have increased nutritional requirements, as adults do, but need special and additional attention for their physical growth and brain development.

Like the adult with cancer, a child with cancer can suffer from nutritional deficiencies and malnutrition owing to the natural course of cancer as well as the treatment received for it. The incidence of malnutrition ranges from 6 - 50%, depending on the type, stage and location of the tumour.

Factors that may alter the nutritional requirements of children with cancer include the effects of surgery, fever, malabsorption and infection. Fluid requirements are increased during anti-cancer therapy or in the presence of fever and diarrhoea, and micronutrients (vitamins and minerals) may require supplementation during periods of poor intake, stress or malabsorption. The best long-term indicator of adequate nutrient intake is growth. Deficiencies in energy and protein can be expected to adversely affect growth considerably. Catch-up-growth has been shown to occur with appropriate nutritional support, however, once the cancer treatment has been completed.

It is thus of vital importance to use all possible means to ensure that the child consumes enough food in order for him/her to meet his/hers increased nutritional needs. Creative efforts are required to minimise the psychological effects of fear, unpleasant hospital routines, unfamiliar foods, learned food aversions and pain. Feeding the child should include the maximal use of favourite, nutrient dense foods during times when intake is likely to be best and food aversions are least likely to occur.

THE TERMINALLY-ILL PATIENT

Terminal care is defined as the management of a person for whom the event of death does not seem far away, and for whom care has turned from curative to palliative (the treatment focuses mainly on the relief of symptoms rather than to reverse the consequences of the disease). Nutrition support for these individuals focuses on helping to maximise the quality of life. Nutritional support should be undertaken only if it can provide direct benefits and the person or his immediate family is in agreement. The wishes of the individual should always be respected and should form the basis of any decision related to any aspects of treatment.

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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