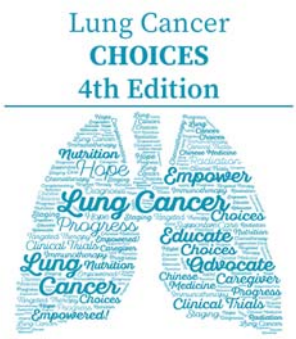

Chapter 8

Nutrition in the Patient with Lung Cancer

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Introduction

Nutrition is vital in cancer treatment and survivorship. Food provides the building blocks needed by the body to repair and heal. The benefits of proper nutrition during cancer treatment include improved quality of life, decreased discomfort from side effects, and reduced frequency of complications and treatment breaks.

Lung cancer treatment can create a burden of healing that can overwhelm even a healthy patient's nutritional reserve. Cancer itself can affect appetite, digestion, and use of nutrients. Treatment regimens such as surgery, chemotherapy, immunotherapy, and radiation can cause side effects that interfere with eating and drinking. A patient's nutritional status can deteriorate throughout treatment. Decisions about treatment regimen may be determined based on general health performance status scores.[1] Weight loss and decreased ability to consume adequate nutrition can negatively influence those performance scores and treatment options.[2]

Many people that begin lung cancer treatment are already experiencing some decreased appetite (anorexia) and may have reduced portion sizes at meals. Anorexia may be noted as disinterest in favorite foods, a decrease in the enjoyable taste experienced with foods or beverages, and an early sense of fullness when eating (early satiety). The effects of anorexia and early satiety can lead to unintentional weight loss and malnourishment.

Among patients with advanced lung cancer, more than half will become malnourished during treatment. Malnourishment is associated with worse outcomes in patients treated for cancer because nutritional deficiencies can decrease treatment tolerance, response to therapy, quality of life, and even survival.[3] Taking action to improve nutritional status may improve strength, energy level, and protect quality of life.

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The goal of nutrition in treatment is to maximize the healing process. In this chapter, we review the factors that affect nutrition and healing; the common barriers to eating, effective strategies to manage the side effects that limit nutritional intake; and resources to use during treatment and survivorship.

Protecting Lean Body Mass

During recovery from cancer treatment, it is important to maintain muscle or "lean body mass" to help maintain optimal health and allow you to participate in usual activities. Muscle wasting can result in debilitation, decreased functional status, and reduced quality of life.[4] Maintenance of lean body mass during treatment may even improve response to cancer treatment.[5]

For some people, the first sign of illness may be an unexpected or involuntary weight loss. Some people may have reacted to this weight loss and decreased interest in food with a happy exclamation, "Oh good - I've been trying to lose weight!" or "My doctor told me I should lose 20 pounds". Patients may allow the weight loss to continue, believing that the process must eventually stop. However, weight loss with a diagnosis of lung cancer is different than intentional weight loss that occurs when dieting.

Involuntary weight loss may occur in about half of the people with lung cancer, even a weight loss of 5% may influence health outcomes. Some involuntary muscle loss occurs when people feel ill and cannot eat enough to maintain their weight. As skeletal muscle is lost, patients experience fatigue, lack of energy for daily activities, decreased ability to move with balance and safety, and decreased ability to cough and clear pulmonary secretions. As smooth muscle is lost, a person may have delayed stomach emptying and feel satiated or feel full; there may be decreased digestion associated with increased nausea as well as a loss of cardiovascular function associated with lightheadedness or dizziness.[6]

Cancer cachexia is a syndrome that results in a progressive loss of muscle mass and fat stores and leads to progressive functional impairment. It is associated with a lack of appetite and negative energy and protein balance. Adequate nutrition is imperative to tolerate and continue the treatment. It is important to identify these symptoms, called "pre-cachexia", and treat any side effects that act as barriers to eating.[7] Medications, such as appetite stimulants, may help manage cancer cachexia, and this option may be discussed with the physician.[8]

Nutritional counseling which focuses on food choice and behaviors related to eating is effective in addressing lung cancer malnutrition and cachexia. Medical Nutrition Therapy, a technique used by a Registered Dietitian/Nutritionist (RDN), may help patients to increase protein and calorie intake, improve weight status, and protect quality of life in lung cancer patients undergoing treatment.[9-10] Many

cancer centers have specially trained RDNs who are dedicated to the nutritional care of cancer patients. If the cancer center does not have an Oncology RDN, a referral may be obtained from the doctor or the Commission on Dietetic Registration to find a board-certified specialist in oncology nutrition – who has the credential "C.S.O.".

Nutrition and Healing

Each time a patient receives treatment for cancer - surgery, chemotherapy, targeted therapy, immunotherapy, or radiation therapy – the body responds to the treatment with healing. The healing process requires specific nutrients, extra calories, and additional protein. People receiving treatment for lung cancer may use more calories than when they were not sick; this state of increased demand for calories and protein is termed "hyper-metabolic."[11-12]

The importance of increasing calories is greater than increasing the amount of protein. If weight loss continues despite higher protein intake, the protein will be utilized for calories and will not be available for structural repair. Therefore, total daily caloric content should be considered in addition to total daily protein intake. It is useful to have a general expectation for the number of calories and protein required each day.(Table 1) Your individual needs may differ, ask your healthcare team about your specific needs.

Table 1. Caloric and Protein Requirements during Healing in Patients Treated for Lung Cancer*

Body Weight	Calories needed	Protein needed
(pounds)	(calories/day)	(grams of protein/day)
110	1500 – 1750	60 to 75
130	1750 – 2060	70 to 90
150	2050 – 2375	80 to 100
170	2300 – 2670	90 to 115
190	2575 – 3010	100 to 130
210	2850 – 3325	115 to 140

*Values estimated with the following equations[12]
Calorie range per day during healing = [30 x body weight (kg) to 35 x body weight (kg)]
Protein grams range per day during healing = [(1.2 to 1.5) x body weight (kg)]
One pound = approximately 2.21 kg
For overweight patients, the normal or ideal weight for the patient's height is used in the calculations. Refer to a BMI chart to estimate a normal weight for height.
Higher protein intake may be contraindicated in patients with kidney or liver disease.
Weight variation of several pounds in a short period of time is likely due to hydration or fluid shifts.
Add an average of 250 extra calories per day to gain a pound in 2 weeks or 500 extra calories per day to gain a pound in 1 week.

Hydration and Fluid Balance

Staying hydrated is important to feeling well during treatment. Hydration balance is cumulative, and it can take several days to become dehydrated or to re-acquire adequate hydration status.

Fluid needs may be increased due to chemotherapy, fever, perspiration, diarrhea, use of oxygen, or the presence of chronic obstructive pulmonary disease (COPD). Symptoms of dehydration include: fatigue, thirst, dry mouth, decreased urine output, concentrated or darker colored urine, decreased skin turgor (elasticity of the skin), headache, and dizziness. Mild chronic dehydration may also increase fatigue and contribute to constipation. A fluid deficit of 1% body weight may decrease metabolic function by 5%.[13]

Patients may consider tracking daily fluid intake to ensure adequate hydration. It may help to measure favorite cups and mugs to make it easier to estimate the volume of fluid consumed. It is best to drink fluids throughout the day, drinking half of their fluid requirements during the first half of the day. Some patients prefer to plan their fluid intake by the hour, such as: drink 1 cup per hour, throughout the day. Most liquids may be included as part of daily hydration, including milk, juice, smoothies, milkshakes, and soda. Caffeinated beverages may be included as part of daily fluid intake if caffeine consumption is less than 300 mg per day (the equivalent of 2 cups of coffee). Caffeine may cause the stomach to empty faster and therefore, may be dehydrating.

Many foods such as fruits, soups, gelatin, ice cream, and frozen desserts include hydrating fluid. Fluids intended for rehydration, called "sports drinks," have a small amount of carbohydrates and electrolytes to help them absorb more effectively. Oral rehydration salt solutions or ORS products are effective at improving hydration status and are now readily available in pharmacies. Ask your healthcare team if ORS would be appropriate for you. Choices of fluids may be based on taste preference and variety to ensure adequacy. Daily fluid requirements may be estimated using the chart below.(Table 2) Your individual needs may differ, ask your doctor about your specific needs.

Table 2. Fluid Requirements During Healing in Patients Treated for Lung Cancer*

Body weight	Fluid needed	
(pounds)	(fluids ounces/day)	(cups/day)
110	50	6 ¼
130	65	8 ¼
150	75	9 1/2
170	85	10 ½
190	95	11 ½
210	105	13
*Fluid per day = [body weight (pounds) / 2.21] = average ounces. You may need additional fluid if you are experiencing diarrhea, fever, or other increased fluid loss.		

Strategies to Help Lung Cancer Patients Eat Enough Food

The nutrition focus during lung cancer treatment is to get enough calories and protein to support the healing process. Oncology specialists recommend that "all calories are good calories in lung cancer therapy." The aim is to make eating as tolerable and interesting as possible and remove any unnecessary diet restrictions. Information found on the television, in magazines, and on the internet regarding "good nutrition" is most commonly focused on helping people reduce their risk for various diseases. Ask your healthcare team's advice if you have been following a heart-healthy, low-fat, low-cholesterol, or low-carbohydrate diet.

Be Flexible

Cultural traditions regarding "what makes a meal" may need to be modified in treatment, such as changing expectation of eating three large meals a day, to planning six small meals instead. If simple foods are tolerated better, the patient may consider using non-traditional meal choices; such as pancakes for lunch and scrambled eggs at the evening meal. Snacking has been found to increase total intake without affecting meal intake, especially if snacks are timed approximately two hours before the next meal.[14]

A quality snack may be created by combining any two of the following food groups: Breads /starches; Meats/nuts/beans/eggs; Milk/ dairy products; Fruits/vegetables.(Table 3)

This technique provides a combination of carbohydrates, proteins, and fats. The goal for a good quality snack (or small meal) is about 250 calories and about 6 grams of protein. Some patients prefer to drink their calories when appetite is poor. Beverages that contain calories and protein can be used as a snack by itself, or as a meal replacement.

Table 3. Examples of Good Quality Snacks

Trail mix with nuts and dried fruit
Egg custard made with milk and eggs
Cheese and crackers
Chicken salad on a piece of toast
Yogurt (full fat) with fruit topping
Apple slices dipped in peanut butter
Cookies and milk
Smoothie made with orange sherbet and milk

Making Every Bite Count

Many foods and beverages are available in full fat or high-calorie option (for example choosing whole milk instead of skim milk). Some can be enhanced to increase nutrient density by adding protein powder supplements or calorie enhancers (for example, adding cream to a milkshake instead of milk). Using more fat in dishes may be helpful for those who experience dyspnea (shortness of breath). Fat requires less oxygen in the digestion process; thus, higher-fat meals may minimize oxygen requirements.

As appetite may decrease with cancer treatment, using more fat is an effective way to maximize caloric intake. Some people who have followed a low cholesterol diet must rediscover fat-containing foods. Monounsaturated fats or "heart-healthy" fats may be emphasized, such as olive, avocado, nut, or oily fish, to achieve a higher caloric density. Some physicians will allow all fat-containing foods during cancer treatment to aid in the taste and palatability of dishes.

Each teaspoon of oil or butter contains about 45 to 50 calories. By adding one teaspoon of fat to each meal and snack, caloric intake is increased by approximately 250 calories daily without having to eat a larger volume of food. Another strategy is to add one to two tablespoons of heavy cream to any milk-containing food or beverage, thus increasing the calorie content of that food by approximately 50-100 calories. These additions are almost invisible to the person who is trying to maximize caloric intake.

Diabetic Concerns

Many people are required to follow a diabetic diet that limits carbohydrate intake. When appetite is decreased, and meal size is reduced, diabetic diets may be liberalized to allow the addition of carbohydrates. Carbohydrate counting or substitution may help increase caloric intake. Eating carbohydrates may be an uncomfortable idea for patients who have followed their doctor's advice for many years to avoid simple sugars and starches. Many doctors also liberalize the blood glucose goals of patients during cancer treatment and may consider using medication to manage blood glucose—not food restriction.

A common strategy for people with diabetes to maximize their oral intake is to have both low carbohydrate and regular carbohydrate foods available. If eating is minimal, the food item with full carbohydrate content may be used. If consumption is close to usual portion sizes and frequency, the lower carbohydrate version may be used. An example of food substitution can be made regarding yogurt: choose a full carbohydrate version when it is the only food eaten for lunch but choose a low sugar yogurt if it is consumed with a sandwich and bowl of soup.

"Life is 10% what happens to you and 90% how you react to it.
- Charles R. Swindoll

Be aware of the symptoms of low blood glucose in patients who take diabetic medications, as decreased oral intake while continuing to take diabetic medications may cause low blood sugar or hypoglycemic episodes. These symptoms may include lack of concentration, clammy sweats, shaking or tremors, changes in vision, lightheadedness, or dizziness. If any of these symptoms occur, blood glucose level should be tested immediately, and if low, carbohydrates should be provided. Strategies to prevent hypoglycemic episodes include eating and drinking small amounts more frequently during the day; planning an evening snack before going to sleep, and; discussing modifications of medication with your healthcare team. Diabetic patients may also consider carrying glucose tablets or hard candy and keeping some juice at home to drink if blood sugar drops.

Vitamins and Mineral Supplements

Several studies have examined the use of supplemental antioxidants, vitamins, and minerals in patients with advanced non-small cell lung cancer receiving chemotherapy. Most studies have not shown the protective benefit of antioxidants during treatment, nor reduction in cytotoxic side effects.[15] The VITAL Study (Vitamins and Lifestyle Study) determined that people at risk for developing lung cancer, particularly smokers, should not use beta carotene supplements, retinol or lutein supplements for disease prevention. The study found the longer people took the supplements, the more they increased their risk for lung cancer.[16] Another study, focusing on the mineral selenium, found that people deficient in selenium benefited by supplementation. However, an increased rate of lung cancer occurred in people taking selenium who were not deficient.[17] Use of antioxidant nutrient supplementation (i.e., Vitamin C, Vitamin E, Selenium, and others) are not recommended during radiation therapy or alkylating chemotherapies. The Academy of Nutrition and Dietetics Evidence Analysis library has graded and compared the nutrition research and is not currently recommending the use of any high-dose oral antioxidants at this time for cancer prevention nor during cancer treatment.[18]

Studies are currently underway to evaluate the impact of omega-3 fatty acids (fish oils) and physical activity as an intervention useful for interrupting the pre-cachexia syndrome, through their anti-inflammatory effects. Omega-3 oils can be found in fish such as salmon, halibut, fresh tuna, as well as flaxseed and walnuts.[19,20]

Bioactive compounds of interest being studied in relation to lung cancer include: Tea (Camellia sinesis); Isothiocyanates and Indole-3-Carbinol (present in cruciferous vegetables such as cabbage, broccoli, Brussels sprouts, kale and cauliflower); Genistein isoflavones (present in soybean); Curcumin (Curcuma longa); Pomegranate polyphenols (Punica granatum); Fisetin flavonoid (present in strawberry, persimmon, grape, apple, cucumber and onion).[21] If tolerated, it is appropriate to include these nutrients into a healthy diet. The best approach for nutrient supplementation should be individualized to each person's background, genetic profile, lab tests, and cancer risk. Blood tests can be done to assess current levels of nutrients and potential advisability of supplementation. Recommendations about supplements may be discussed with the physician or Oncology Registered Dietitian/Nutritionist.[12,17]

Managing Side Effects and Complications

Early identification and active intervention for side effects are important to protect quality of life. A significant component of cancer treatment support is geared to manage symptoms and side effects. Effective use of medication may facilitate symptom control and side effect management. The patient may speak with the health care team members about medicines that may help control symptoms. Nutritional intervention may focus on lifestyle changes and behavior modification to address symptoms or side effects.[12]

Anorexia and Early Satiety

Some patients with lung cancer may experience anorexia, also called loss of appetite. People with anorexia may describe their lack of appetite as "searching for foods that interest the taste buds" or "not being able to find anything to eat that sounds good to eat." How does a patient eat if there is no sensation of appetite or feeling of hunger? Anorexia must be addressed because although the patient may not feel natural appetite, the body experiences signs of hunger, including weakness, fatigue, excessive sleeping, and inability to concentrate.

Early satiety is often described as "feeling full after only a few bites". In severe cases, people may state that they "would rather spit food out than swallow it" or "the food balls up in the mouth, and they just can't swallow it."

This starvation cycle can be interrupted purposefully. One well-tolerated approach is to transition from several large meals each day to smaller, more frequent meals and snacks. By eating and drinking frequently, creating scheduled snacking times (even small portions count), can provide fuel adequate to improve weakness and fatigue. The anorectic patient should consciously think about eating to provide vital nourishment to the muscles and immune system and should not expect appetite or hunger to drive eating. In other words, "don't wait to feel hungry—eat because it is time to eat." If the anorexia is severe, appetite stimulant medications may be considered.

Patients may consider eating and drinking every 2 to 3 hours during the day. Or, if eating is impossible, a patient may consider getting most of their nutrition from beverages. Many people experiencing anorexia for solid food still feel thirst and can use nutritious beverages to provide calories, protein, as well as fluid. For example: 2 ounces of a milkshake taken each hour provides at least 1500 calories over a day. Some patients use a kitchen timer, cell phone alarm, or watch to cue them to eat and drink.

Avoid asking the patient, "Are you hungry?" or "What do you want to eat?" Instead, try asking "What could you eat (or drink) right now? A frustrating feature of anorexia is the inability to think of enjoyable foods. When the anorexic patient thinks of something that may be enjoyable, interest in the food may disappear before the food is readily available. Appetite is quickly "switched off like a light," and smelling the item during cooking can make it impossible to take a single bite of the dish. This frustration may be managed by reminding patients and families that food preparation is a

team effort. The goal of the family is to help provide food options, and the patient tries to approach eating and drinking. The patient makes the ultimate decision about eating or drinking.

Anorectic patients may be unable to eat the same food repeatedly or tolerate leftovers. Therefore, it is advisable to make small batches and rotate through tolerated menu items. Food may be served to the patient frequently, almost as a "surprise". Consider keeping a record of foods and beverages that taste good or sometimes are tolerable, which may depend on the day of the treatment cycle, fatigue, or other factors. If the food does not taste good, the patient should try another type of food. Creating a list of tolerated foods reassures the patient that some foods are acceptable and appealing may help stimulate ideas for other menu options.

Taste Changes

Taste alterations may be the side effect of cancer itself, the chemotherapy regimen, infection, or certain medications. Most taste changes develop and dissipate depending on the timing of the treatments. Taste changes may limit appetite but may be managed as follows: (1) "cardboard" taste may be improved by adding more flavor; (2) metallic taste is managed by using bland flavors; (3) salty taste is modified by choosing low salt foods; and (4) sickly sweet taste is improved by choosing low sugar foods.[22] (Table 4)

Table 4. Specific Suggestions for Managing Taste Changes in Patients with Lung Cancer

1.	Identify flavors that come through as "true" or accurate; consider similar foods to develop a greater number of tolerated food items. Often watermelon, cantaloupe, and other fruit will maintain a pleasant flavor.
2.	If tart or sour flavors are appealing, drink a small glass of fruit juice, cranberry juice or lemonade when eating to refresh the taste buds. Add a small dish of fruit at each meal.
3.	Limit excessively sweet taste by using homemade foods and beverages that are made with less sugar or add milk or plain yogurt to high-calorie beverages to decrease sweetness. Water down juices or pour over ice to reduce the sweetness of juices. Try a sample of the herb Gymnema sylvestre to temporarily deaden the taste buds to sweet flavors (professional wine tasters use it, and the effect lasts about 20 minutes).
4.	Limit excessively salty taste by choosing low salt foods or cook homemade meals without salt.
5.	Marinate foods with tangy or vinegar flavors. Use strong flavored sauces or toppings such as barbeque sauce or salad dressings.

6.	If red meat is unappealing, use alternative protein sources such as chicken, fish, meat salads, eggs, beans, nuts, or cheese.
7.	Try a pickle or pickled vegetable at meals to excite the taste buds. Add flavor with brown sugar, maple syrup, honey, cinnamon, jams, berries, and dried fruits.
8.	Season tasteless foods with ketchup, hot sauce, Tabasco, vinegars, mustards, hot peppers spices and herbs. Use gravies and sauces to enhance flavors.
9.	Drink beverages and soups with a straw, perhaps from a cup with a lid, so the patient does not see, smell or taste much of the liquid.
10.	Use cold plates and cold foods to reduce exposure to food odor.
11.	Add a slice of lemon, orange or cucumber to flavor water.
12.	Trial a sample of Synsepalum dulcificum to sweeten and enhance flat flavors.
13.	Clean the mouth and tongue after each meal.
14.	Use sugar-free mints, candies, and gums to refresh the mouth.
15.	A metallic taste may be managed with plastic or bamboo cutlery.
16.	Examine the mouth for red or white patches that may indicate an infection and report any signs of thrush to the doctor.

Nausea and Vomiting

Nausea and vomiting are common side effects of many chemotherapy regimens. Most cancer centers use medication routinely to minimize nausea or vomiting. It may be helpful to maintain a record each day of a treatment cycle that nausea occurs, including the time of day and factors that influence nausea. Distinguish and note what triggers nausea or queasiness to help the health care team identify whether nausea is anticipatory, acute, delayed, or breakthrough. Each of these types of nausea may be treated differently with medication and behavioral strategies.[22] (Table 5)

Table 5. Specific Suggestions for Managing Nausea and Vomiting in Patients with Lung Cancer

1.	Eat and drink small volumes at frequent intervals throughout the day. Imagine "trickling" the food and beverages. For some people, nausea is worse when the stomach is empty or when they become overly hungry.
2.	Identify good times of day to eat.
3.	Choose bland, starchy foods that will digest quickly: potato, toast, pancakes, waffles, cous cous, noodles, rice, dry cereal, oatmeal, pretzels, crackers, applesauce, bananas.
4.	Eat and drink clear liquids that digest rapidly: broth-based soups, juice, soda, gelatin, Popsicles.
5.	Sour and tart flavors may help decrease nausea. Use lemon with food or put an orange or lemon slice in a cup of ice water. Some people like pickles or pickled foods with their meal.
6.	Use cold plates to decrease exposure to odors. Avoid being around cooking odors, or exposure to fast food odors in an enclosed environment (like the car).
7.	Foods and beverages made with ginger are a natural way to soothe the stomach: ginger tea, ginger snaps, ginger ale, ginger candies.
8.	Avoid foods that are greasy, fried, pungent, or strongly spiced.
9.	Review medication use with your medical provider: Optimize use of anti-nausea medications, and address reflux, and constipation.

Other Concerns

Mucositis is a painful inflammation and ulceration of the mucous membranes of the mouth and digestive tract that may be a complication of chemotherapy or radiation therapy. Oral mucositis ("mouth sores") may cause difficulties with eating, including chewing solid food and drinking hot or acidic beverages. Radiation esophagitis is an inflammation of the esophagus after radiation therapy that may cause painful swallowing. Nutritional modifications help minimize symptoms and nutritional deficiencies resulting from these conditions.[22] (Table 6) Foods that are recommended if diarrhea is occurring due to the side effects of immunotherapy.[22] (Table 7) Fatigue and food safety are issues that warrant special considerations.[22,23] (Tables 8 and 9)

Table 6. Specific Suggestions for Managing Mucositis and Radiation Esophagitis in Patients with Lung Cancer

1.	Eat small, frequent meals throughout the day; schedule eating and drinking at least every 2 to 3 hours.
2.	Keep a record of the amount of fluid intake achieved to avoid dehydration, especially if there is pain with swallowing.
3.	Choose soft, moist, foods that are easy to eat. Cut food into small portions and chew thoroughly.
4.	Chop, puree, or blend food into a soft or drinkable texture.
5.	Use high-calorie beverages to maximize calorie intake between or after meals.
6.	Before eating, moisten the food with gravy, bland sauces, or soups.
7.	Room temperature foods and liquids may cause less pain than those that are hot or cold.
8.	Avoid dry, scratchy, greasy, spicy, or acidic foods.
9.	Drink liquids with a large lumen straw to avoid contact with mouth ulcers.
10.	If swallowing pills causes pain, take pills with a spoonful of yogurt, apple sauce, or pudding.
11.	Talk with the doctor about medications that may numb or coat the mouth or esophagus. If food is caught in the esophagus, or a lump-like sensation is present after swallowing, reflux medication may be helpful.

Table 7. Specific Suggestions for Managing Diarrhea in Patients with Lung Cancer

1.	Eat and drink small volumes at frequent intervals throughout the day. Imagine "trickling" the food and beverages. Avoid eating large portions as this may trigger diarrhea.
2.	Eat and drink clear liquids that digest rapidly: broth-based soups, juice, soda, gelatin, Popsicles.
3.	Choose bland, starchy foods that will digest quickly: rice, potato, white toast, pancakes, waffles, couscous, noodles, dry oat cereal, oatmeal, pretzels, and crackers.
4.	Include beverages and foods that contain electrolytes (potassium): Banana, inside of a baked potato, orange juice (small portions), tomato juice (small portions).
5.	Include beverages and foods that contain electrolytes (sodium): Canned soups, crackers, pretzels.

6.	Substitute low lactose items for dairy such as milk, yogurt, cheese, and ice cream. Consider using a lactase enzyme or tablet when consuming dairy.
7.	Avoid beverages that contain caffeine, carbonation, or alcohol. Avoid sugar alcohol substitutes found in sugar-free candy and gum (ingredients that end in "OL").
8.	Avoid foods that are high fiber, greasy, fried, pungent, or strongly spiced.
9.	Report frequent loose stools to your health care team, as an infection may cause diarrhea. Do not use anti-diarrheal medications until instructed by your healthcare team.
10.	Review medication use with your medical provider: Ask if you should stop taking medications intended to treat constipation.

Table 8. Specific Suggestions for Managing Fatigue in Patients with Lung Cancer

1.	Convenience foods or frozen meals are adequate if fatigue hinders meal preparation. Pick up a prepared meal at the grocery store, for example, a baked chicken, canned green beans, potato salad, and ice cream.
2.	To maximize the energy provided from food schedule meals and snacks at frequent intervals. Plan your more substantial meals for the time of day you have the most energy
3.	Choose foods that are easy to chew and swallow. Soft and moist foods require less effort to eat.
4.	Use single-serving containers, plastic cutlery, and paper plates to decrease cleanup. Organize your kitchen to keep common or tempting foods in easy reach.
5.	Select meals that are easy to prepare. All food is helpful, and there are no rules about what to eat during various parts of the day. A patient may have three meals a day made from breakfast foods (breakfast, oatmeal, and juice; lunch, scrambled eggs and toast; dinner, pancakes with a glass of milk)
6.	Alternate beverages that have calories with water for fluids. A small glass of juice or milk with a meal will add to the nutritional value of the meal. Stay well hydrated. Avoid drinking liquids in the evening to avoid interrupting sleep at night.
7.	If you are not able to eat much because you are fatigued: Use oral nutritional drinks as snacks or even as meal replacements. Many people find drinking is easier than eating.
8.	Keep a list of groceries and allow others to shop or prepare food for you. Give family and friends specific information of how to assist you: include preferences for brands and flavors.
9.	Balance rest with activity, talk with your doctor about a gentle exercise plan to maintain muscle, strength, and promote bowel health.

Example menu if the patient has fatigue:

Breakfast: Instant oatmeal made with whole milk, juice, coffee with cream

Snack: ¼ cup of Trail Mix, 6 oz. Yogurt

Lunch: 8 oz. can of Cream Soup, Peanut butter and jelly sandwich, potato chips, Instant Iced Tea

Snack: Ice Cream Bar

Dinner: Baked chicken (already prepared at a grocery store), Salad Mix (bagged), Instant mashed potato, gravy (out of a jar), green beans (canned), a glass of chocolate milk

Snack: Graham crackers, Vanilla pudding (single-serve container)

Table 9. Food Safety Suggestions for Patients with Lung Cancer

1.	**4 Basic Steps are of food safety: Clean, Separate, Cook, and Chill**.[23] Safety practices are especially important when the immune system is weakened, such as during chemotherapy or periods of neutropenia.
2.	**Clean:** Wash hands in warm soapy water for at least 20 seconds before food preparation and before eating.
3.	**Clean:** Food preparation surfaces should be cleaned thoroughly with dish soap and water and allowed to air dry.
4.	**Clean:** Wash canned goods lids before opening. Use clean utensils and food platters.
5.	**Clean:** Wash raw fruits and vegetables under running tap water, including those with skins and rinds. Ask the doctor if you should use only cooked or canned fruits and vegetables.
6.	**Separate:** Avoid cross-contaminating foods and food contact surfaces with raw meats.
7.	**Separate**: Use separate cutting boards, for meat and produce, and for raw versus cooked meat.
8.	**Cook:** Avoid eating pink or undercooked meat. **Cook** raw pork, eggs and ground beef to an internal temperature of 160 degrees F. **Cook** poultry, hot dogs, lunch meats, bologna, and deli meats, sauces, soups and gravies to an internal temperature of 165 degrees F. **Cook** steaks, roasts, and fish to in internal temperature of 145 degrees F. Use a food thermometer to ensure proper temperatures.
9.	**Chill:** Keep cold food at 40 degrees F. or cooler.
10.	**Chill:** Promptly refrigerate perishable groceries and meal leftovers. Do not let hot food sit on the counter to cool down before refrigeration.

11.	**Chill:** Divide up large batches of food into smaller containers, so they cool quicker in the refrigerator.
12.	**Chill:** Thaw frozen foods in the refrigerator; do not thaw foods on the counter at room temperature. If you thaw food in the microwave, cook it immediately to 185 degrees F.
13.	**Discard** leftovers stored at room temperature more than 2 hours, and discard leftovers that are more than two days old. When in doubt, throw it out.

Resources for Treatment and Survivorship

The National Cancer Institute (NCI) offers a comprehensive, free resource to patients undergoing cancer treatment regarding nutrition: Eating Hints: Before, During and After Cancer Treatment.[22] It can be accessed online, and downloaded or printed at: http://www.cancer.gov/cancertopics/coping/eatinghints/page1 It is also available in Spanish. Other resources are available on the website of the National Cancer Institute www.cancer.gov.

The American Cancer Society (ACS) offers helpful information: Nutrition for People with Cancer: Survivorship during and after cancer treatment and Living well during treatment.[24] It is available online at http://www.cancer.org/acs/groups/cid/documents/webcontent/002903-pdf.pdf. Support information is also available in Spanish as well as other languages. Other resources are available on the website of the American Cancer Society www.cancer.org.

The American Institute for Cancer Research (AICR) offers a comprehensive guide for nutrition, physical activity, weight management, and cancer prevention information. They also provide recommendations for cancer survivors. The 3rd Expert Report Diet, Nutrition, Physical Activity, and Cancer: A global perspective includes reviews of thousands of nutrition and cancer studies, to help develop public policy and personal prevention recommendations.[25] In addition, the AICR routinely updates recommendations for each cancer type, reviewing the most recent research, and then combining it with previously reviewed data. The website www.aicr.org also offers updates on new research as it occurs, recipes and links to reputable resources.

Notes

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