

Medical Nutrition Therapy for Neuroendocrine Cancer



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Agenda

Nutrition and Cancer Risk Reduction

Pancreatic Exocrine Insufficiency

Carcinoid Syndrome

Blood Glucose Management

Symptom Management

Nutrition and Cancer Risk Reduction





Following the AICR's Cancer Prevention Guidelines

Associated with reduced mortality risk from all causes, cancer, and heart disease

Reduces the risk of cancer

Associated with 10-61% lower risk of cancer incidence and mortality

For each recommendation followed, risk of cancer postponed by 1.6 years

A Plant-Based Diet



Dietary pattern centered on whole, unrefined or minimally refined plants

Less environmental impact and lower risk of diet-related chronic diseases

Can include both animal and plant proteins

75% plant, 25% animal

Protein

Individualized

Limit red meat

- <18oz beef, pork, lamb per week

Avoid processed meats

Choose more fish

- >8oz/week fatty fish

Plant protein: legumes, nuts, seeds, whole grains



Ultra Processed Foods

NOVA Classification System

1. Unprocessed or Minimally Processed Foods

- Whole fruits, vegetables, legumes, grains, meat, fish, poultry, eggs, milk
- Can be frozen, dried, ground, powdered, pasteurized

2. Processed Culinary Ingredients

- Substances extracted from whole foods or the environment
- Oil, sugar, starch, salt, bacteria, yeast

3. Processed Foods

- Group 1 + Group 2
- Freshly made bread
- Canned vegetables in brine
- Jarred fruit in syrup
- Fresh cheese
- Canned tuna

4. Ultra Processed Foods

- Formulations of ingredients that result from a series of processes
- Often require sophisticated equipment and technology
- Contain preservatives
- Sweet and savory snacks, reconstituted meat, confectionary, breakfast cereal

Ultra Processed Food Exposure is Associated with...

Adults:

- Weight gain
- Increased waist circumference
- Obesity & abdominal obesity
- Metabolic syndrome
- High blood pressure
- Type 2 diabetes
- Cardiovascular disease
- Coronary artery disease
- Cerebrovascular disease

Children & adolescents:

- Asthma
- Blood lipids
- Metabolic syndrome
- Waist circumference

How much physical activity should you do?



This can also be achieved by 75 minutes of vigorous activity across the week or a mixture of moderate and vigorous.

All adults should undertake muscle strengthening activity, such as



exercising
with weights



yoga



or carrying
heavy shopping

at least 2 days a week

Minimise the
amount of time
spent sedentary
(sitting) for
extended periods



Nutrition and Pancreatic Exocrine Insufficiency



Causes of Pancreatic Exocrine Insufficiency

Disease in the pancreas

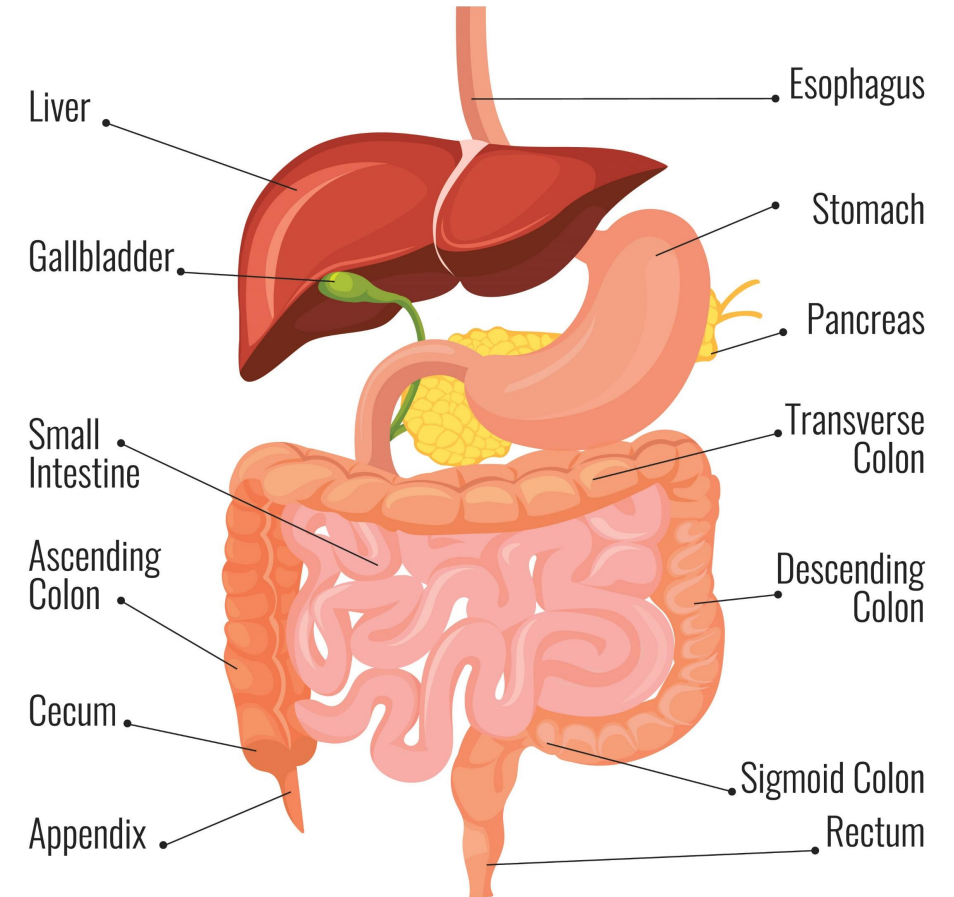
- Pancreatic Neuroendocrine Tumor (PNET)

Somatostatin analogs

- Octreotide, Lanreotide

Surgery

- Pancreatic resection
- Whipple surgery



GASTROINTESTINAL TRACT

Signs and Symptoms



Abdominal
gas, bloating,
smelly gas,
diarrhea



Abnormal
stools
Yellow,
orange, oily,
floating stools



Weight loss
despite
eating
enough



Can cause fat
soluble
vitamin
deficiencies



Fecal
elastase stool
test

Treatment

Pancreatic Enzyme Replacement Therapy (PERT)

- Creon, Zenpep, Pertyze

Dosing

- 25,000-80,000 lipase units per meal
- 500-4,000 lipase units per gram of fat

Enzymes are taken with all foods and beverages that contain fat



Barriers to Treatment

Swallowing difficulty

- Capsules can be opened and added to acidic foods (applesauce, jam), but not alkaline foods (yogurt)

Insurance coverage

- Assistance programs, coupons, brand alternatives

Appropriate Dosing

Adherence



Nutrition

Establish a routine. Take enzymes with meals, snack, and nutrition shakes.

Estimate 4,000 lipase units per 1 gram of fat

- 1 Creon 24,000 lipase units capsule per 6g of fat
- 1 Creon 36,000 lipase units capsule per 9g of fat
- 1 Zenpep 40,000 lipase units per 10g of fat

Limit fiber

Avoid antacids (TUMS, Maalox)

Meal	Food Choices	Enzymes Needed
Breakfast	Smoothie: 1 scoop protein powder 1c berries 1 banana 1tbsp almond butter 1c milk	54,000 lipase units (13 grams of fat)
Lunch	Stir-fry: 1c bok choy 1/2c firm tofu 1/4c mushrooms 1c brown rice	48,000 lipase units (12 grams of fat)
Snack	2tbsp hummus 1c bell peppers 1/2c wheat crackers	40,000 lipase units (10 grams of fat)
Dinner	Fish tacos (2): 6oz cod, seasoned 2 corn tortillas Mayo sauce, avocado, cabbage, cilantro, lime	160,000 lipase units (40 grams of fat)
Dessert	1/2c grapes 1oz cheddar cheese	40,000 lipase units (10 grams of fat)

Supplements

Medium Chain Triglyceride (MCT) Oil

- Calorie supplement 1tbsp=130kcal
- Water soluble. Add to beverages, smoothies, yogurt.

Clear oral supplements

- Protein water, Boost Soothe, Ensure Clear

Over the counter pancreatic enzymes

- Not regulated by the FDA
- Often in low dosages
- Often not enterically coated

Questions to Ask Provider

Can you change my enzyme prescription to adult dosing?

- 25,000-80,000 lipase units per meal

Can you prescribe my enzymes, so they match my eating pattern?

- Ex: 3 meals and 2 snacks; total number of capsules per day

Would I benefit from taking stomach acid lowering medication?

Could you refer me to a gastroenterologist?

Nutrition and Carcinoid Syndrome



Causes of Carcinoid Syndrome

Excessive production of gastrointestinal hormones, peptides, and amines

Midgut NET

Liver metastasis

The 5 E's

- Eating
- Exercise
- Ethanol
- Emotional state
- Epinephrine

Signs and Symptoms

Flushing

Diarrhea

Wheezing

Hypotension

Bradycardia



Nutrition Strategies

Do

Small frequent meals

Low-fat foods

Low-fiber diet for diarrhea

Hydrate

High protein foods

Keep a journal

Don't

Alcohol

Large meals

High fat foods

Raw vegetables

Tomatoes

Spicy foods

Foods high in amines

Amines

Histamine, Tyramine, Tryptamine, Phenylethylamine

Aged cheeses

- Blue, cheddar, parmesan, swiss, camembert

Alcohol

- Beer, wine, liquor

Smoked, salted, pickled fish or meat

- Herring, salami, sausage, corned beef, bologna, pepperoni

Liver

Yeast extract and brewer's yeast

Fermented foods

- Kimchi, shrimp paste, miso, soy sauce, vinegar, tofu, fish sauce

Chocolate

Avocado, raspberries, bananas

Peanuts, Brazil nuts, fava beans

Coconut

Niacin

Tryptophan $\square$ Serotonin

Niacin Supplementation

- Nicotinamide not nicotinic acid
- General recommendation for deficiency is 300mg/day for 3-4 weeks

Signs of deficiency

- Diarrhea
- Dermatitis
- Dementia

Sample Meal Plan

Meal	Food Choices
Breakfast	Toast with almond butter Cantaloupe Protein shake
Lunch	Omelet Roasted sweet potatoes (peeled)
Snack	Lactose free milk Graham crackers
Dinner	Salmon with lemon Rice Sauteed zucchini
Snack	Peeled apple slices



5-HIAA Urine Test

Avoid High Serotonin Foods

48 hours prior to and 24 hours during urine collection

Walnut	Pecan	Pineapple	Eggplant	Banana
Plantain	Kiwi	Plum	Tomato	Avocado
Date	Grapefruit	Cantaloupe	Honeydew	Olive
Berries	Apple	Cherry	Papaya	Mango
Pear	Peach	Orange	Lemon	Lime
Carrot	Cucumber	Lettuce	Nuts	Seeds

Nutrition and Blood Glucose Management



Causes

History of diabetes

Disease in the pancreas

- Pancreatic Neuroendocrine Tumor (PNET)

Somatostatin analogs

- Octreotide, Lanreotide

mTOR inhibitors

- Everolimus

Steroids

Surgery

- Pancreatic resection
- Whipple surgery

Consistent Carbohydrate Diet

Avoid simple sugars

- Fruit juice, soda, foods prepared with added sugar

Limit carbohydrates in each meal to <1c

- Bread, pasta, rice, potatoes, fruit, beans, corn, tortillas

Include protein with all meals and snacks

Don't skip meals

Carbohydrate Counting

Each serving of carbohydrate = 15g

30-45g per meal and 0-15g per snack

1 slice of
bread

1 tortilla (6")

¼ large bagel

2 taco shells
(5")

½ hamburger
or hotdog
bun

½ cup
cooked
cereal

4-6 small
crackers

½ cup beans,
corn,
potatoes

3 cups
popcorn

1 small fruit

2 tbsp dried
fruit

1 cup melon

½ cup
unsweetened
fruit juice

1 cup milk

2/3 cup
yogurt,
unsweetened

Nutrition Facts

Serving Size 1 cup (225g)

Amount Per Serving

Calories **230**

% Daily Value*

Total Fat 8g **10%**

Saturated Fat 1g **5%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 160mg **7%**

Total Carbohydrate 37g **13%**

Dietary Fiber 4g **14%**

Sugars 12g **20%**

Includes 0g Added Sugars

Protein 5g

Vitamin A 0mg **0%**

Calcium 200mg **15%**

Iron 8mg **45%**

Potassium 250mg **6%**

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice, but calorie needs vary.



Meal	Food Choices	Carbohydrate Counting (Net carbohydrates)
Breakfast	Smoothie: 1 scoop protein powder 1c berries 1 banana 1tbsp almond butter 1c milk	43g (3 servings)
Lunch	Stir-fry: 1c bok choy 1/2c firm tofu 1/4c mushrooms 1c brown rice	40g (3 servings)
Snack	2tbsp hummus 1c bell peppers 1/2c wheat crackers	30g (2 servings)
Dinner	Fish tacos (2): 6oz cod, seasoned 2 corn tortillas Mayo sauce, avocado, cabbage, cilantro, lime	23g (2 servings)
Dessert	1/2c grapes 1oz cheddar cheese	14g (1 serving)

Questions to ask Provider

Would I benefit from medication?

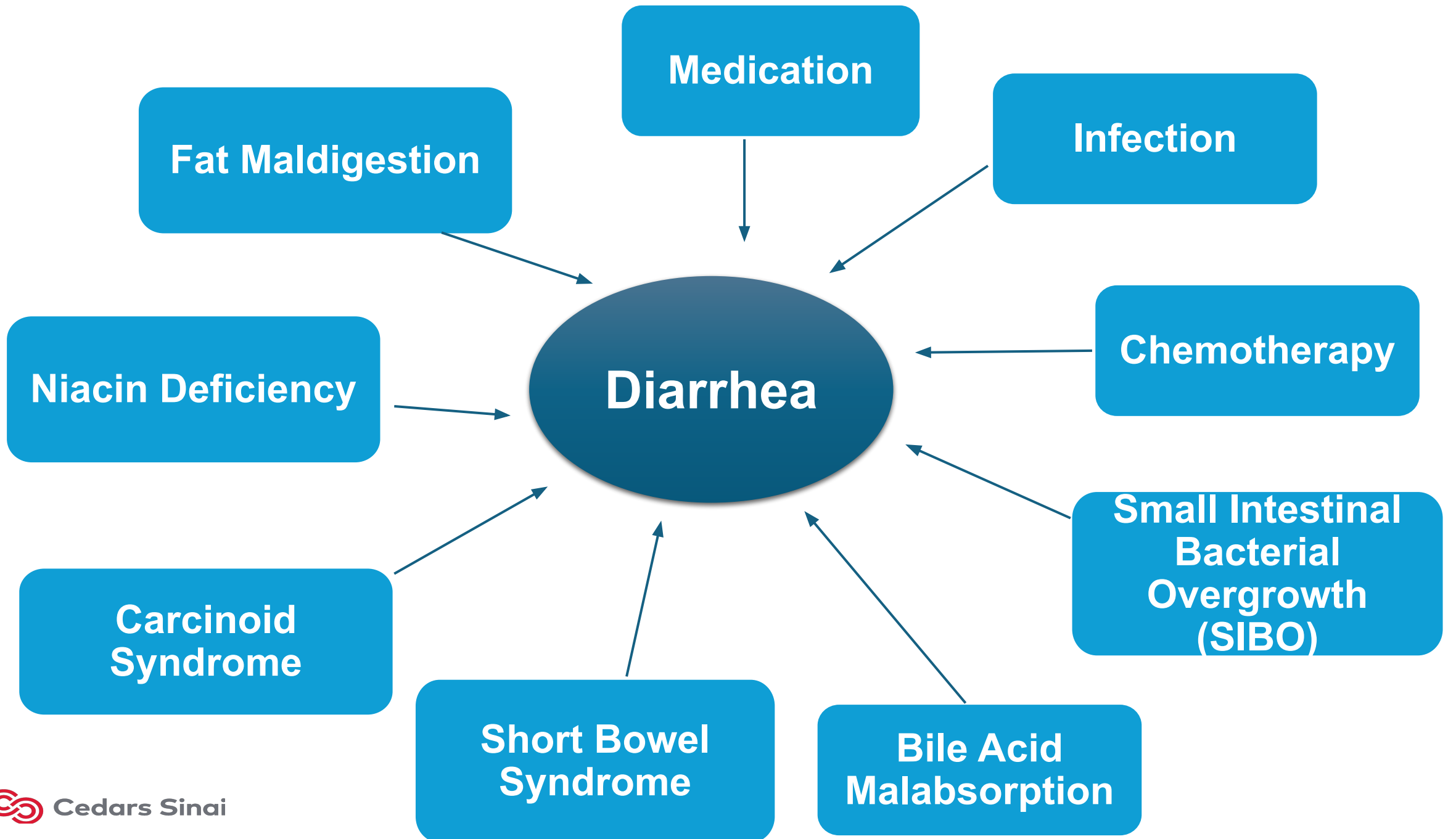
Would I benefit from a continuous glucose monitor?

What are the optimal ranges for my blood sugar and when should I seek medical attention?

Can you refer me to a Registered Dietitian (RD)?

Nutrition and Symptom Management





Diarrhea

Choose

Avoid

Fatigue

Choose easy to prepare meals

Eat every 3-4 hours

Hydrate

Consider meal delivery services/ready to eat meals

Exercise

Ask for help

Decreased Appetite

Pivot to liquid foods

- Soups, smoothies, kefir, nutrition shakes

Eat on a regular schedule

Distracted eating

Exercise

Emotional state,

- Seek support
- Discuss with provider

Discuss appetite stimulants with provider

Weight Loss

Symptom management

Small, frequent meals

Calorically dense foods

Nutrition shakes or homemade smoothies

- Protein powder, calorie supplements

Resources

The Adult Patient's Guide to Managing a Short Bowel

- <https://www.shortbowelsyndrome.com/sign-up>

Pancreatic Cancer Action Network PNET Booklet

- <https://media.pancan.org/patient-services/educational-materials/PanCAN-Booklet-PNET.pdf>