

## Management of Pancreatic Exocrine Insufficiency

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A 56-year-old obese Caucasian woman named M.B. reported experiencing anorexia and early satiety in the prior two months. She has lost 10 pounds in two weeks. No changes had been made to her type 2 diabetes medications, she took no other medications, and her exercise habits were unchanged. M.B. made an appointment with her primary care physician (PCP) and her physical examination was inconclusive. The complete blood count and chemistry panel were normal; however, a computed tomography scan of the abdomen showed a 3 cm abnormality in her pancreas with a question of involvement of her superior mesenteric artery. Her PCP suggested that she see a gastroenterologist for an endoscopy.

The gastroenterologist performed an endoscopic ultrasound (EUS) and blood work was conducted, including the cancer antigen 19-9 (CA 19-9) and carcinoembryonic antigen tumor marker tests. M.B.'s CA 19-9 was slightly elevated at 88 mg/dL, and the EUS procedure obtained several tissue specimens that were consistent with adenocarcinoma of the pancreas with no involvement of lymph nodes. She then saw an oncologic gastrointestinal surgeon who ordered a positron-emission tomography (PET) scan; the scan showed the tumor in the head of the pancreas involving major blood vessels. Based on these findings, her pancreatic cancer was determined to be locally advanced and unresectable.

M.B. was referred to a medical oncologist and reported several additional symptoms that she started to experience, including more frequent and very foul smelling stools as well as bloating with flatulence. She was continuing to lose weight because eating was so uncomfortable. Her oncologist asked a registered dietitian to consult with her. An initial diet history revealed that M.B. was eating a diet consisting of three

meals and two snacks daily; however, portions were smaller because she had early satiety.

At the request of the registered dietitian, M.B. completed an evaluation tool where she rated how often she experienced a variety of symptoms (see Figure 1). Her score was high, indicating that she had pancreatic exocrine insufficiency (PEI). The dietitian discussed instituting a trial of pancreatic enzymes with the oncologist. The objective was to see if the enzymes would be effective in decreasing the frequency and severity of pancreatic insufficiency symptoms. Samples of pancreatic enzymes were provided by the oncologist and specific dosing was determined in consultation with the dietitian after her detailed diet history. The dietitian asked M.B. to keep a food diary and to record the dose of enzymes taken with each meal and snack. Three weeks later, M.B. was asked to rate how often she was experiencing the symptoms now that she had been using pancreatic enzymes, and she reported a definite decrease in the frequency of symptoms. On subsequent visits, the dietitian updated M.B.'s history and discussed additional strategies to minimize symptoms of PEI. The dosing of enzymes also was tweaked several times. M.B. went on to receive chemotherapy and radiation and required continued reassessment and adjustment of diet and enzyme dosing by the dietitian.

### Pathophysiology

The American Cancer Society ([ACS], 2013) estimated that 45,220 people will be diagnosed with pancreatic cancer in the United States in 2013. Pancreatic cancer is the 10th most common type of cancer and accounts for 7% of all cancer-related deaths (ACS, 2013).

The pancreas is a gland that is about two inches wide by six to eight inches

long and is positioned horizontally deep within the abdomen. Two different types of glandular tissue make up the bulk of the pancreas. The endocrine tissue accounts for about 5% of the pancreas and is involved in the production of the insulin and glucagon hormones. The exocrine tissue accounts for 95% of the pancreas and produces pancreatic enzymes to aid in the digestion of fat, protein, and carbohydrate (ACS, 2012).

### Surgery

Surgical resection offers the only reasonable hope of long-term survival. Various surgical options are available for resecting pancreatic cancer, with tumor location being a major determining factor. Most pancreatic cancers occur in the head of the pancreas and the pancreaticoduodenectomy, or Whipple procedure, is the most common procedure. A Whipple procedure involves the removal of the head of the pancreas, the gastric antrum and pylorus, the duodenum, the gallbladder, and the common bile duct (Fernandez-del Castillo, Jimenez, & Steer, 2012). A total pancreatectomy is performed if diffuse carcinoma of the entire pancreas or multifocal tumors within the pancreas are found, whereas a distal pancreatectomy is performed if the tumor is located in the body or tail of the pancreas. A regional or radical pancreatectomy removes tumors located in the pancreatic head or periampullary region and is more extensive than the Whipple procedure (Dunphy, 2008). A patient who has had surgery for pancreatic cancer may experience a deficiency in the secretion of enzymes (Matsumoto & Traverso, 2006).

Gastric resection also may be associated with PEI because of impaired stimulation of cholecystokinin and insufficient mixing of gastric chyme, resulting from dumping syndrome or