

Enteral Nutrition Challenges: Focus on Pancreatic Insufficiency Webinar

Live Webinar: Tuesday August 25, 2020 (2:00-3:00 pm EDT)

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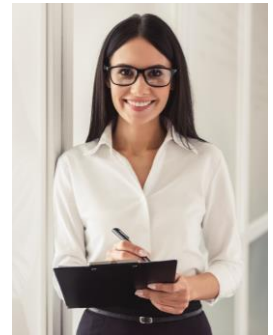
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This complimentary webinar has been made possible through with the generous support of Alcresta Therapeutics, Inc. Please note that [Alcresta Therapeutics, Inc.](https://www.alcresta.com/) provided financial support but did not have any input into the information presented in this webinar.

Course Description:

Do you have questions about Enteral Nutrition and Fat Malabsorption? Join award winning dietitian, Jeanette Hasse, PhD, RD, LD, CNSC, FASPEN, FADA, CCTD, as she helps define nutrition treatment options! This webinar aims to identify challenges associated with enteral nutrition in patients with fat malabsorption and define nutrition treatment options. The presentation will review the process of fat digestion, summarize the basic physiology of the pancreas and disorders leading to exocrine pancreatic insufficiency, and outline symptoms and diagnosis of fat malabsorption. The effect of fat malabsorption on nutrition status will be examined with a focus on appropriate nutrition interventions. Enteral nutrition strategies will be evaluated along with appropriate dosing and delivery of pancreatic enzymes for bolus and continuous enteral feeding.

Course Objectives:

After completing this continuing education course, the learner should be able to:

1. Review basic physiology of the pancreas and disorders leading to exocrine pancreatic insufficiency.
2. Evaluate complications and diagnosis of fat malabsorption.
3. Analyze indications and routes of delivery for enteral nutrition and pancreatic enzymes for individuals with exocrine pancreatic insufficiency.

Speaker: Jeanette Hasse, PhD, RD, LD, CNSC, FASPEN, FADA, CCTD

Disclosure: Dr. Hasse is on the Speaker's Bureau for Alcresta Therapeutics, Inc.

Professional Approvals: Becky Dorner & Associates, Inc. has been a Continuing Professional Education (CPE) Accredited Provider (NU004) with the Commission on Dietetic Registration since 2002.

This course is intended for: RDNs	CDR Activity Type and Number: Activity Type: 171 Live webinar 175 Recorded Webinar Activity number: 157086 157728 Recorded Webinar
Course CPE Hours: 1.0	CDR Level: 2
Suggested CDR Performance Indicators: 4.1.2, 4.2.7, 8.1.5, 8.3.1	



Note: Numerous Other Learning Needs Codes and Performance Indicators May Apply.

How to Complete a CPE Course:

<https://www.beckydorner.com/continuing-education/how-to-complete-cpe/>


Expiration Date for Recorded Webinar: August 25, 2023

Questions? Please contact us at info@beckydorner.com or 1-800-342-0285.



Enteral Nutrition Challenges: Focus on Pancreatic Insufficiency Webinar

Today's Webinar



Audio and Webinar

- ▶ Please refer to handout for instructions

Handouts

- ▶ Live: Emailed to the person who registered for the program, and in the Go To Webinar System
- ▶ Recording: Available on our website with the recording

Questions


- ▶ Live program: Use GoToWebinar to ask questions
- ▶ Recording: Email info@beckydorner.com

Program Length

- ▶ The program will last about 60 minutes

Credit Hours/Certificate

- ▶ Please refer to your handouts for detailed information



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Today's Webinar



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Enteral Nutrition Challenges: Focus on Pancreatic Insufficiency

Jeanette Hasse, PhD, RD, LD, CNSC, CCTD, FASPEN, FADA

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Enteral Nutrition Challenges: Focus on Pancreatic Insufficiency Webinar

Jeanette Hasse, PhD, RD, LD, CNSC, CCTD, FASPEN, FADA



Disclosures
Dr. Hasse is on the Speaker's Bureau for Alcresta Therapeutics, Inc.

- Nutrition manager
- National speaker and author
- Medical expert in the critical care nutrition field for over 35 years
- Involved in research and development of nutrition care protocols for transplant patients
- Given several presentations on nutrition and transplantation
- Editor in Chief of the journal, *Nutrition in Clinical Practice*
- Co-editor of the book, *Comprehensive Guide to Transplant Nutrition*
- Recipient of several professional awards

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Objectives

1

Review basic physiology of the pancreas and disorders leading to exocrine pancreatic insufficiency

2

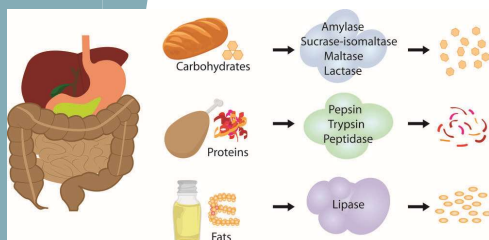
Evaluate complications and diagnosis of fat malabsorption

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Analyze indications and routes of delivery for enteral nutrition and pancreatic enzymes for individuals with exocrine pancreatic insufficiency

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Digestion

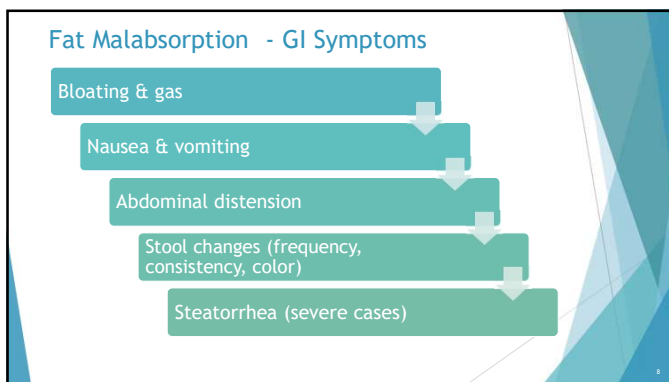


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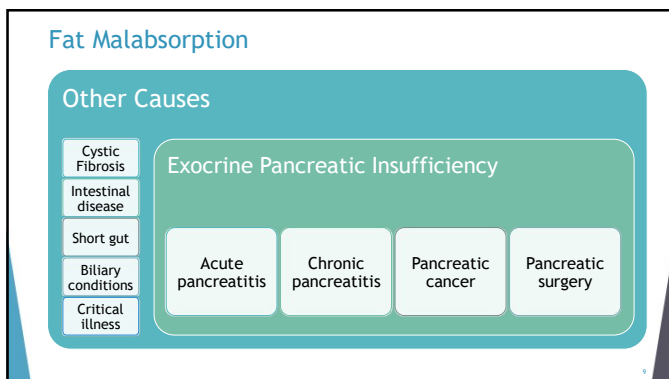
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	Carbohydrate	Protein	Fat
Mouth	Salivary Amylase: Polysaccharides & Disaccharides → smaller polysaccharides & maltose		
Stomach		Pepsin: Proteins → small polypeptides	
Small intestine lumen	Pancreatic amylases: Polysaccharides → maltose & other disaccharides	Pancreatic trypsin & chymotrypsin: Polypeptides → smaller polypeptides Pancreatic carboxypeptidase: Small polypeptides → amino acids	Bile: Fat globules → fat droplets Pancreatic lipase: Triglycerides → glycerol, monoglycerides, free fatty acids
Small intestine brush border	Disaccharidases: Disaccharides → monosaccharides	Dipeptidases, carboxypeptidase, & aminopeptidase Small peptides → amino acids	

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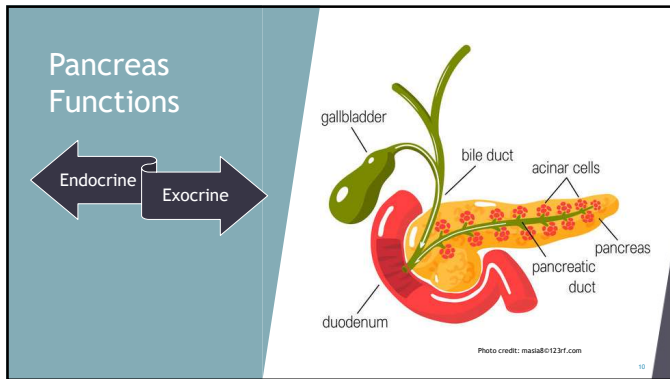


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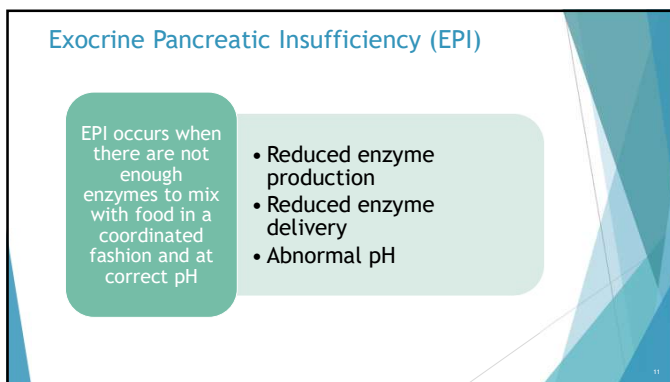


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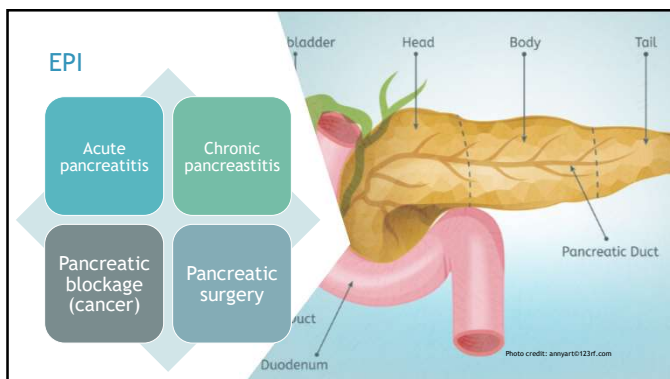
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Acute Pancreatitis

Inflammatory condition of the pancreas that can cause local injury, systemic inflammatory response syndrome, and organ failure



Symptoms

- Abdominal pain
- Nausea
- Vomiting



Diagnosis - must meet 2

- Abdominal pain
- Amylase or lipase >3 times normal
- CT evidence

Crockett SD. AGA Institute Guideline on Initial Management of Acute Pancreatitis. Gastroenterol. 2018;154:1096. Photo credit: amyart12345.com

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Acute Pancreatitis Classified According to Revised Atlanta Criteria

Mild acute pancreatitis	Moderately severe acute pancreatitis	Severe acute pancreatitis
<ul style="list-style-type: none">• No organ failure• No local or systemic complications	<ul style="list-style-type: none">• Organ failure that resolves within 48 hr (transient organ failure) ±• Local or systemic complications with persistent organ failure	<ul style="list-style-type: none">• Persistent organ failure (>48 hr)<ul style="list-style-type: none">- Single organ failure- Multiple organ failure

Banks PA et al. Gut. 2013;62(1):102-11

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Acute Pancreatitis Classified According to Revised Atlanta Criteria

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80% of cases are mild

Necrotizing Pancreatitis:
Pancreatic or peripancreatic necrosis
Occurs mainly in moderate to severe cases

Banks PA et al. Gut. 2013;62(1):102-11

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Chronic Pancreatitis

Pathologic fibroinflammatory syndrome of the pancreas in individuals with genetic, environmental, and/or other risk factors who develop persistent pathologic responses to parenchymal injury or stress

Symptoms

Intractable pain

Malabsorption

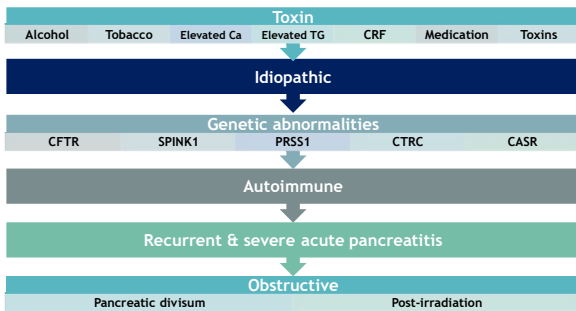
Diabetes mellitus

Gardner TB et al. ACG Clinical Guideline: Chronic Pancreatitis. Am J Gastroenterol. 2020;115(3):322.

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Chronic Pancreatitis: Common Causes



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Etiology of EPI in Pancreatitis

- ▶ Parenchymal destruction^{1,2}
 - Acinar cell necrosis
 - Decreased enzyme secretion
- ▶ Destruction of ductal architecture²
 - Pancreatic duct leak
 - Decreased enzyme activity
- ▶ Ductal cell destruction^{1,2}
 - Decreased bicarbonate secretion
 - Inappropriate environment for enzyme activity



¹ Leung PS et al. Int J Biochem Cell Biol. 2006;38(7):1024-1030.
² Hegyi P et al. Gut. 2011;60(4):544-552.

Photo credit: gunita6123rf.com

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Pancreatic Cancer

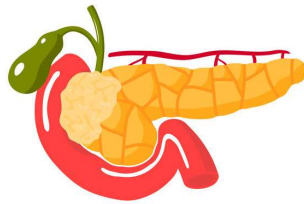


Photo credit: masala123rf.com

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Pancreas Surgery

Biliary bypass

- ▶ If tumors growing in the head of the pancreas block the common bile duct, the blockage can cause pain and digestive problems. A **biliary bypass** may be performed to reroute the flow of bile around the tumor directly into the small intestine.

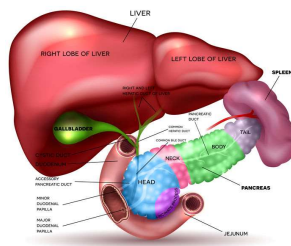


Photo credit: 123rf/ignitza

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Pancreas Surgery

Stent placement

- ▶ Stent placement is a more common approach to relieve a blocked bile duct. A stent is placed inside the bile duct via ERCP.

Gastric bypass

- ▶ If a tumor causes an intestinal obstruction, a gastric bypass will allow food past the blockage.

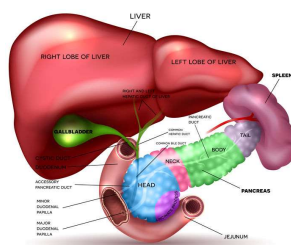


Photo credit: 123rf/ignitza

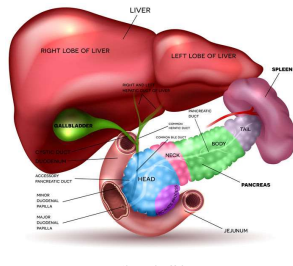
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Pancreas Surgery

Pancreaticoduodenectomy (Whipple)

- Removes head of the pancreas, a portion of the bile duct, the gallbladder, the duodenum (first part of the small intestine) and part of the stomach. The rest of the pancreas, the bile duct and the stomach are reattached to the small intestine



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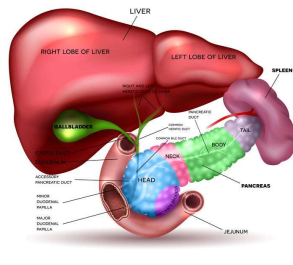
Pancreas Surgery

Distal pancreatectomy

- Removes only the tail of the pancreas or the tail and a portion of the body of the pancreas. The spleen is usually removed as well.

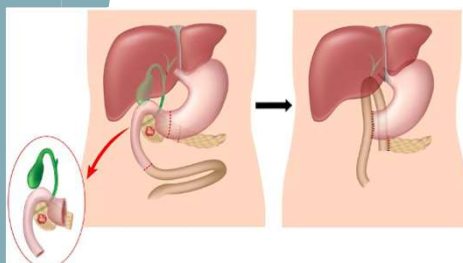
Total pancreatectomy

- Removes the entire pancreas, the gallbladder, part of the duodenum, the bottom portion of the stomach, and local lymph nodes.



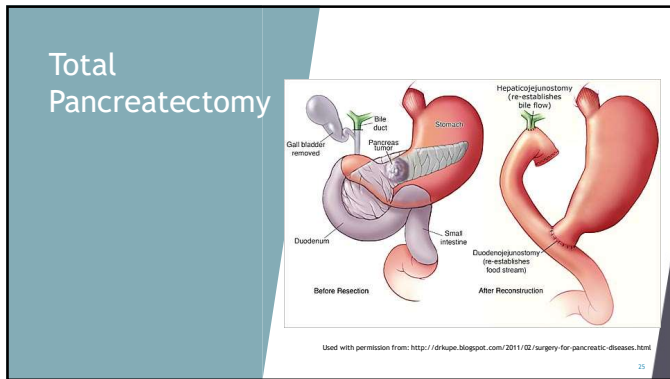
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Whipple Procedure

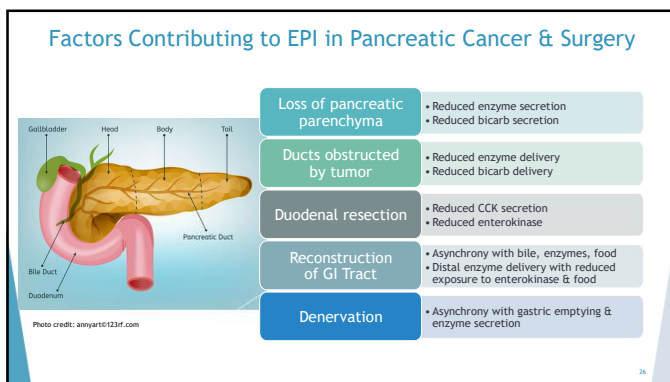


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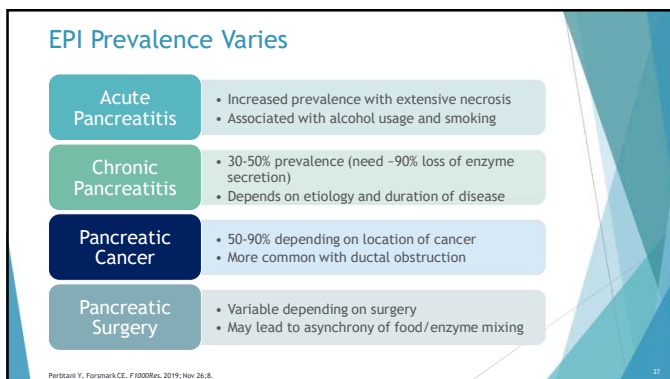
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Prevalence of EPI in Patients with Acute Pancreatitis

Holleman et al meta-analysis of 32 studies (1495 patients):

The pooled prevalence of EPI across all studies reviewed was 27.1%, tested at a mean follow-up of 36 months after initial admission

- Patients from seven studies (n=194) who underwent direct tests for EPI had a pooled prevalence of 41.7% [18.5%-69.2%]
- Alcoholic etiology and necrotizing pancreatitis are associated with higher risk of EPI (22.7% and 32.0% respectively)

Pooled prevalence of EPI after mild pancreatitis was 19.4%

Pooled prevalence of EPI after severe pancreatitis was 33.4%

Holleman et al. 2018; *Pancreatology*. 2018;18(3):253-262.

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Prevalence of EPI in Patients with Acute Pancreatitis

Huang et al meta-analysis of 41 studies:

EPI occurred in 62% of all AP patients during index admission, including all grades of severity

One third (35%) of all AP patients had EPI during follow-up, significantly more after severe AP compared vs. mild AP or necrotizing AP vs. edematous AP

EPI was not restricted to patients who had extensive pancreatic necrosis; 46% of patients who had mild AP had EPI during index admission and 20% at follow-up

Huang W, et al. *Dig Dis Sci*. 2019;64(7):1985-2000. doi: 10.1007/s10620-019-0598-9.

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EPI Prevalence in Pancreatic Cancer

Non-resection

10% per month progressive decline



PANCREATIC CANCER

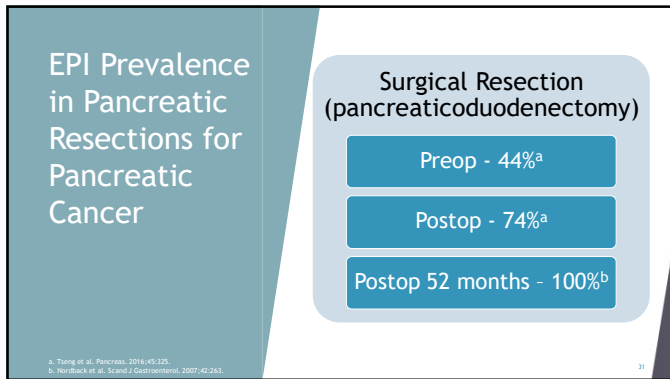
Photo credit: masab0123f.com

Sikaris et al. *J Clin Gastroenterol*. 2014;101:106.

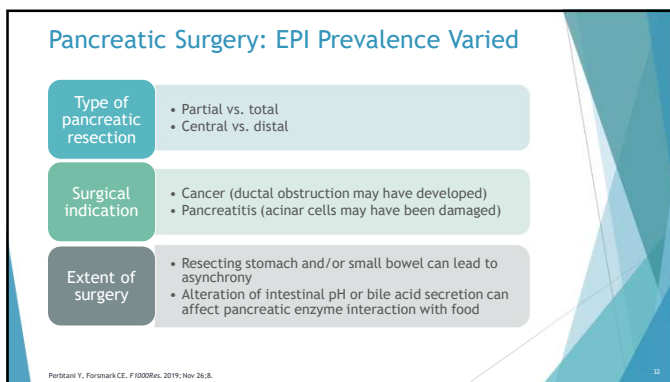
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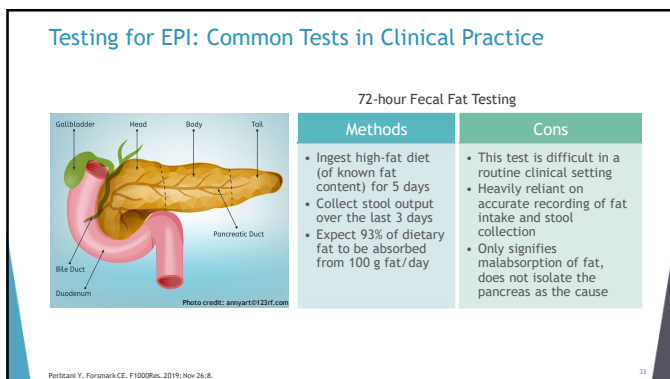
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Testing for EPI: Common Tests in Clinical Practice

► Fecal Elastase-1

Methods	Advantages	Interpretation	Cons
<ul style="list-style-type: none">Measures chymotrypsin-like elastases (CELA) 3A and 3B (not elastase-1)	<ul style="list-style-type: none">No timed stool collection or specific dietAccessible and can be performed while a patient is taking Pancreatic Enzyme Replacement Therapy (PERT)	<ul style="list-style-type: none">Reasonable sensitivity in advanced or severe EPI if a cut-off of <100 mcg/g of stool is chosen100-200: indeterminate>200 mcg/g stool is normal	<ul style="list-style-type: none">High false positive rates dependent on cut-off levels chosen, stool consistency at the time of sampling (may be falsely low in watery stool)Low fecal elastase exists with advanced age and other medical conditions (e.g., CKD, DM)

Perttari V, Forsmark CE. F1000Res. 2019; Nov 26;8. Fecal Elastase-1

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Fat Malabsorption - GI Symptoms

Bloating & gas

Nausea & vomiting

Abdominal distension

Stool changes (frequency, consistency, color)

Steatorrhea (severe cases)

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EPI - Nutrition Symptoms

Reduced intake

Weight loss

Reduced muscle mass

Reduced function

Fat-soluble vitamin deficiency

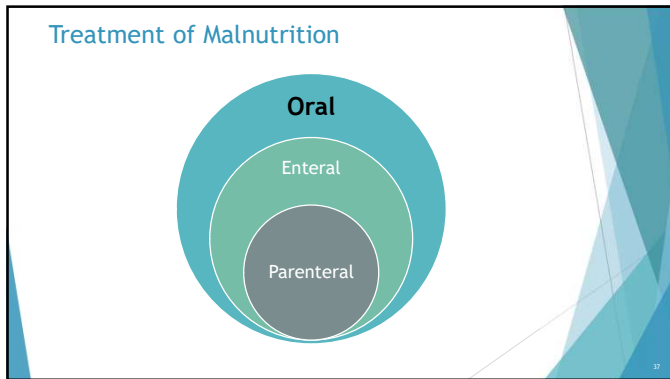
Fatty acid deficiency

Osteoporosis

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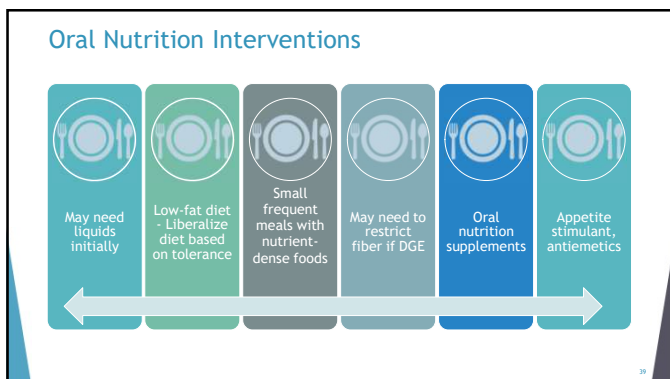
Acute Pancreatitis - AGA Guidelines

Guideline 4.

- In patients with AP, the AGA recommends early (within 24 h) oral feeding as tolerated, rather than keeping the patient nil per os. (Strong Moderate)

Crockett SD. AGA Institute Guideline on Initial Management of Acute Pancreatitis. Gastroenterol. 2019;156:1096.

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Pancreatic Enzyme Replacement Therapy

Achieving the 4 “Rights”

1. Dose
2. Place
3. Time
4. pH

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Form	Product	Manufacturer	Lipase units
Enteric-coated beads enclosed in a capsule	Creon	AbbVie Inc Chicago, IL	3000; 6000; 12,000; 24,000; 36,000
	Pancreaze	Vivus, Inc Campbell, CA	2600; 4200; 10,500; 16,800; 21,000
	Pertzye	Digestive Care, Inc Bethlehem, PA	4000; 8000; 16,000; 24,000
	Zenpep	Allergan, Inc Madison, NJ	3000; 5000; 10,000; 15,000; 20,000; 25,000; 40,000
Non-enteric coated tablet (acid suppression is required)	Viokace	Allergan, Inc Madison, NJ	10,440; 20,880

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PERT for Oral Intake

Lipase Dosing	Lipase units/kg body weight ^b
Starting dose per meal	500
Maximum dose per meal	2500
Maximum dose per day ^a (reflecting 3 meals and 2-3 snacks per day)	10,000 (or 4000 units lipase/g dietary fat)

^aProvide a half of meal dose for snacks.
^bReduce dose in older patients because they weigh more but tend to ingest less fat/kg body weight.

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PERT for Oral Intake

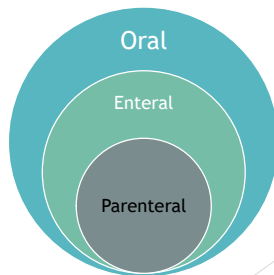
Administration of oral pancreatic enzymes:

- ▶ Pancreatic enzymes capsules should be swallowed whole
- ▶ If a patient is unable to swallow the capsules intact, they can be opened and the beads can be sprinkled on a small amount of acidic food with pH of 4.5 or less (e.g., applesauce)
- ▶ The patient must swallow the food-enzyme mixture immediately, and drink fluid afterwards to make sure no enzyme remains in their mouth
- ▶ Non-enteric-coated tablets should not be crushed or chewed and should be taken with a proton-pump inhibitor

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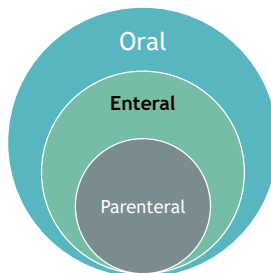
Treatment of Malnutrition

- ▶ Inability to use GIT
- ▶ Short gut
- ▶ Fistula
- ▶ Ileus



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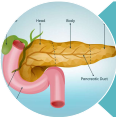
Treatment of Malnutrition



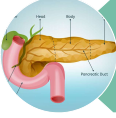
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Acute Pancreatitis: AGA Guidelines



5. In patients with AP and inability to feed orally, the AGA recommends enteral rather than parenteral nutrition. (Strong Moderate)



6. In patients with predicted severe or necrotizing pancreatitis requiring enteral tube feeding, the AGA suggest either NG or NJ route. (Conditional Low)

Crickett SD. AGA Institute Guideline on Initial Management of Acute Pancreatitis. Gastroenterol. 2018;154:1096. Photo credit: anyart0123rf.com

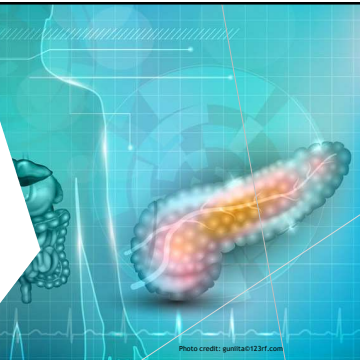
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SCCM - ASPEN Critical Care Nutrition Guidelines

- L1c. We suggest that patients with moderate to severe acute pancreatitis should have a naso-/oroenteric tube placed and EN started at a trophic rate and advanced to goal as fluid volume resuscitation is completed (within 24-48 hours of admission)
[Quality of Evidence: Very Low]
- L2. We suggest using a standard polymeric formula to initiate EN in the patient with severe acute pancreatitis. Although promising, the data are currently insufficient to recommend placing a patient with severe acute pancreatitis on an immune-enhancing formulation at this time
[Quality of Evidence: Very Low]
- L3b. We suggest that EN be provided to the patient with severe acute pancreatitis by either the gastric or jejunal route, as there is no difference in tolerance or clinical outcomes between these 2 levels of infusion.
[Quality of Evidence: Low]

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EN & Chronic Pancreatitis



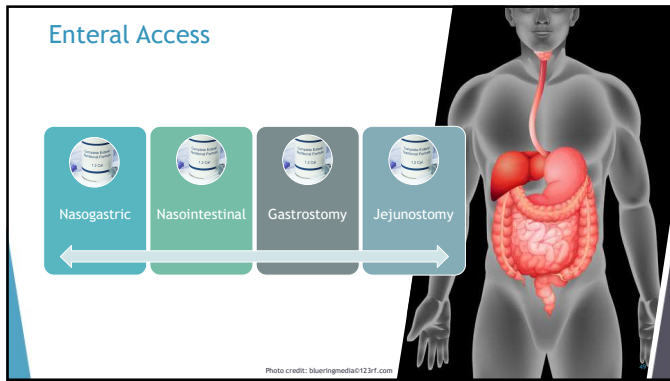
When nutrition status is compromised & oral intake is inadequate

May help reduce inflammation and/or pain

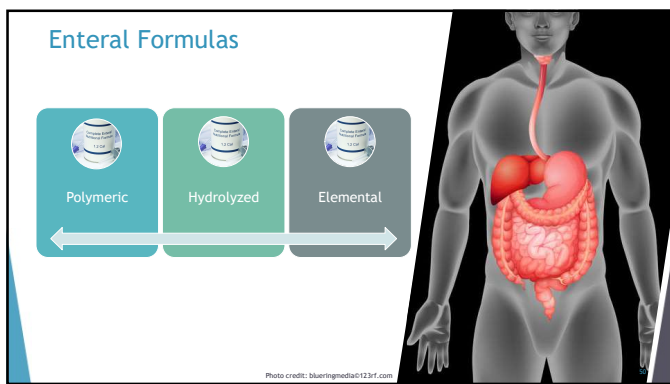
Photo credit: guntta0123rf.com

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	Carbohydrate	Protein	Fat
Mouth	Salivary Amylase: Polysaccharides & Disaccharides → smaller polysaccharides & maltose		
Stomach		Pepsin: Proteins → small polypeptides	
Small intestine lumen	Pancreatic amylases: Polysaccharides → maltose & other disaccharides	Pancreatic trypsin & chymotrypsin: Polypeptides → smaller polypeptides Pancreatic carboxypeptidase: Small polypeptides → amino acids	Bile: Fat globules → fat droplets Pancreatic lipase: Triglycerides → glycerol, monoglycerides, free fatty acids
Small intestine brush border	Disaccharidases: Disaccharides → monosaccharides	Dipeptidases, carboxypeptidase, & aminopeptidase Small peptides → amino acids	

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Pancreatic Enzyme Replacement Therapy

Achieving the 4 "Rights"

1. Dose
2. Place
3. Time
4. pH

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Oral PERT for EN

Right Dose

- ▶ Dosing needs to be individualized according to the patient's symptoms
- ▶ A starting daily dose for EN is 1,000-2000 lipase units/g fat provided in 24 hrs (500 to 4,000 lipase units/g fat)
- ▶ If supplementation appears ineffective, try higher dose (= increased cost)

Ferris S, et al. Nutr Clin Pract. 2011;26(3):349-51.

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Oral PERT for EN

Right Place

- ▶ Requires PERT to mix with formula
- ▶ May not work well if oral PERT given in stomach if EN is directed to intestine

Ferris S, et al. Nutr Clin Pract. 2011;26(3):349-51.

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Oral PERT for EN

Right Time

- ▶ Bolus feeding: Administer PERT no more than 30 minutes before or after feeding
- ▶ Continuous feeding: Calculate the amount of enzyme needed for g fat/day divided into doses every 2- to 3-hours
- ▶ Nocturnal feeding: May be impractical. May try single dose at the beginning of the feed period, usually a 3-hour amount or 50% of the amount required for the total feed period. An additional dose can be given if the patient awakes spontaneously during the night

Ferrie S, et al. *Nutr Clin Pract*. 2011;26(3):349-51.

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Oral PERT for EN

Right pH

- ▶ Consider acid suppression if using non-enteric coated PERT

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Oral PERT via G-Tube

Pertzye (4000 USP lipase units - Digestive Care, Inc., Bethlehem, PA) is the only oral pancreatic enzyme with US Food and Drug Administration approval for gastrostomy (G) tube administration.

- ▶ G-tube administration should only be performed with the contents of only one or two 4,000 USP lipase unit capsules
- ▶ Administer with soft foods with a pH of 4.0 or less (e.g., applesauce) via a G-tube with a diameter of 14 French or larger.



Photo credit: pattarawit234f.com

SOURCE: http://resources.clinicalnutrition.com/Pertzye/PERTZYE_R.pdf

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Oral PERT via G-Tube

Steps for Administration:

- ▶ Transfer ≥10 mL of applesauce into a medicine cup.
- ▶ Open 1 or 2 Pertzye 4,000 lipase unit capsules.
- ▶ Mix the capsule contents into applesauce to create a suspension. Once mixed, administer the suspension immediately. Care should be taken not to crush the enzyme microspheres.
- ▶ Remove the plunger from a 35-mL syringe. Transfer the applesauce mixture into the syringe. Replace the plunger partially back into the syringe.
- ▶ Tap the syringe with the syringe tip facing upward so that the applesauce mixture will move towards the plunger. Carefully push the plunger slowly until the residual air is removed from the syringe tip.
- ▶ Once the residual air is removed, connect the syringe directly into the G-tube feeding port.
- ▶ Push the syringe contents into the G-tube feeding port using steady pressure until empty.
- ▶ Draw up approximately 10 mL of water with the syringe and flush the G-tube feeding port with the water.
- ▶ Discard any unused portion of the applesauce mixture. Do not save for later use.
- ▶ If dose requires more than two capsules, repeat steps 1-9 until prescribed dose is reached.
- ▶ †For use with the contents of the 4,000 USP lipase unit capsule.

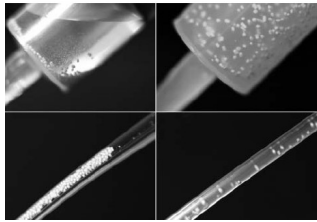
SOURCE: https://resources.cherusa.com/Pertzye/PERTZYE_PI.pdf

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Suspended Pancreatic Enzyme Microspheres

Behavior of microspheres in water (left) and thickened liquid (right)



Ferris S, et al. Nutr Clin Pract. 2011;26(3):349-51. Used with permission.

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Bolus Feeding: Right Dose= 500-4000 Units per g fat

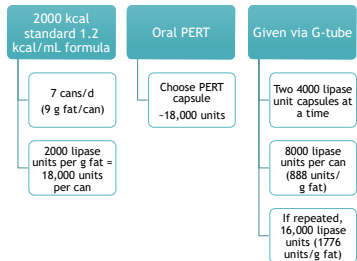


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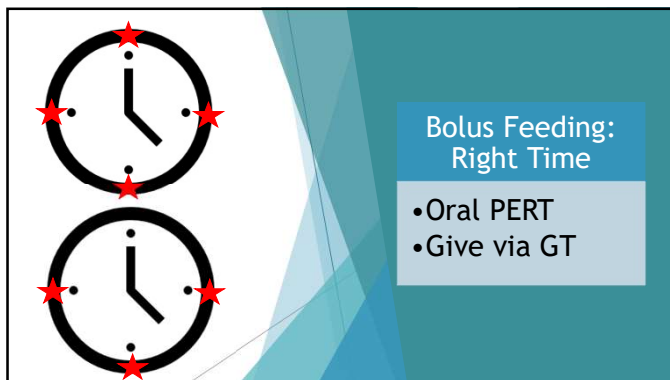
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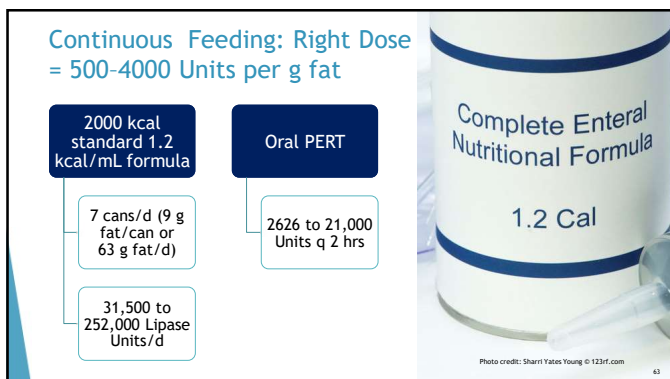
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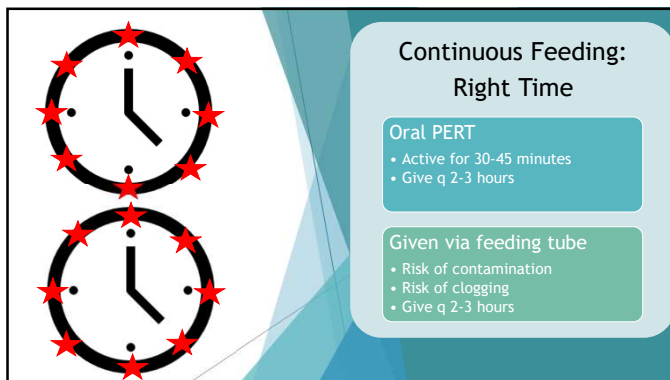


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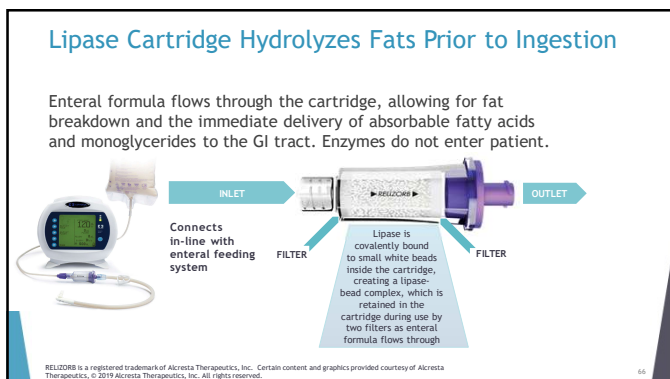
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Fat Hydrolysis with Lipase Cartridge

1 cartridge per 500 mL (2 per 1 L)

Minimum flow rate 10 mL/hr for 1 cartridge
(24 mL/hr for 2)

Fat hydrolysis varies by formula
(<https://www.relizorb.com/docs/pdfs/Compatible-Formulas-and-Pumps.pdf>)

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Continuous Feeding: Right Dose = 1 Cartridge per 500 mL

2000 kcal standard 1.2 kcal/mL formula

1666 mL/d

2 tandem cartridges q 14 hours

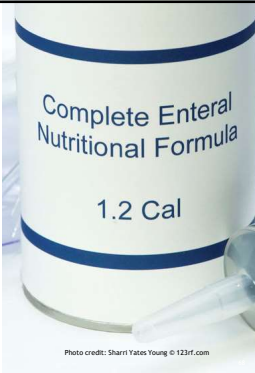


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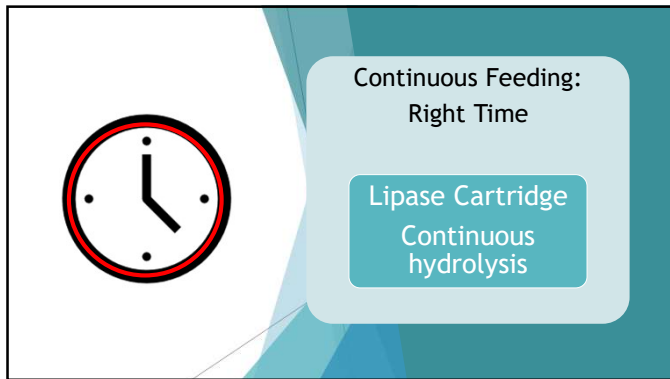
Continuous Feeding: Right Place



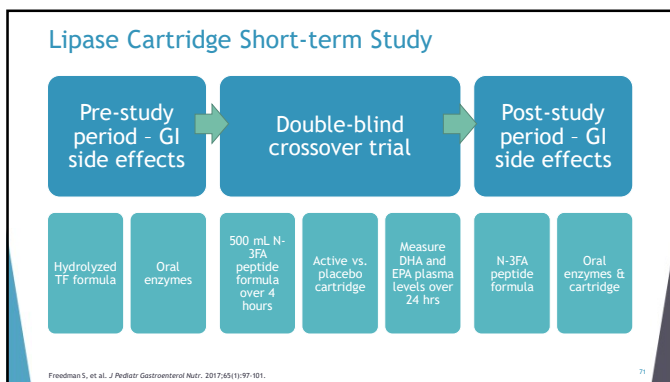
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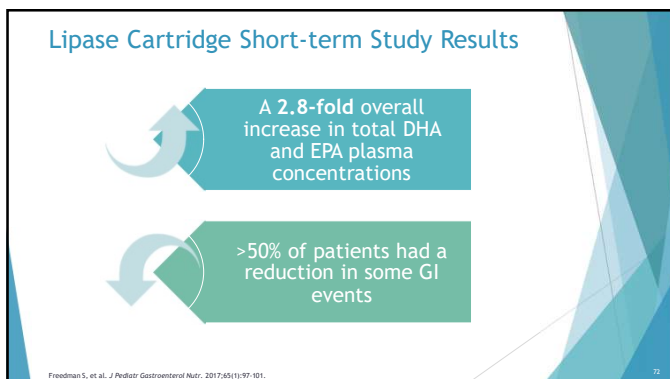
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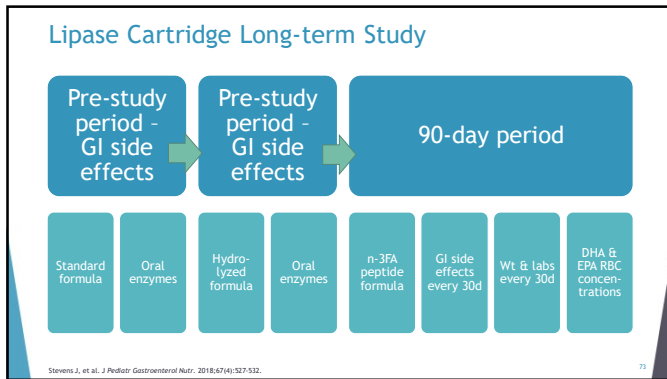


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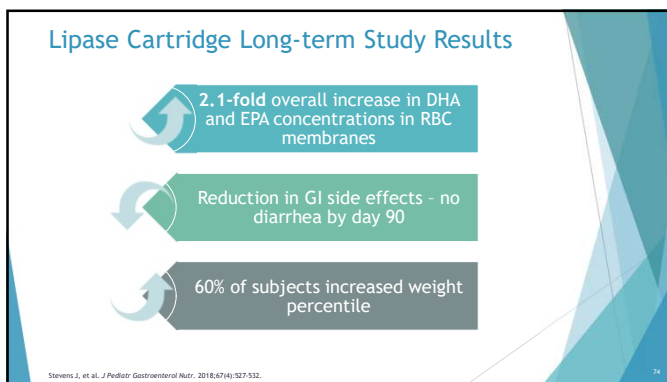


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Product	Advantages	Limitations
Oral pancreatic enzymes	<ul style="list-style-type: none"> Can be used for bolus feedings Does not require a pump Can be given orally or with EN Broad availability in hospital or outpatient pharmacies 	<ul style="list-style-type: none"> Only one product FDA approved for EN use but anecdotal reports of others Lacks research showing efficacy with EN despite historical use Counts toward total daily lipase units Crushing enzymes is labor intensive Using crushed enzymes increases the chance of clogging a feeding tube Could increase microbial contamination if closed feeding system is opened If given orally, must be given frequently since enzyme activity is time-limited Enzymes and EN may not mix effectively if not delivered together

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Product	Advantages	Limitations
Lipase cartridge	<ul style="list-style-type: none">• FDA approved for EN use• Research shows efficacy with EN• Maintains closed EN systems• Ease of use• Does not contribute to total daily lipase limit• Continuously hydrolyzes fat in the formula during EN infusion	<ul style="list-style-type: none">• Requires pump for EN infusion• Cannot use with oral diet• Cannot use formulas with insoluble fiber as they clog the cartridge• Availability dependent on individual hospital or outpatient pharmacy• Variable fat hydrolysis depending on formula selection


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Summary

- 1 Fat digestion is complex; fat malabsorption contributes to GI side effects and malnutrition
- 2 EPI is prevalent with pancreatitis and pancreatobiliary surgery and contributes to fat malabsorption
- 3 Nutrition therapy may be needed with pancreatic enzymes given at the right dose, place, time, and pH to be effective

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References and Resources from *Enteral Nutrition Challenges*:

Focus on Pancreatic Insufficiency Webinar with Jeanette Hasse, PhD, RD, LD, CNSC, FASPEN, FADA, CCTD 8/25/20

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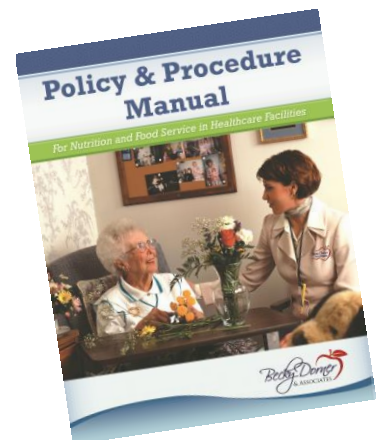
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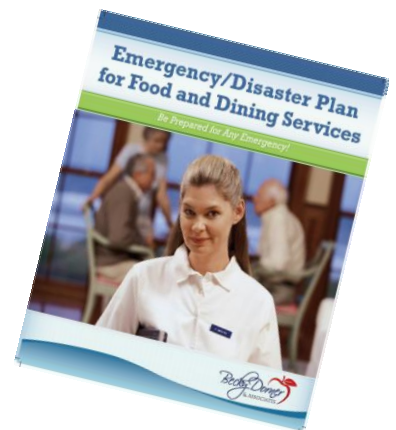
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