Diet and Pancreatic Enzyme Replacement Therapy

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Symptoms which affect nutritional status

Patient and carers struggle with the lack of dietary information and support. (Gooden and White, 2013)

- **Weight loss**
  - 80 – 90% patients present with weight loss at time of diagnosis
  - 40% exceed 10% unintentional weight loss
  - 40% of patients at time of surgery have cancer cachexia (Bachmann et al, 2008)

- Loss of appetite
- Abdominal pain
- Abdominal bloating
- Jaundice
- Maldigestion
- Vomiting
- Taste and smell changes
- Food aversions

Affects quality of life due to reduced functional status.
Causes of weight loss

• Metabolic change mediated by cytokines reduce appetite and increase energy expenditure

• GI Symptoms

• Endocrine insufficiency

• Exocrine insufficiency
Symptoms of fat maldigestion (Steatorrhea)

- 90% reduction in function before evidence of maldigestion
- Lipase is the most sensitive to a shortage.
- Occur before carbohydrate and Protein maldigestion.
- Absorption occurs in duodenum

Pale
Floating
Difficult to flush
Greasy
Sticky
Large volume stool
Diarrhoea
Foul smelling
Wind and bloating

- Normal stool has <7g fat/day
- Severe fat maldigestion > 15g fat/day
- Visible oil in stool indicates 30 – 40g fat/day
- Up to 55g of fat in stool per day without symptoms
Pancreatic enzyme response to a meal

Lipase, amylase, trypsin and chymotrypsin

(Taken from Keller and Layer, 2005)
## Lipase secretion rates

(Adapted from Keller and Layer 2005)

<table>
<thead>
<tr>
<th></th>
<th>Interdigestive</th>
<th>Maximal</th>
<th>2 hours postprandial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U/min</strong></td>
<td>1000</td>
<td>3000 – 6000</td>
<td>2000 – 4000</td>
</tr>
<tr>
<td><strong>U/hour</strong></td>
<td>60 000</td>
<td>180 000 – 360 000</td>
<td>120 000 – 240 000</td>
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</tbody>
</table>
## Preparations

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Product name</th>
<th>Lipase /U</th>
<th>Enteric coated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbott (Mylan)</td>
<td>Creon 10 000</td>
<td>10 000</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Creon 25 000</td>
<td>25 000</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Creon 40 000</td>
<td>40 000</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Creon micro</td>
<td>5000/g</td>
<td>gastro resistant granules</td>
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<tr>
<td>Merck</td>
<td>Nutrizym 22</td>
<td>22 000</td>
<td>Yes - minitablets</td>
</tr>
<tr>
<td>Janssen - Cilag</td>
<td>Pancrease HL</td>
<td>25 000</td>
<td>Yes - minitablets</td>
</tr>
<tr>
<td>Essential</td>
<td>Pancrex granules</td>
<td>5000 /g</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Pancrex V capsules</td>
<td>8000</td>
<td>No</td>
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<td></td>
<td>Pancrex V 125 capsules</td>
<td>2950</td>
<td>No</td>
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<tr>
<td></td>
<td>Pancrex V Forte tablets</td>
<td>5600</td>
<td>Yes</td>
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<tr>
<td></td>
<td>Pancrex V Powder</td>
<td>25 000 /g</td>
<td>No</td>
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<tr>
<td></td>
<td>Pancrex V tablet</td>
<td>1900</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Pancreatic enzyme replacement therapy (PERT)

- Source: pigs pancreas (allergy and religion)
- Gelatine capsule containing enteric coated granules
- Temperature and pH sensitive
- No clear maximum treatment guidelines
  - 400,000 units of lipase per day
  - 10,000 units per kg/day
  - 5000 – 4000 IU lipase per g fat
- Lowest effective dose
Right time, right place....... Right ph

- **Goal**........ enough active enzymes in the duodenum with food
- 80 000 with a meal and 40 000 with a snack/nutritious fluids/supplements
- Adjust to fat content of meal
- Take before, during and at the end of a meal (Dominguez-Munoz, 2013)
- Small amount of cold liquid
- Take capsules whole (do not sprinkle on food, crush or chew)
- If need to open – mix microspheres with acid fruit puree
- Omit enzyme with small portions of fat free foods/fluids
- Varies from patient to patient:
  - Functional pancreatic tissue
  - Differing amounts of fat in the diet
- **Side effects** – Flatulence, abdominal bloating, nausea, mouth ulcers, anal irritation
- Constipation ?due to improved digestion.
- Fibrosing colonopathy (50 000 U lipase/kg/body weight)
Unresolved symptoms

- Check compliance and understanding
- “sounds like a lot”
- ? Is dose sufficient
- Add PPI (lipase active ph 5.5)
- Fat content of diet and MCT
- Anti diarrheal agent
- Difficult to normalize fat digestion
- Consider other causes: small bowel bacterial overgrowth, bile salt malabsorption, coeliac disease (Bustillo et al 2009)
Nutritional support

Nutritional assessment and advice

• No fat restriction
• Little and often
• High protein and high kcal
• Food fortification
• Nutritious fluids
• Oral nutritional supplements (Colomer et al 2007 & Bauer et al 2005)
Improving nutritional status

• Manage symptoms
• Treat pancreatic exocrine and endocrine insufficiency
• Provide nutritional support
• Correct micronutrient deficiency (Vitamin A, E, D, K, selenium, copper, zinc, magnesium, Iron, folic acid)
• Treat pain – effect on mobility
• Exercise – lean body mass (Fearon, 2014)
References

• Gooden and White (2013) Pancreatic cancer and supportive care — pancreatic exocrine insufficiency impacts on QOL. Support Care Cancer 21 1835-1841
• Hardt et al (2008) Is pancreatic diabetes (type 3c diabetes) under diagnosed and misdiagnosed? Diabetes Care (31) 2 5165-5169