NMDC221 Session 3: Gastrointestinal & Alimentary Disease Part III
Session 3

Recommended Reading
P 482; 546-48; 576-77; 580-2 (prescribed text).
Topic Overview

Gastrointestinal & Alimentary Disease: Part III
Nutritional management & consideration of drug-nutrient interactions
  o Gut dysbiosis
  o Irritable bowel syndrome
  o PROM’s
  o Fructose & lactose Intolerance
Gut Dysbiosis
Gut Dysbiosis

- Characterized by an excessive number of bacteria in the intestines and subsequent nutrient malabsorption.
- Consideration in Autism Spectrum disorder (ASD) (Carding, Verbeke, Vipond et al 2015)

Predisposing factors include:
- Hypochlorhydria or achlorhydria, malnutrition, Crohn’s disease, Coeliac disease, Intestinal adhesions, Delayed small intestinal motility, Liver cirrhosis, Farnesoid X receptor
- Diabetes mellitus
- Pancreatitis
- HIV
- Aging (Rana & Bhardwaj, 2008, p 1030)
- Antibiotics, stress, radiation, altered GIT peristalsis (Hawrelak J, Myers S 2004)
Gut Dysbiosis

Nutritional Considerations
Protein
  o Consumption of a high-protein diet can increase the production of potentially harmful bacteria metabolites and high sulphide amounts in the colon
Sulphates
Highly refined CHO’s
  o Studies have illustrated diets high in simple sugars slow bowel transit time and increase fermentative bacterial activity and faecal concentrations of total and secondary bile acids in the colon (Hawlerak, Myers 2004) => Colonic fermentation.
Hypochlorhydria

- Hypochlorhydria comes about in advanced age as a result of a high prevalence of atrophic gastritis, which affects as many as 10–30% of elderly persons over the age of 60 years.
- The decreased gastric acid secretion in persons with atrophic gastritis results in increased survivability of swallowed bacteria in the stomach and small intestine, which in younger, normal-chlorydic persons would be killed by stomach acid.

(Russell, 2000)
Gut Dysbiosis

Nutritional Considerations:

1. Patients GIT Microflora

Prebiotics
- Prebiotics may have a role in managing dysbiosis, as their use stimulates the growth of beneficial bacteria.

Probiotics
- Probiotics have several useful functions in dysbiosis:
  - Interfere with pathogen adhesion
  - Neutralize bacterial toxins
  - Enhance mucosal barrier function
  - Reduce migration across the gut barrier

(Quigley & Quera, 2006)
Probiotic Studies
Stress-associated changes to GIT microflora

<table>
<thead>
<tr>
<th></th>
<th>$L.\ acidophilus$</th>
<th>$L.\ Casei$</th>
<th>$L.\ plantarum$</th>
</tr>
</thead>
<tbody>
<tr>
<td>During preparation</td>
<td>4.0</td>
<td>3.5</td>
<td>2.6</td>
</tr>
<tr>
<td>After short flight</td>
<td>1.7</td>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>After long flight</td>
<td>2.9</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Changes in the Lactobacillus fecal flora in Soviet Cosmonauts (log/mL).

(Hawrelak & Myers, 2004)
Gut Dysbiosis

2. Adequate Gastrointestinal Function

Glucosamine

- Glyco-proteins are important in protecting the bowel mucosa from damage, and the breakdown of glucosamine is an important consequence of inflammation at mucosal surfaces.

- Abnormalities in colonic glycoprotein synthesis have been implicated in the pathogenesis of ulcerative colitis & Crohn's disease.

  (Braun & Cohen, 2010, p. 537)
Gut Dysbiosis

Garlic
- Meta-analyses of the epidemiological literature suggests that a high intake of garlic (28g/day) acts as an antibacterial nutrient (Shils et al. 2006)

Peppermint
- Anti-microbial against a raft of different micro-organisms.
- Culinary doses can be enough to inhibit the growth of harmful bacteria while maintaining the level of *Bifidobacterium bifidum*, *Bifidobacterium longum*, *Lactobacillus acidophilus*, and *Lactobacillus plantarum* (Karmakar et al. 2012, p. 3)
Nutritional considerations – Dietary habits
Reduce high animal protein and sulphate rich foods from dried fruit, processed foods, white bread products etc.

Balanced Fat & Animal Protein Diet
- High fat & animal protein diets can lead to reduced levels of *Bifidobacter*.
- There is a subsequent increase in bacterial enzymes, purification and subsequent reabsorption of oestrogen, raised ammonia levels and reduced levels of short-chain fatty acids.
- Requires an increase of soluble & insoluble fibres, reduction of SFA’s and animal protein while maintaining adequate protein requirements

(Osiecki, 2006, p. 635 & 638)
Gut Dysbiosis

Nutritional considerations

- High carbohydrate diets can lead to an overgrowth of harmful bacteria in the stomach and small intestine.
- This overgrowth is more likely with the presence of hypochlorhydria, functional disorders, immune deficiency or malnutrition. Pancreatic insufficiency can result.
- Avoiding simple sugars and cereal grains until ‘healthy’ colonization is required.

(Osiecki, 2006, p. 635 & 638)
Nutritional considerations

Low Sugar Diet

- High sugar diets encourage the growth of *Candida albicans*. Probiotics (*L. acidophilus* & *Bifidobacterium*) and prebiotics aid in the re-establishment of appropriate bowel flora. Requires a low sugar diet regime of 6-8 weeks.

Chronic Inflammation

- Ongoing inflammation of the GIT mucosa leads to reduced digestion and absorption which leads to nutrient deficiencies

(Osiecki, 2006, p. 635-6)
Gut Dysbiosis

Nervous System
- B group vitamins
- Mg
- High stress has a negative effect on the numbers of *L. bacillus* and *Bifidobacterium* present within the GIT tract.
Choosing the Right Strain for Specific Therapeutic Applications

Dr Jason Hawrelak PhD, makes prescribing probiotics in an evidence-based manner simple. Probiotic research on nearly 50 health conditions is highlighted, from abdominal pain to viral gastroenteritis, with information gleaned from 138 clinical trials. Available Endeavour Library pages via nPod.

# Gut Dysbiosis

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Dosage - Adult</th>
<th>Therapeutic Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. Acidophilus</td>
<td>10-50 billion org/day</td>
<td>Significantly decreases the levels of toxic amine serum levels in gut dysbiosis of SI</td>
</tr>
<tr>
<td>Bifidobacter</td>
<td>10-50 billion org/day</td>
<td>Found to reduce the level of <em>C. albicans</em> present in the LI</td>
</tr>
</tbody>
</table>

(Osiecki, 2006, p. 636-7; Braun & Cohen, 2010)
## Gut Dysbiosis

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Dosage</th>
<th>Therapeutic Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Betaine HCl</td>
<td>500-650mg per main meal</td>
<td>Aids in reducing the pH of the GIT to regulate the overgrowth environment of detrimental bacteria.</td>
</tr>
<tr>
<td>Glucosamine</td>
<td>600-3,000mg</td>
<td>Protect bowel mucosa and anti-inflammatory</td>
</tr>
<tr>
<td>Garlic</td>
<td>400-1000mg dried or 2-5g fresh</td>
<td>Antibacterial, antifungal</td>
</tr>
<tr>
<td>B group Vitamins</td>
<td>10-200mg (depending on which B vitamin)</td>
<td>Pentinosidine formation by <em>C. albicans</em> blocks lysine binding sites leading to a functional deficiency of these nutrients</td>
</tr>
</tbody>
</table>

\[a\]
Irritable Bowel Syndrome
IBS - signs and symptoms

- Abdominal pain or cramping
- A bloated feeling
- Flatulence
- Diarrhoea or constipation — alternating bouts of constipation and diarrhoea
- Mucus in the stool

Features

Very common GIT condition of ‘unknown’ cause.
Irritable Bowel Syndrome

Diagnostic Criteria (Rome II)
- The presence of abdominal pain or discomfort for at least 3 days per month in the last 3 months along with ≥2 of the following:
  - i. Improvement with defecation
  - ii. Onset (of each episode of discomfort) associated with a change in frequency of defecation
  - iii. Change in consistency of stool

(Bharucha, 2007; Kumar & Clark, 2009, p. 338)
Irritable Bowel Syndrome

Nutritional Considerations

○ Elimination Diet – RPH allergy unit

See :-


○ Dairy, coffee and wheat have been demonstrated by several studies as potential food intolerances in IBS. Other suspect foods include: egg, corn, potato, onion, citrus and yeast

(Burden, 2001, p. 231; Spiller, 2005, p. 23)
Irritable Bowel Syndrome

Nutritional Considerations

- There is evidence to suggest that some IBS patients will have a worsening of symptoms when consuming fructose or sorbitol
  
  (Spiller, 2005, p. 23; Shepherd et al, 2008, p. 765)

- Gluten consumption is commonly linked to constipation type IBS

  (Lenighan et al. 2012, p. 115)
Irritable Bowel Syndrome

Nutritional Considerations

Probiotics

- *Lactobacillus rhamnosus* GG, LC705, *Bifidobacterium breve* Bb99, *Propionobacterium freudenreichii* inoculation demonstrated a 42% reduction in overall symptoms scores for patients with IBS
  
  (Kajander et al, 2005, p. 387)

- Fan et al. (2006) demonstrated increased improvements with the supplementation of *Bifidobaacterium* and *Lactobaccillus*. Symptom reduction changed from 57% in the first two weeks to 73% at 6 weeks (p.987)
Irritable Bowel Syndrome

Nutritional Considerations

Psyllium
- There has been some mild improvement shown for the use of psyllium in IBS patients

(Ford et al. 2008, p. 2313)

Turmeric
- Turmeric tablets (72-144mg/day) significantly improved abdominal pain and discomfort by up to 25% and improvement of overall symptoms by up to 36%.
- This was possibly by reducing COX-2 and inducible nitric oxide synthase

(Bundy et al. 2004, p. 1015)
## IBS – Main nutrients to consider

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L. Plantarum &amp; L. fermentum</strong></td>
<td>10-50 billion org/day</td>
<td>Reduction in pain, constipation, alternating bowel habits, flatulence and bloating</td>
</tr>
<tr>
<td><strong>Vitamin C</strong></td>
<td>500mg divided dosages up to 5,000mg</td>
<td>Adreno-corticoid function; assist in regulating stress response.</td>
</tr>
<tr>
<td><strong>Peppermint oil</strong></td>
<td>300-600mg/day</td>
<td>Significant reduction in severity of abdominal pain and IBS symptoms</td>
</tr>
<tr>
<td><strong>Psyllium</strong></td>
<td>1 TLB day</td>
<td>Bulking agent</td>
</tr>
<tr>
<td><strong>B Complex</strong></td>
<td>10-200mg major B</td>
<td>Adrenal support, HCL production</td>
</tr>
<tr>
<td><strong>Magnesium</strong></td>
<td>300-800mg</td>
<td>Nervous system support</td>
</tr>
<tr>
<td><strong>Tryptophan</strong></td>
<td>300-4,000mg</td>
<td>Depletion has been found to exacerbate sensations of pain and urge in IBS patients</td>
</tr>
</tbody>
</table>

(Kilkens et al. 2004, p. 1794)
Irritable Bowel Syndrome

Drug Therapy
Due to the multi-factorial characteristics of IBS the drug treatment regime is not well defined. Orthodox treatment regimes focus around;
- Diet modification to assist diarrhoea and constipation & removal of dietary triggers
- Smooth muscle relaxants / carminatives
- Anti-nausea agents
- Anti-diarrhoeal agents & laxatives
- Anti-depressants
- Emotional therapy (Kumar & Clark, 2014)
# Irritable Bowel Syndrome

<table>
<thead>
<tr>
<th>Drug</th>
<th>Drug Action</th>
<th>Side Effects</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anti-spasmodics:</strong> Tegaserod</td>
<td>Serotonin agonist that increases peristaltic action to aid in constipation, bloating and discomfort.</td>
<td>In 10% of cases diarrhoea can present</td>
<td>None Listed</td>
</tr>
<tr>
<td><strong>Anti-spasmodics:</strong> Mebeverine</td>
<td>Local anesthetic &amp; anti-muscarinic effect on the smooth muscle of the GIT</td>
<td>GIT upsets, dizziness, insomnia, anorexia and headache</td>
<td>None Listed</td>
</tr>
</tbody>
</table>

(Bullock et al. 2007, Kumar & Clark, 2009)
**Irritable Bowel Syndrome**

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<tr>
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<th>Drug Side Effects</th>
<th>Interactions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opioid Antidiarrhoeal:</strong></td>
<td></td>
<td></td>
<td>None listed</td>
</tr>
<tr>
<td>Loperamide</td>
<td>Stimulate opioid receptors on wall of GIT to reduce peristalsis = greater time for reabsorption of water &amp; electrolytes</td>
<td>Well tolerated but can only be used for short term. Potential to exacerbate constipation</td>
<td></td>
</tr>
<tr>
<td><strong>Dopamine Antagonists:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domperidone, Droperidol, Haloperidol, Metoclopramide</td>
<td>Anti-emetic: D2 receptor antagonist and have an affinity for serotonin receptors in the pharynx and upper gut allowing increased gastric emptying</td>
<td>Can increase prolactin levels (dopamine antagonism) &amp; anti-muscarinic effects (dry mouth, constipation, blurred vision)</td>
<td>L-Phenylalanine: concurrent use can create involuntary movements of mouth &amp; face</td>
</tr>
</tbody>
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(Harkness & Bratman, 2003, p. 144; Bryant & Knight, 2011, p. 597, 610)
## Irritable Bowel Syndrome

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</thead>
<tbody>
<tr>
<td><strong>Tricyclic Antidepressant (TCA): Clomipramine</strong></td>
<td>Anti-depressant with a specific affinity for ‘diarrhoea-predominant IBS’</td>
<td>Anticholinergic effects, sedating, orthostatic hypotension &amp; weight gain</td>
<td>5-HTP, SAMe, Tyrosine: can potentiate the chance of serotonin syndrome</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Zinc: improvement of drug efficacy with concurrent use</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Coenzyme Q10 &amp; Vitamin B2: drugs deplete</td>
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## Irritable Bowel Syndrome

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<th>Drug Action</th>
<th>Side Effects</th>
<th>Interactions</th>
</tr>
</thead>
</table>
| Selective Serotonin Re-uptake Inhibitor (SSRI) : Paroxetine | Anti-depressant with a specific affinity for ‘constipation-predominant IBS’ | Insomnia / agitation, gastro-intestinal distress & mild weight gain | 5-HTP, SAMe, Tyrosine: can potentiate the chance of serotonin syndrome  
Zinc: improvement of drug efficacy with concurrent use  
Coenzyme Q10 & Vitamin B2: drugs deplete |

Irritable Bowel Syndrome

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<th>Interactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimulant Laxatives: Bisacodyl, sodium picosulfate, senna</td>
<td>Block water absorption which in turn generates a concentration gradient of electrolytes. This has the effect of creating a greater faecal mass to stimulate peristalsis.</td>
<td>Cramping and dehydration</td>
<td>Can cause dehydration and losses of zinc, potassium and selenium</td>
</tr>
</tbody>
</table>

(Mahan & Escott-Stump, 2008, p. 694; Bryant & Knight, 2011, p 607)
I would remove the next 6 slides and use the case study as a final opportunity to practice concept map/schematic skills ready for assessment
Case Study
PATIENT REPORTED OUTCOME MEASURES (PROMS)
Case Study

A 67-year old male patient consults you for the following symptoms. He routinely suffers bloating and burping straight after eating which lasts for at least 45min to 1 hour at a time. He experiences constant heart burn symptoms, generally in the evening which can wake him at night time. He describes his stomach as ‘sensitive’ and he hardly eats anything rich or fatty as it causes him to get gas and urgent bowel movements.

Upon further questioning you discover he was diagnosed with a peptic ulcer in 1997, but was treated successfully with Nexium HP 7® (H. pylori triple therapy) – was cleared up after the medication. He is currently taking ½ Aspirin before breakfast which was recommended by his Doctor as he has slightly elevated blood pressure and a family history of cardiovascular problems. He has self prescribed fish oil 1000mg capsules one per day.
Case Study

His family history reveals his mother died of heart related issues at 55 years and his father of a stroke at 69 years.

When investigating his past history, he mentions he was an allergic child with eczema which required wet dressings and corticosteroid treatment.

His stress levels are relatively high, his wife dying just 7 months earlier of breast cancer. His sleep is poor, often waking at night time to urinate 3-4 times and his mind is often active and finds it hard to get back to sleep.
Case Study

Physical Examination Results

BP 125/85

- **Nails**: vertical ridging, brittle & yellow, moons on all fingers. Good capillary return
- **Skin**: slight yellow tint, ruddy nose & ears (reddish tint).
- **Appearance**: slim build, in the last three years has been losing weight (~5-6kg).
- **Height**: 187cm  **Weight**: 74kg  **Waist**: **Hip** 0.85 (Male>0.95)
- **Tongue**: thick white coat with strawberry spots on the tongue
- **Zinc tally**: no initial taste then sweet after 5 seconds
## Case Study

<table>
<thead>
<tr>
<th>Time</th>
<th>Daily Dietary Intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.30 am</td>
<td>Wholemeal toast (2 slices) with butter (1 tsp) scrambled eggs (1 egg) &amp; tomato sauce (1 Tsp) n 1 cup coffee (white- Hilo &amp; 1 sugar)</td>
</tr>
<tr>
<td>10.30 am</td>
<td>1 cup tea (white - Hilo &amp; 1 sugar) Ryvita (1) with vegemite (1 tsp) &amp; margarine (1 tsp)</td>
</tr>
<tr>
<td>12.30 pm</td>
<td>Left overs – last night’s meal was chow mien chicken Tinned peaches (1/2 cup) &amp; Nestle’ low fat apricot yoghurt (1/2 cup)</td>
</tr>
<tr>
<td>3pm</td>
<td>Red apple</td>
</tr>
<tr>
<td>5.30 pm</td>
<td>Beef steak (120gms) with boiled potatoes (2), sweet corn (1/2 cup) &amp; green peas (1/2 cup) – salt added in cooking Low fat cheese (30gms)&amp; crackers (3). Glass of red wine (250ml).</td>
</tr>
<tr>
<td>9pm</td>
<td>Handful of roasted peanuts (salted – ½ cup). 1 cup Milo (white - Hilo)</td>
</tr>
</tbody>
</table>

**Water – 1 litre per day**
Case Tutorial Activity

- Formulate a schematic representation of this case. Be sure to consider all of the contributing and sustaining factors and how they may be influencing his presentation.

- Consider what may be suitable SMART treatment aims for this client and what plan you would adopt to assist this patient.
What are Outcome Measures?

- Clinical Outcome Measures – e.g. blood pressure, blood tests, range of motion, etc.
- Patient Reported Measures (PRMs)
  - PROMs: Patient reported outcome measures
  - PREMs: Patient reported experience measures

PROMS = OUTCOMES THAT MATTER TO PATIENTS
Why use Outcome Measures?

Model for Improvement

- What are we trying to accomplish?
- How will we know that a change is an improvement?
- What change can we make that will result in improvement?

Act | Plan
--- | ---
Study | Do
Outcome Measures Used at Endeavour

- LMS Clinic Hub – ‘Outcome Measures’ tab

Clinic Hub S2 16

Outcome Measures

General Tools
- GAD-7
- PHQ-9
- GRSRS Gastrointestinal Scale
- Menopausal Rating Scale
- MD Anderson Symptom Inventory (MDASI)
- Insomnia Severity Index

Tools for Acupuncture and Myotherapy
Gastrointestinal System Rating Scale GSRS - Activity

- Initially read through the GSRS and discuss obstacles/barriers to using this specific outcome measurement tool, and brainstorm ways to overcome these.
- Fill in the GSRS questionnaire (using this hypothetical case).
- The following slide tells you how to interpret the GSRS.
GSRS gastrointestinal scale is a GIT scale which is a valid test for gastro-oesophageal reflux disease and general digestive complaints. This is not a specific test for IBS diagnosis or monitoring but does monitor general digestive function. It is a very useful patient-related scale to evaluate the outcomes of treatment for digestive complaints. Takes around 3-5 minutes to complete.

**Scoring:** This questionnaire is better conducted with the practitioner leading the questions and the client answering them. Each question the answer is circled. At the end of the questionnaire, the score is added together. The score ranges from 0 to 45. The total score should be written and circled at the bottom of the questionnaire.

<table>
<thead>
<tr>
<th>Total of Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9</td>
<td>None to minimal gastrointestinal issues</td>
</tr>
<tr>
<td>10-19</td>
<td>Minimal gastrointestinal issues</td>
</tr>
<tr>
<td>20-29</td>
<td>Moderate gastrointestinal issues</td>
</tr>
<tr>
<td>30-39</td>
<td>Moderate to severe gastrointestinal issues</td>
</tr>
<tr>
<td>40-45</td>
<td>Severe gastrointestinal issues</td>
</tr>
</tbody>
</table>
THERAPEUTIC DIETS
Lactose and Fructose Intolerance
Lactose Intolerance

- Up to 70% of the world population has lactase non-persistence (no longer produce the enzyme that breaks down lactose after weaning or early childhood).

- This does not necessarily result in automatic intolerance as many nutritional and genetic factors influence tolerance.

- Secondary lactose intolerance can present post small intestinal inflammation or infection.

  (Lomer, Parkes & Sanderson, 2008, p.95)
Lactose Intolerance

- Lactose occurs naturally in the diet only as mammalian milk and dairy products, *e.g. cow, goat, sheep (also known as ewe) and human milk.*
  
  (Lomer, Parkes & Sanderson, 2008, pp.95)

- Poorly broken down lactose is fermented by bacteria in the colon. This produces methane leading to bloating, flatulence & cramping.

- Higher levels of sugar (lactose) present in the bowel creates an osmotic gradient leading to loose & watery stools.

  (Mahan & Escott-Stump, 2009)
Therapeutic Considerations

Calcium & Vitamin D

- Lactose increases calcium absorption, which also requires vitamin D.  
  (Mahan & Escott-Stump, 2009)

Lactose Diets

- Incremental inclusion of lactose can be tolerated in those that do not present with severe reactions.
- Some lactose intolerant individuals can tolerate yoghurt, buttermilk and hard cheeses.
- Supplementation with lactase enzyme at the time of lactose consumption can minimize symptoms.  
  (Moore, 2009)
Fructose Intolerance

- Hereditary fructose intolerance means that fructose can’t be broken down to glucose.

- Infants do not present with symptoms until fruit is added to the diet when weaning.  
  (Mahan & Escott-Stump, 2009)

- Continued ingestion leads to hepatic and renal injury and growth retardation in infants.  
  (Ali, Rellos & Cox, 1998)
Fructose Intolerance

- Ingestion of fructose (fruits, some vegetables and honey) causes severe abdominal symptoms (same as lactose intolerant symptoms)

- Unabsorbed fructose creates an osmotic gradient that attracts water into the lumen. This leads to loose, watery stools. Bacteria ferment the sugar leading to gas, bloating and cramping.

  (Tsampalieros, Beauchamp, Boland & Mack, 2008)
Lactose & Fructose Intolerance

- As the symptom picture for both of these intolerances is very similar, we can surmise that the effect on nutrient absorption would be similar also.

- Due to altered osmotic gradients caused by poorly broken down sugar, water & electrolytes would be lost in loose stools.

  (Katz, 2008)
Dietary & Nutritional Prescription

Lactose Free Diet

- **Specifically avoid:**
  - Cows products (milk, cheese, yoghurt, butter)
  - Goats milks products
  - Sheep milk products

- **As a substitute:**
  - Nut milks (almond milk)
  - Nut or seed butters or spreads (olive oil spread)
  - Soy products
  - Grain milks (rice, oat or quinoa milk)
FODMAP

- **FODMAP**: Fermentable Oligosaccharides, Disaccharides, Monosaccharides and Polyols.
- “FODMAPs are osmotically active, rapidly fermentable short-chain carbohydrates that are poorly absorbed in the gut” (Barrett and Gibson, 2007).

Gastroenterological Society of Australia (GESA)

| FODMAPs are found in many foods we commonly eat and is an acronym for: |
|-----------------|---------------------------------------------------------------------------------|
| **Fermentable** |
| **Oligosaccharides** | - Fructans and galacto-oligosaccharides (GOS) |
| **Disaccharides** | - Lactose |
| **Monosaccharides** | - Fructose in excess of glucose |
| And |
| **Polyols** | - Sorbitol, Mannitol, Maltitol, Xylitol and Isomalt |
FODMAPs can be classified into two groups:

- Those FODMAPs that are partly absorbed (fructose, lactose, polyols)
- Those FODMAPs that are not absorbed in anyone (fructans and GOS)

<table>
<thead>
<tr>
<th>EXCESS FRUCTOSE</th>
<th>FRUCTANS</th>
<th>LACTOSE</th>
<th>GOS</th>
<th>POLYOLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td>Custard apples</td>
<td>Custard</td>
<td>Chickpeas</td>
<td>Apples</td>
</tr>
<tr>
<td>Boysenberry</td>
<td>Nectarines</td>
<td>Condensed milk</td>
<td>Legume beans (e.g. baked beans,</td>
<td>Apricots</td>
</tr>
<tr>
<td>Figs</td>
<td>White peaches</td>
<td>Dairy desserts</td>
<td>kidney beans, bolognese beans)</td>
<td>Blackberries</td>
</tr>
<tr>
<td>Mango</td>
<td>Persimmon</td>
<td>Evaporated milk</td>
<td>Lentils</td>
<td>Longon</td>
</tr>
<tr>
<td>Pear</td>
<td>Tamarillo</td>
<td>Ice cream</td>
<td>Pistachio nuts</td>
<td>Lychee</td>
</tr>
<tr>
<td>Tamarillo</td>
<td>Watermelon</td>
<td>Milk</td>
<td></td>
<td>Nashi pears</td>
</tr>
<tr>
<td>Watermelon</td>
<td>Artichoke</td>
<td>Milk powder</td>
<td></td>
<td>Nectarines</td>
</tr>
<tr>
<td>Asparagus</td>
<td>Chicory</td>
<td>Unripened cheeses (e.g. ricotta, cottage,</td>
<td></td>
<td>Peaches</td>
</tr>
<tr>
<td>Artichokes</td>
<td>Garlic (and powder)</td>
<td>cream, mascarpone)</td>
<td></td>
<td>Pears</td>
</tr>
<tr>
<td>Sugar snap peas</td>
<td>Leek</td>
<td></td>
<td></td>
<td>Plums</td>
</tr>
<tr>
<td>Fruit juices</td>
<td>Onion (and powder)</td>
<td></td>
<td></td>
<td>Cauliflower</td>
</tr>
<tr>
<td>Dried fruit</td>
<td>Spring onion (white part)</td>
<td></td>
<td></td>
<td>Mushrooms</td>
</tr>
<tr>
<td>High-fructose corn syrup</td>
<td>Barley</td>
<td>Yoghurt</td>
<td></td>
<td>Snow peas</td>
</tr>
<tr>
<td>Honey</td>
<td>Rye</td>
<td></td>
<td></td>
<td>Isomalts (953)</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td></td>
<td></td>
<td>Maltitol (965)</td>
</tr>
</tbody>
</table>

GESA, 2013
### Dietary & Nutritional Prescription

#### Low Fructose/ Fructose Free Diet

<table>
<thead>
<tr>
<th>Food type</th>
<th>Free fructose</th>
<th>Lactose</th>
<th>Fructans</th>
<th>Galacto-oligosaccharides</th>
<th>Polyols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits</td>
<td>Apple, cherry, mango, pear, watermelon</td>
<td>Peach, persimmon, watermelon</td>
<td></td>
<td>Apple, apricot, pear, avocado, blackberries, cherry, nectarine, plum, prune</td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td>Asparagus, artichokes, sugar snap peas</td>
<td>Artichokes, beetroot, Brussels sprout, chicory, fennel, garlic, leek, onion, peas</td>
<td></td>
<td>Cauliflower, Mushroom, Snow peas</td>
<td></td>
</tr>
<tr>
<td>Grains and cereals</td>
<td></td>
<td>Wheat, rye, barley</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuts and seeds</td>
<td></td>
<td>Pistachios</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk and milk products</td>
<td>Milk, yoghurt, ice-cream, custard, soft cheeses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legumes</td>
<td></td>
<td>Legumes, lentils, chickpeas</td>
<td>Legumes, chickpeas, lentils</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Honey, high-fructose corn syrup</td>
<td>Chicory drinks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food additives</td>
<td>Inulin, FOS</td>
<td>Sorbitol, mannitol, maltitol, xylitol, isomalt</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FODMAPs, fermentable oligo-, di-, and mono-saccharides and polyols; FOS, fructo-oligosaccharides.

(Gibson, 2012)
Taking a client through a low-FODMAPS diet

(Gibson, 2012)
Dietary & Nutritional Prescription

Low Fructose/ Fructose Free Diet Considerations

- Low FODMAPs diets will be by nature, low in FOS → low production of butyrate in the bowel.

- Not good for long term implementation as the risk of colon cancer may increase.
Dietary & Nutritional Prescription

Food elimination & Challenge Tests

- As with lactose intolerance, fructose should be completely removed from the diet for 2-3 weeks.
- Fructose is then re-introduced & the symptoms noted.
- Client is required to record foods and symptoms within this cycle

(Payne & Barker, 2010)
References


References


References


References


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