Fiber, Pre- & Probiotics: 
Assisting in the Challenge of Bowel Management in the Elderly

Course Objectives:

- Constipation
  - Definition
  - Causes
- Treatment Options for Constipation
  - Laxatives
  - Lifestyle changes
  - Fiber
  - Prebiotics
  - Probiotics
- Antibiotic Associated Diarrhea — C. diff
- Treatment Options for C. diff

Constipation

- The most widespread LTC resident issue
- 30-80% of LTC residents are constipated
- ~75% are on a bowel management protocol
- ~59-78% use laxatives
- The average cost of treating constipation (labor & supply) in a nursing home is $2,253 per resident per yr

Rome III Criteria For Chronic* Constipation

- *Criteria >3 months w/ symptom onset >6 months prior to dx
  1. Include 2 or more of the following:
     - Straining
     - Lump or Hard Stools
     - Sensation of Incomplete Evacuation
     - Sensation of Anorectal Obstruction or Blockage
     - Manual Maneuvers to Facilitate Defecations
     - <3 Defecations Per Week
  2. Loose stools are rarely present without use of laxatives
  3. Insufficient criteria for IBS

Causes of Primary Constipation

Normal-transit
  - Difficulty with evacuation or presence of hard stools

Slow colonic transit
  - Associated with decreased motility

Anorectal dysfunction
  - Inefficient coordination of the pelvic musculature in the evacuation mechanism

Causes of Secondary Constipation

Dietary Factors

Physical Inactivity

Endocrine and Metabolic Diseases

Myopathies and Neurologic Diseases

Structural Abnormalities

Physiological Conditions

Medications
Risk Factors for Elderly

- Low fiber intake
- Immobility
- Polypharmacy
- Cognitive or functional impairment
- Dehydration
- Depression or Anxiety
- Co-morbidities

Drugs that may Cause Constipation

- Narcotics
- Antacids
- Anticholinergics
- Antidepressants
- Diuretics
- Antihypertensives
- Antidiarrheals
- Iron

Consequences

- Decline in quality of life
- A decrease in functional ability
- Increased pain
- Dysuria (painful urination)
- Fecal incontinence
- Colon ulcers
- Perforation of the colon
- Fecal impaction
  - Intestinal obstruction
  - Bowel perforation
  - Death

Treatment

Pharmacologic
- Stool softeners, lubricants, osmotic laxatives, stimulant laxatives, enemas, medications

Nonpharmacologic
- Lifestyle changes
  - Adequate fiber intake along with water
  - Prebiotics & Probiotics

Classification of Laxatives

Bulk Laxatives
- Psyllium, methylcellulose, wheat dextrin, polydextrose

Lubricant Laxatives
- Mineral oil

Stool Softeners
- Colace, Surfak

Osmotic Laxatives
- Lactulose, sorbitol, polyethylene glycol (Miralax)

Saline Laxatives
- Milk of Magnesia, magnesium citrate

Stimulants
- Dulcolax, Ex-Lax

Issues with Laxatives

- Worsening of symptoms
  - Bloating and gas, cramping, abdominal pain/colic
- Development of complications
  - Electrolyte imbalance, metabolic disturbances
  - Diarrhea, low blood volume
  - Interference with drug absorption
  - Structural changes in gut mucosa
  - Depletion of beneficial microorganisms → C. diff
- Abuse potential (dependency)
- Diminished therapeutic effect
- Should not be used in people with certain conditions
  - Renal, heart, liver failure (osmotic)
Weaning from Stimulants

• Habitual use of stimulant laxatives should be replaced with bulking agents gradually.

• A combination of a **stimulant + fiber** might be useful for a 30-day pd to boost colonic function & bridge the transition from stimulant dependence to natural facilitation of bowel movements.

• The goal should be permanent discontinuation of stimulants in favor of fiber intake.

Lifestyle Changes

• Increase Physical Activity

• Bowel Training—Sitting on the toilet 1st thing in the morning or 15-20 min after meals when the colonic activity is the greatest about.

• Increase Hydration

Fiber

First-line approach which improves stool consistency & accelerates colon transit time.

Adequate Intake (AI) for Fiber

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>38g/d for ages 31-50y</td>
<td>25g/d for ages 31-50y</td>
</tr>
<tr>
<td></td>
<td>30g/d for ages ≥ 51y</td>
<td>21g/d for ages ≥ 51y</td>
</tr>
</tbody>
</table>

FOOD FIRST

**Challenges with Getting Adequate Fiber**

- Difficulty chewing & swallowing
- Poor appetite may reduce consumption
- Gas & Bloating

**Dietary Fiber**

- Nondigestible CHO & lignin that are intrinsic & intact in plants
- Isolated, nondigestible CHO that have beneficial physiological effects in humans
- Includes: inulin, oligofructose, fructooligosaccharides (FOS), resistant starch, polydextrose, maltodextrin

**TOTAL FIBER**

**Prebiotics**

- Non-digestible food ingredients that stimulate the growth and/or activity of bacteria in the digestive system which are beneficial to the health of the body.
- Food for probiotics proliferating their growth

**Food grade commercial prebiotics**

- Fructo-oligosaccharides (FOS)
- Galactosaccharides (GOS)
- Lactulose
- Inulin
- Polydextrose
- Isomalt-oligosaccharides
- Lacto-sucrose
- Gentio-oligosaccharides
- Xylo-oligosaccharides

**Prebiotics Produce SCFA**

- Soluble fiber: e.g. prebiotic fiber

**Polydextrose**

- Prebiotic soluble fiber
- Partially fermented in the large intestine, leading to increased fecal bulk, reduced transit time, softer stools, and lower fecal pH
- Fermentation leads to the growth of favorable microbiota (↑ lactobacillus, ↓ bacteroids), enhanced production of SCFAs, & suppressed production of carcinogenic metabolites supporting colon health
- Does not require additional fluid consumption
- Clinically proven

Prebiotic Soluble Fiber

- Good Bacterial Growth
- Produce SCFA
- Fecal Weight
- Inhibit Pathogenesis
- Nourish colon supporting integrity
- Mineral Absorption

Constipation Relief


*Food grade commercial prebiotics*
Typical Fiber Supplements

- Require 8 oz of fluid to hydrate the supplement alone
- If sufficient fluid is not consumed it may cause choking
- Excessive gas and bloating
- Can interfere with medications
- Can decrease the absorption of minerals
- Contraindicated for people with difficulty swallowing, intestinal obstruction, impacted
- Low in fiber

Aging Causes

- Changes in microbiota
- Decrease in beneficial microorganisms
- Increase in harmful microorganisms

Microbiota

- Living microorganisms that coat the inner wall of our intestines
- ~100 trillion microorganisms
- Weighing ~3lbs
- Outnumbering the cells in our body by a factor of 10
A Healthy Colon keeps things Moving

Factors Disturbing Intestinal Microbiota
- Medications (Antibiotics)
- Aging
- Stress
- Intestinal infection
- Food intake
- Chronic diarrhea
- Poor hygiene
- Surgery

A disturbed microbiota makes patients extremely susceptible & vulnerable to infection & disease

Antibiotic Use in LTC
- 50% to 75% of residents
- 3 months to restore microbiota to normal levels

Antibiotic Associated Diarrhea (AAD)
- ≥ 3 abnormally loose bowel movements/24hrs
- Occurs in 5-62% of residents
- Depends on antibiotic type, health, & exposure
- 15-25% of AAD is caused by C. diff

Fecal-Oral Route Transmission
- Colonized Humans
- Environmental Surfaces
- Contaminated Equipment
New Super Bug Surpassed MRSA

- C. diff have surpassed MRSA
- Epidemic outbreaks are becoming a widespread problem
- These newer hypervirulent mutated strains are far more deadly than the organisms of 30 years ago
- Possibly due to over utilization of antibiotics

Risk factors

- Antibiotic use
- Age >65 years
- Hospitalization
- Feeding tube
- Anti-gastric ulcer drugs
- Anti-peristaltic drugs
- Low albumin level
- Severe underlying illness
- Length of stay in LTC facility
- Poor infection control
- GI surgery
- Immunosuppressive therapy
- Intensive care unit

Pathogenesis of C. diff Associated Disease

Antibiotic therapy → Disturbed colonic microbiota → C. diff exposure and colonization → Release of toxin A and toxin B → Diarrhea and Colitis

Mucosal injury and inflammation leads to fluid secretion & altered membrane permeability

C. Diff toxin-induced Pseudomembranous colitis
Clinical Presentations

- Profuse watery diarrhea
- Abdominal pain, distention
- Fever
- Nausea
- Dehydration
- Loss of appetite
- Hypoalbuminemia
- Possible occult blood in stool
- Colitis (severe case)
- Risk increases for development of paralytic ileus, toxic megacolon, sepsis, electrolyte imbalance, hypotension, & volume depletion

Treatment for C. diff

- Discontinuation of antibiotics, if possible
- Metronidazole (250mg 4X/d or 500mg TID/d) for 10-14d or
- Vancomycin (125mg 4X/d) for 10-14 d

Non-antibiotic Management

- Correct loss of beneficial microorganisms due to profuse diarrhea & antibiotic use
- Correction of fluid losses & electrolyte imbalances
- Monitor weight
- Avoid antiperistaltic drugs
- Implementation of infection control policies

Effective treatment of c.diff needs to do 3 things:

1. **Reduce** the burden of c.diff & its toxins in the intestine
2. **Assist** the host’s immune system
3. **Restore** the normal colonic microbiota

Since residents taking antibiotics are already in a weakened state, they are even more vulnerable after antibiotic use.
Probiotics are live microorganisms that have been shown to confer a health benefit. Lactobacillus, Bifidobacterium, Saccharomyces (a yeast) are the most common.

Probiotics: Mechanism of Action

- Inhibit the growth of bacteria
- Blocks attachment or invasion by pathogens
- Improve mucosal barrier function
- Alter host immune response

Published Target Points

- Oral microbiology
  - Dental caries
  - H. pylori
  - Helicobacter
- Allergy
  - Atopic dermatitis
  - Asthma
- Colorectal cancer
- Vaginal infections
- Systemic effects
  - Immune function
  - Reduced allergies
  - Growth parameters in undeveloped children

Products Containing Probiotics

Lactobacillus casei shirota

Genus Species Strain
### Probiotics Proven For AAD & C.diff

<table>
<thead>
<tr>
<th>Probiotic</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saccharomyces boulardii</td>
<td>Florastor (capsule)</td>
</tr>
<tr>
<td>Saccharomyces boulardii + Bacillus coagulans + FOS</td>
<td>Diff-Stat (chewable tablet, powder)</td>
</tr>
<tr>
<td>Lactobacillus rhamnosus GG</td>
<td>Culturelle (capsule) (children)</td>
</tr>
<tr>
<td>Lactobacillus Reuteri ATCC 55730</td>
<td>BioGaia Probiotic Chewable tablets (children)</td>
</tr>
<tr>
<td>Lactobacillus casei DN-114 001</td>
<td>DanActive (fermented milk)</td>
</tr>
<tr>
<td>Lactobacillus acidophilus CL1285, Lactobacillus casei LIBC18R</td>
<td>Biok+CL1285 (fermented milk,capsule)</td>
</tr>
</tbody>
</table>

### Are live cultures the same as probiotics?

- Live cultures are microbes that are used to ferment foods
- During production live cultures can die
- Not all live cultures are probiotics
- NYA Live & Active Culture Seal = > 100 M cultures/g at the time of manufacture
- Does not differentiate btw starter cultures + added probiotics

### Saccharomyces boulardii

- A non-pathogenic yeast with over 56 years of use & clinical research
- #1 Probiotic that has been clinically shown to prevent AAD & c.diff worldwide
- Genetically resistant to antibiotics & resistant to heat & acid
- Inactivates bacterial toxins, inhibits toxin binding to intestinal receptors & lessens toxin-induced inflammation
- Stimulates host immune defenses


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### Bacillus coagulans

- A lactic acid producing bacteria, probiotic
- Naturally encapsulated in a spore for protection
- Has over 50 yrs of history of safe use
- Reaches the intestines → coat dissolves → bacteria multiply → producing lactic acid
- Inhibits growth of pathogens, alleviates abdominal pain & bloating
- In a recent clinical study, b. coagulans with FOS was shown to prevent AAD

### S. boulardii & High Dose Vancomycin for C. diff

- [Graph showing](#) % CDD recurrences

### Challenges with Probiotics

- Manufacturing
- Shelf stability
- In the body
- With antibiotics
- Appropriate use
**Synbiotics (Probiotic + Prebiotic)**

- Produce a synergistically beneficial effect
- More effective than probiotics alone
- Offer improved chance of survival in GI tract

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**Potential Benefits of Using Synbiotics**

- Fewer outbreaks & transmissions of infection within the facility
- A reduction in dehydration & malabsorption associated with AAD
- A reduction in the inappropriate use of antibiotics
- A reduction in the # of patients with infections who are transferred to acute-care settings
- A reduction in direct & indirect patient care costs as a result of more appropriate resource utilization

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**Affects of Aging on Colon Health**

<table>
<thead>
<tr>
<th>Function</th>
<th>Colon</th>
<th>Inability to function leads to</th>
<th>Conditions</th>
<th>Prevention with Nutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Absorbs water forming stool &amp; lubricates</td>
<td>Mucosa</td>
<td>Hard stool, watery stool</td>
<td>Constipation, Diarrhea</td>
<td>Prebiotics + Probiotics + Dietary Fiber</td>
</tr>
<tr>
<td>2) Eliminates waste, keeps things moving</td>
<td>Muscle</td>
<td>Increase in toxins, bacterial growth, hard stool</td>
<td>Constipation, Diarrhea</td>
<td>Prebiotics + Probiotics + Dietary Fiber</td>
</tr>
<tr>
<td>3) Prevents pathogen adhesion</td>
<td>Mucosa, Microbiota</td>
<td>Increase in pathogens, destruction of intestinal cells</td>
<td>Constipation, Diarrhea/AAD</td>
<td>Prebiotics + Probiotics + Dietary Fiber</td>
</tr>
<tr>
<td>4) Provides immunity</td>
<td>Microbiota, Antibodies (immunoglobulins)</td>
<td>Infections</td>
<td>Diarrhea/AAD</td>
<td>Prebiotics + Probiotics + Dietary Fiber</td>
</tr>
</tbody>
</table>

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**Disease State**  
**Antibiotic Treatment**  
**Synbiotics**  
**Balanced Microbiota**  
**Prevention of AAD**

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**Healthy intestinal microflora is a fundamental characteristic of a healthy organism.**

A. Nissle, 1917

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THANK YOU