Children’s Gastrointestinal Problems: Thinking Outside the Box

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Our job is to problem solve:

(And have an open mind)

Research and clinical studies are simply there to give us added guidance: They are a piece of the puzzle, not the whole puzzle
What are we Treating?

Is Colic a Diagnosis?  Is Reflux a diagnosis?
  ▶ GE reflux, esophagitis, gastritis
  ▶ Gastric dysmotility, gastroparesis
  ▶ Intestinal dysmotility (dysfunction), dumping syndrome
  ▶ Bacterial/fungal overgrowth, dysbiosis
  ▶ Food sensitivities
  ▶ Pancreatitis
  ▶ Is the problem in the GI tract?
Functional Medicine: Achieving Balance

![Handful of pills](image1)

![Children playing](image2)

![Baby sleeping](image3)

![Fruits and vegetables](image4)
Functional Medicine

Energy/Oxidation and reduction

- Immune system and inflammation
- Detoxification and Biotransformation
- GI system absorption and digestion
- Neurotransmitters and hormones
- Structural and Barrier integrity
- Psychological and spiritual equilibrium

Diet
- Stress
- Sleep
- Physical activity
- Environmental toxins
- Genetic predisposition

Healthy vs. Non Healthy
GE Reflux/Dyspepsia

Food Sensitivities and Intolerances

Immune Dysregulation

Altered Mucosa Lining

Parental influence

Altered Motility

Bacterial Dysbiosis

Mental and Emotional Stress

Unknown influence

Genetic Predisposition
Other Issues

- Stooling and constipation
- General body muscle tone
- Ventilation and Chest wall movement
- Breathing/eating/swallowing coordination
- Learned behavior
Oral Motor Problems
Swallow Breathing and “Body Mechanics”
Digestion

- **Mechanical activity**
  - **Stomach**

- **Chemical/Enzymatic activity**
  - **Oral**: amylase, proteases, lipase
  - **Stomach**: HCL, Pepsin, Lipases
  - **Pancreatic**: HCO3, Proteases, Lipases, Amylase
  - **Biliary**: Bile acids, Phospholipids
  - **Intestinal mucosa**: Breakdown of protein and CHO fragments

- **Bacterial activity**
  - **Primarily in Colon**: For their benefit and ours

- **Digestive system is operational in infants (including gastric acidity)**
Immunity: Immune system and Tolerance

- The GI tract accounts for the greatest contact (surface area) with the outside world
- 60-70% of total bodies Immune system is in the GI tract
- Systems:
  - Physical barrier:
    - Physical integrity of mucosal lining
    - Stomach acidity
    - Enzymatic activity
  - Bacterial flora play a role in gut immunity
  - Cellular and humoral immune system
    - In state of mild chronic controlled inflammation
    - Must have tolerance to “safe foods, bacteria, etc”
    - Must React appropriately to pathogenic and harmful organisms
- Inflammation has effects on motility and absorption
Colonic Flora
(We’re not alone)
The “Colonic Rainforest”: Under the canopy

- Fun facts:
  - Per person: 500-1000 species/ 40 major species
  - Strict anaerobes: 95%
  - Facultative anaerobes: 1-10%
    - Includes: E. coli, Klebsiella, Streptococcus, lactobacillus, Staphylococcus, Bacillus
  - Aerobes: not found
  - 1/3 dry weight of stool: viable bacteria
Gut Flora/Probiotics: What do they do?

- **General Effects**
  - **Production of:**
    - Nutrients
    - Antioxidants
    - Coagulation factors
  - Activates MALT (mucosa assoc. lymphoid tissue)
  - Promotes antioxidant activity
  - Controls potential pathogenic bacteria
  - Decreased production of endotoxins
  - Decreased mutagenicity
Gut Flora and Allergy

Allergy Risk

- No Maternal History, Vaginal delivery
- Maternal History, Vaginal History
- Maternal History, C section

J All Clin Immunol 2003; 112:420-423
How Do We Diagnosis?

Pattern recognition

Diagnostic Tests as confirmation… Maybe?

Like everything else, diagnostic tests are only a piece of the puzzle
Diagnostic Studies

- Contrast radiology studies
  - Anatomic detail
- Radioscintigraphy (Tc scan)
  - Chalasia scan
  - Gastric emptying scan
- Esophageal pH monitoring
  - Is acid going up the esophagus
- Endoscopy
  - Details of anatomy and histology
- Esophageal and antroduodenal manometry
  - Motility - rarely used and rarely needed
Clinical Presentation and Empiric Treatment

Empiric Treatment: “Personal Opinion”

- The quickest, most reliable path to diagnosis
  - Quicker time to diagnosis and relief
  - Least invasive
  - Inexpensive
Let’s Look at Gastroesophageal Reflux
A Way of Thinking

Gastroesophageal Reflux

- The phenomenon of reflux
- The manifestations of reflux
- The root of reflux
A Way of Thinking

Gastroesophageal Reflux
(The Phenomenon of Reflux)

We all have reflux
A Way of Thinking

Gastroesophageal Reflux
(The Manifestations of Reflux)

How does reflux present?
Or
When does it become a problem?
GERD: Presenting Symptoms in Infants

- Emesis/Spitting up
- Regurgitation
- Irritability
- Feeding refusal/aversion
- FTT/weight loss
- Recurrent ear infections

- Chronic sinus problems
- Respiratory symptoms
  - Apnea
  - Reactive airway disease
  - Pneumonia
  - Hoarseness
  - Cough
Treatment Strategies of GERD
Categories

- “Conservative measures
  - Positioning
  - diet
- Pharmacological treatment
  - Acid neutralizing agents
  - Acid suppressing agents
  - Prokinetics
- Surgical intervention (Nissen fundoplication, G-tube placement)
<table>
<thead>
<tr>
<th>Medication</th>
<th>Mechanism of action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metoclopramide</td>
<td>Peripheral and central Dopamine antagonist</td>
</tr>
<tr>
<td>Cyproheptidine</td>
<td>Anti-Histamine</td>
</tr>
<tr>
<td></td>
<td>Serotonin receptor antagonist</td>
</tr>
<tr>
<td>Bethanechol</td>
<td>(Muscarinic) cholinergic</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>Motilin agonist</td>
</tr>
</tbody>
</table>
Surgical Intervention: G-Tube Placement

- Bypasses oral-pharyngeal mechanisms
- Easier use of specialized formula
- Easier administration of medications
- Allows for manipulation of feedings
  - Rate, i.e. continuous
  - Gastric or jejunal feedings
- Surgical G-tube
- PEG (Percutaneous endoscopic gastrostomy)
A Way of Thinking

Gastroesophageal Reflux
(The Root of Reflux)

Is There Something Other Than Reflux Going On?
There May be One or More Contributing Factors

- Anatomic problems
- Dysmotility
- Metabolic problems
- Food Sensitivity/Allergy
- Poor mucosal Integrity (Leaky Gut)
- Dysbiosis
Dysmotility: Formula Modification

Considerations:

- **Osmolality**: Increased osmolality delays gastric emptying
- **Whey protein**: Increased emptying
- **MCT oil vs LCT**
Definition: A deviation from the norm in stool frequency (decreased), consistency (harder), or difficulty with passage of stool resulting in clinical problems.

Symptom presentation may include:

- Abdominal distention/pain
- Nausea/emesis
- Anorexia/decreased appetite

(All symptoms of GE reflux)
Is Constipation Causing Problems?
“You have to make the package and deliver it”

- Sometimes you can’t tell from the history so: Empiric trial
- Older child
  - Miralax: to make the package
  - Senna: to deliver
- Infant or tolerant child
  - Glycerin suppositories
- Always ask the question: Is there a root to this problem? or what’s causing the constipation?
Elimination (Stooling)

- Preterm infant in the NICU
- Unable to come off of IV Nutrition
- Stooling at least daily

- Administration of rectal suppositories 2 x daily
- Within 2 weeks on full enteral feedings
Bacterial/Yeast Overgrowth

A rise in Microbial counts in the small intestine

- **Risk factors**
  - Poor motility
  - Acid suppression
  - Dilated small bowel
  - Absence of ileocecal valve

- **Problem - malabsorption**
  - Mucosal inflammation
  - Deconjugation of bile salts
  - May compete for nutrients

- **Typical GI symptoms**
  - Bloating
  - Cramps
  - Diarrhea
  - Nausea
  - GE Reflux

- **Extra GI Symptoms**
Bacterial/Yeast Overgrowth (and Dysbiosis)

What to do

- Antibacterial/antifungal
  - Drug therapy
  - Antimicrobial oils
  - Dilated small bowel
  - Absence of ileocecal valve
- Probiotics
- Change diet
  - Vegetable fibers vs starches and sugars
- Further improve local ecology
  - Calm immune system
  - Improve function of mucosal barrier
Dysmotility and PPI use are independent risk factors for small intestinal bacterial and/or fungal overgrowth

Protein Intolerance/Food Allergies

Predisposition
- Immature mucosal defense system (Preterm infant)
- Increased permeability
  - Prematurity
  - Malnutrition
  - Infectious enteritis
  - Bowel injury or compromise

Treatment
- Hydrolysate or elemental formula, cow’s milk or soy elimination from maternal diet
For Formula Fed Infant/Child: Changing the formula

Milk allergy is an adverse response to protein:

• Milk protein is intact in lactose-free milk
  • Lactose-free does not resolve the problem as milk protein remains intact

• No relief will occur by switching to formulas using same protein source

**Four Main Classes of Formula**

• Milk (Casein or Whey)-based basic formulas
• Soy-based formulas
• Partially or extensively hydrolyzed protein formulas
• Amino acid-based formulas
Removing the Protein Allergen

**Most Allergenic**

Basic Infant formula and breast milk contain whole proteins.

All *basic formulas (dairy + soy)* are made of complete protein chains that trigger allergic reactions.

*Hydrolysate formulas* break the protein chain into pieces. This is better tolerated by many, but can still trigger an allergic reaction.

*Amino Acid-based formulas* are made with individual non-allergenic amino acids. They are very well tolerated and classified as hypoallergenic.

**Least Allergenic**

Reaction to Hydrolysates is more common than realized.
Improving Treatment of Dairy and Soy Milk Protein Allergy

A Diagnostic Approach to Treating Milk Protein Sensitivity

All Infants with suspected milk protein allergy symptoms

↓

14-day trial with amino acid-based formula

↓

If unsure, continue for a week or 2 longer or return to previous formula
The Older Child with Food Allergy/Intolerance

- Similar set of symptoms as infant
- Testing is difficult
- Diagnosis/Treatment is also sometimes difficult
- Elimination diet is often needed
- Rotation diet works for some
- Dietician is vital
- Enzymes?
The Older Child with Food Allergy/Intolerance: Testing

- Skin (Prick skin test)
  - Positive predictive value is <50%
  - Negative Predictive value is >95% (less than age 3 yrs. 80-85%)
- Need to be off anti-histamines
- RAST testing
  - Quantitative
  - Less sensitive than skin testing
  - May be useful for re-evaluating child’s allergy
The Eosinophilic Gastroenteropathies (eosinophilic esophagitis, gastroenteritis and proctocolitis)

- Severe eosinophilic esophagitis might lead to esophageal strictures
- Diagnosis by endoscopic biopsy
- Thought to be primarily allergic in origin
- Primary treatment is recognition and elimination of allergens
Sun Si Miao (Chinese physician, 6th century) “before considering acupuncture and herbs, the physician should first address the diet and lifestyle”.