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?

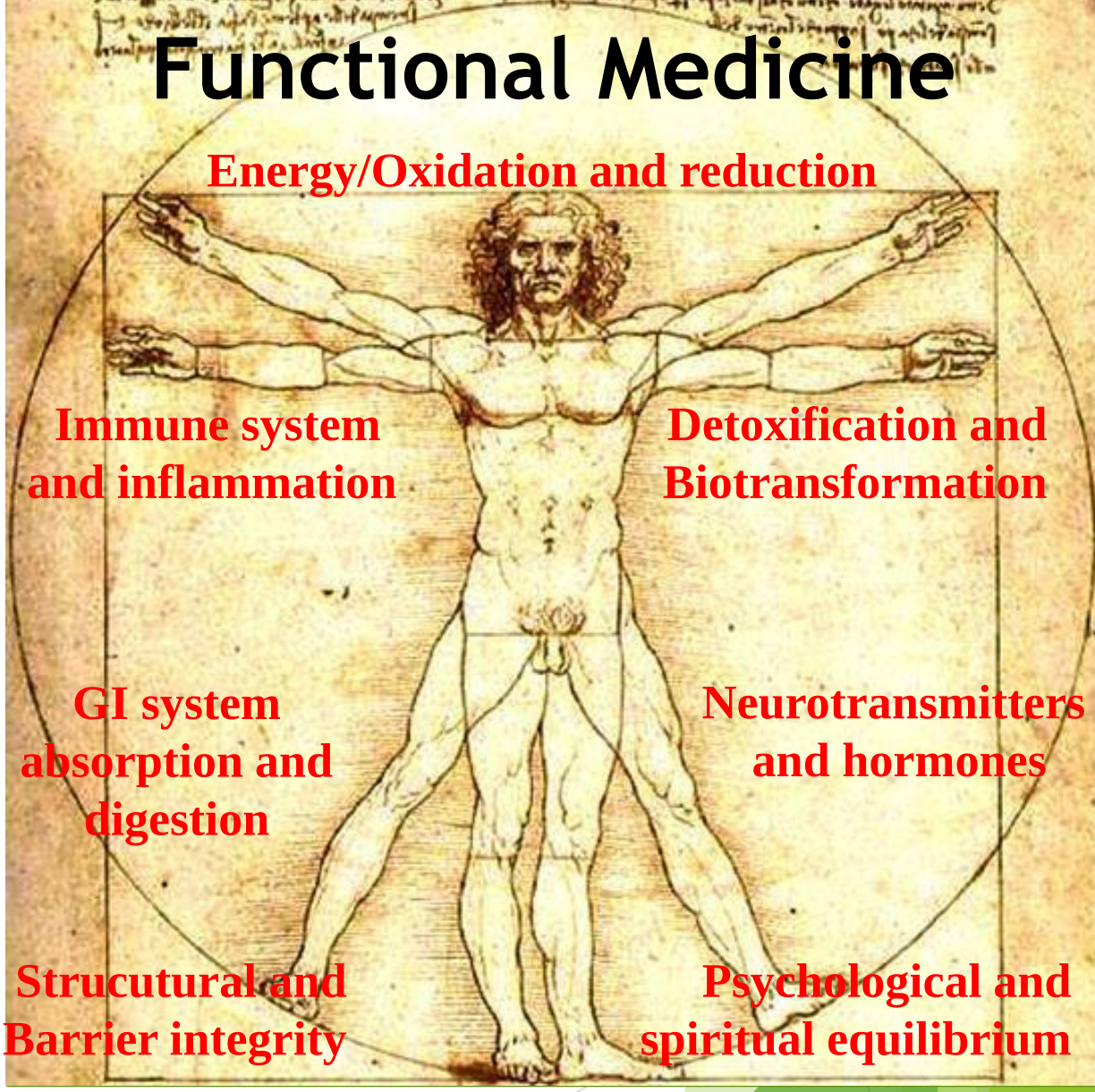
Is Colic a Diagnosis? Is Reflux a diagnosis?

- 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

Functional Medicine



Diet

Stress | Sleep

Physical activity

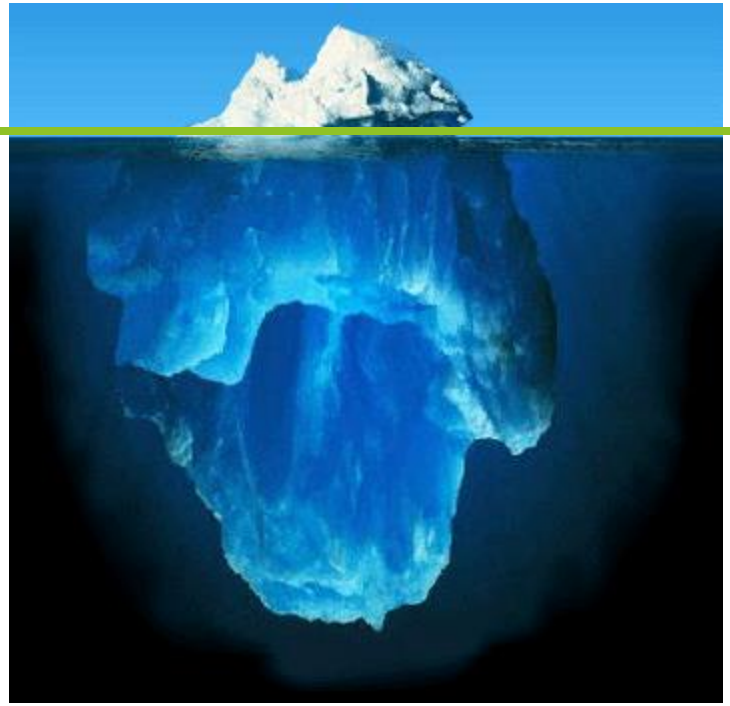
Environmental toxins

Genetic predisposition

Healthy

Non Healthy

GE Reflux/Dyspepsia



Food Sensitivities and Intolerances

Immune Dysregulation

Altered Mucosa Lining

Parental influence

Genetic Predisposition

Mental and Emotional Stress

Unknown influence

Bacterial Dysbiosis

Altered Motility

Other Issues

Stooling and constipation

General body muscle tone

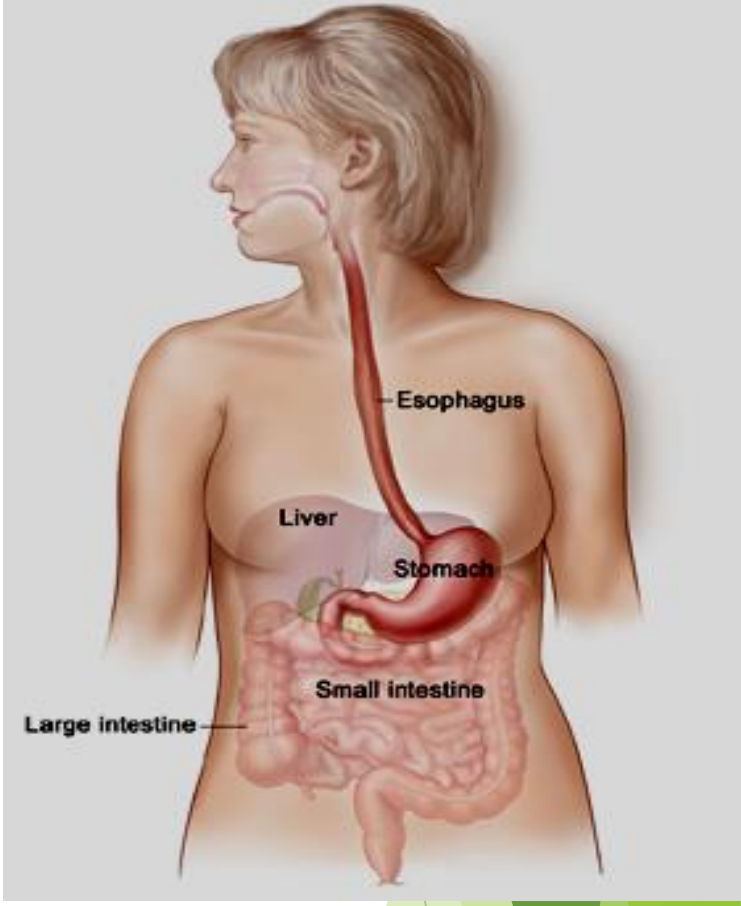
Ventilation and Chest wall movement

Breathing/eating/swallowing coordination

Learned behavior

Oral Motor Problems
Swallow Breathing and “Body Mechanics”

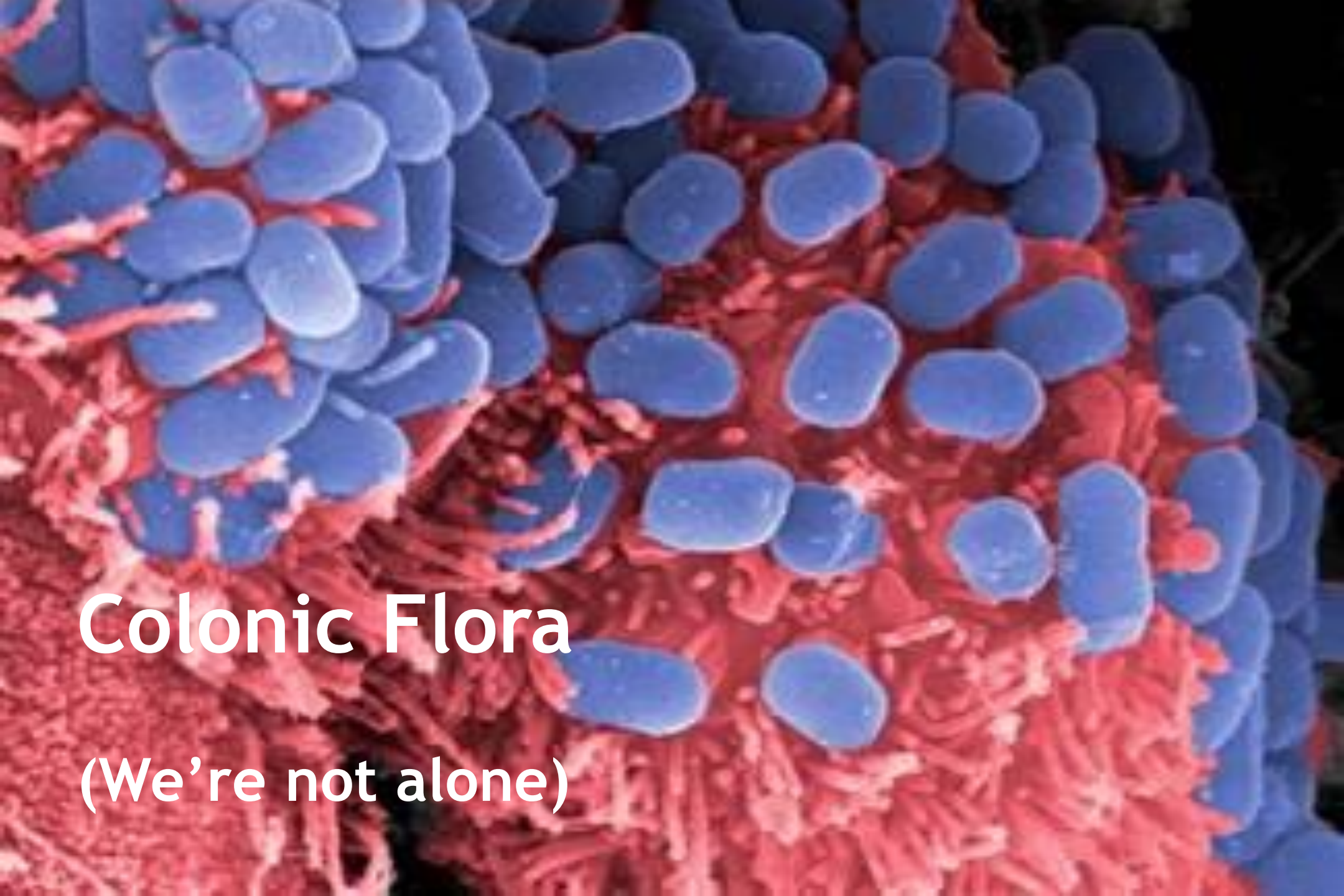
Digestion



- 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)

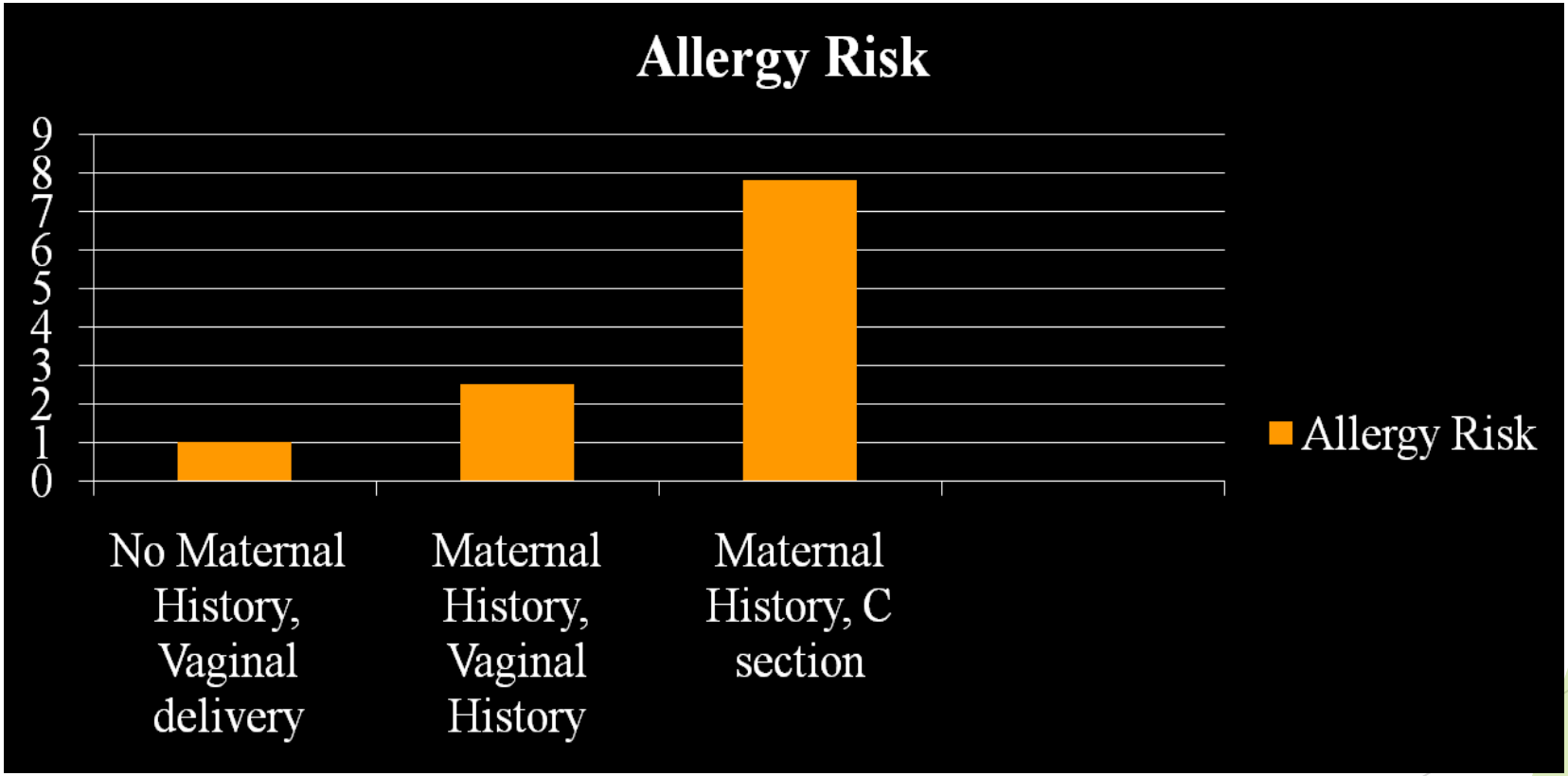
The “Colonic Rainforest”: Under the canopy

- 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. lympoid tissue)
  - Promotes antioxidant activity
  - Controls potential pathogenic bacteria
  - Decreased production of endotoxins
  - Decreased mutagenicity

Gut Flora and Allergy



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)

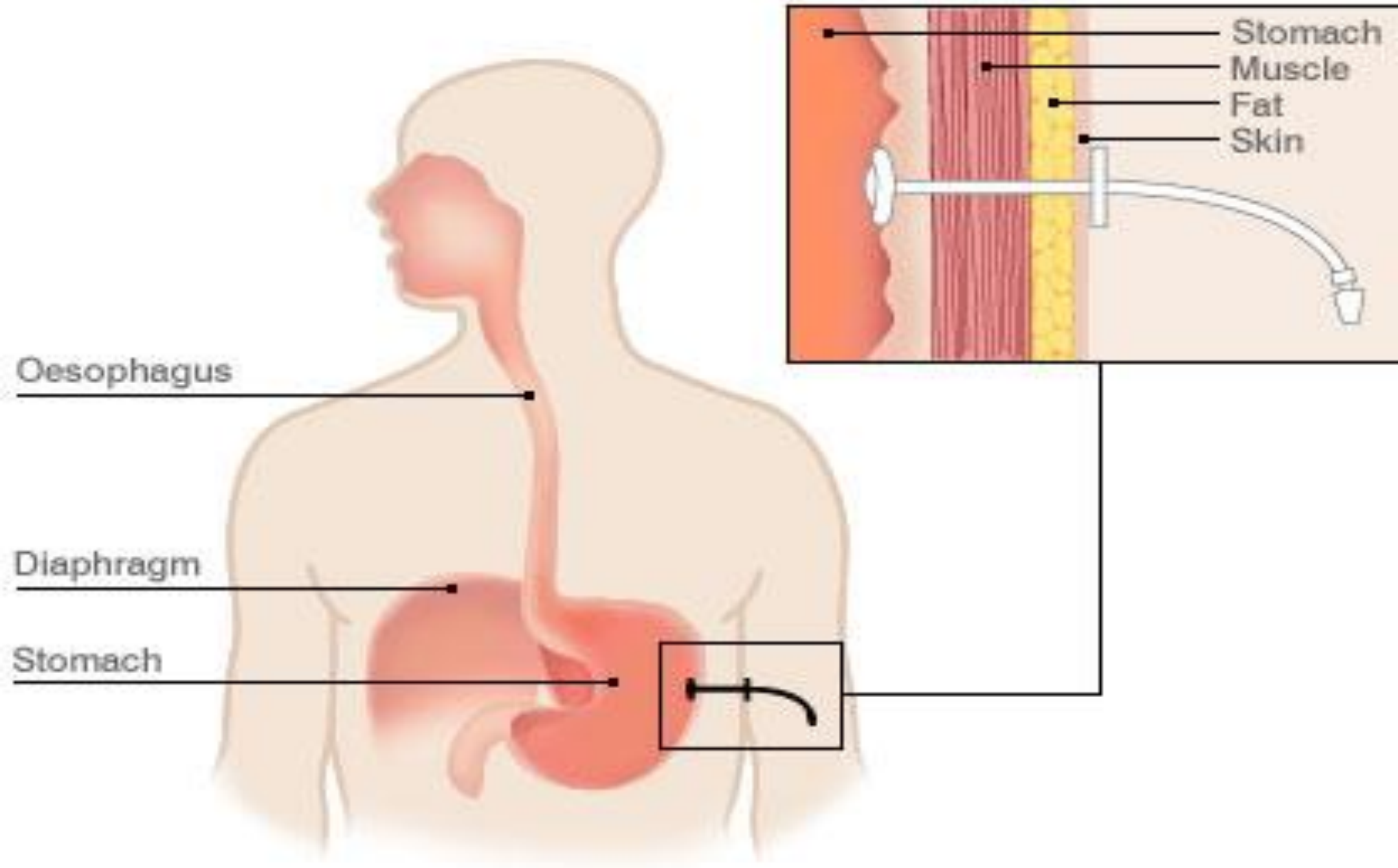
Prokinetic Agents

Medication	Mechanism of action
Metoclopramide	Peripheral and central Dopamine antagonist
Cyproheptidine	Anti-Histamine Serotonin receptor antagonist
Bethanechol	(Muscarinic) cholinergic
Erythromycin	Motilin agonist

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)

PEG (PERCUTANEOUS ENDOSCOPIC GASTRONOMY) FEEDING TUBE



A Way of Thinking

Gastroesophageal Reflux
(The Root of Reflux)

Is There Something Other Than Reflux Going On?

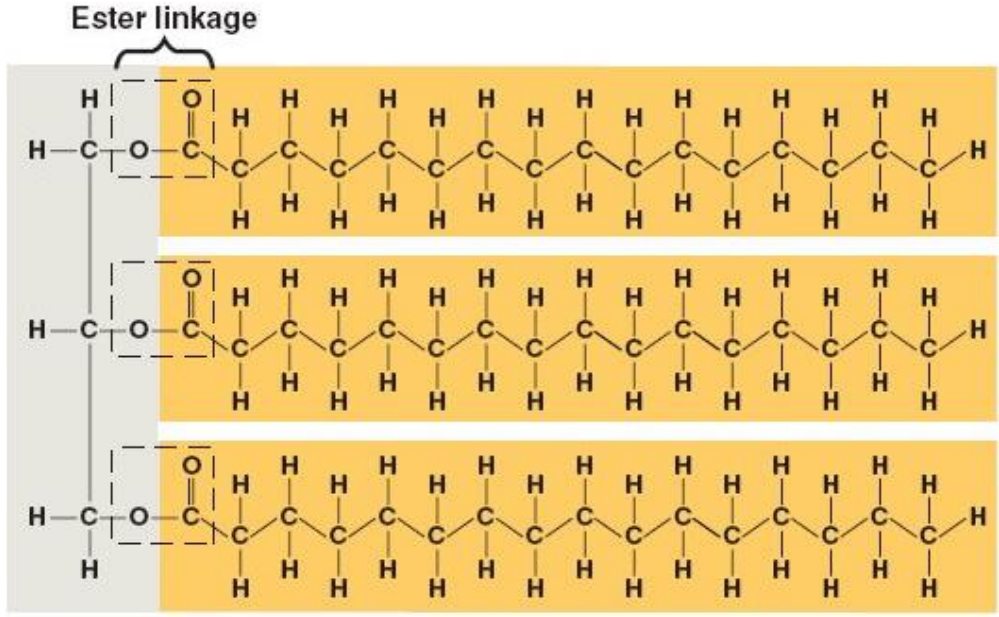
There May be One or More Contributing Factors

- 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



(b) Fat molecule (triacylglycerol)

Constipation

- 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

C Jacobs, **E Coss Adame**, **A Attaluri**, **J Valestin**, and **SSC Rao**.
Aliment Pharmacol Ther. 2013 June ; 37(11): 1103–1111.

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**

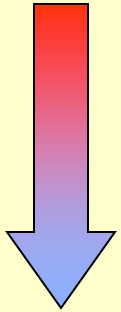
Four Main Classes of Formula

- **Milk (Casein or Whey)-based basic formulas**
- **Soy-based formulas**
- **Partially or extensively hydrolyzed protein formulas**
- **Amino acid-based formulas**

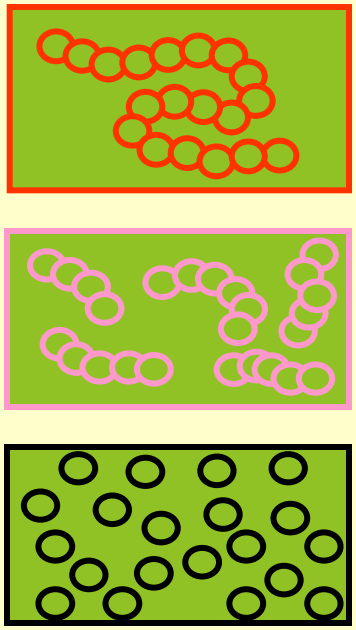
Removing the Protein Allergen

Basic Infant formula and breast milk contain whole proteins

Most Allergenic



Least Allergenic



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.

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% (les 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*".