

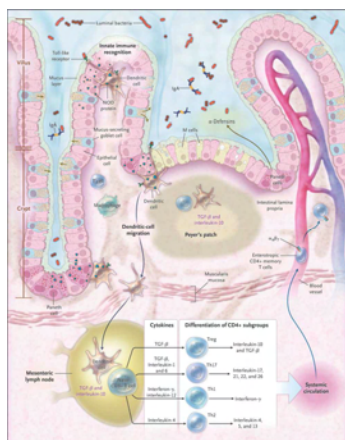
## Update on nutritional issues in patients with IBD, short bowel syndrome and food allergies

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## Objectives

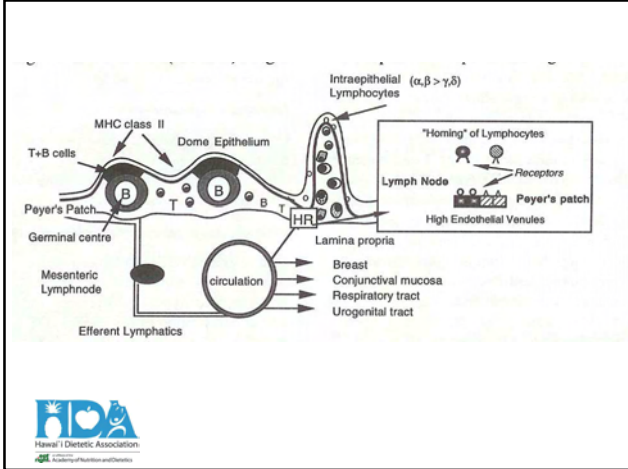
- Review dietary principles and applications for patients with short bowel syndrome
- Update on dietary concepts related to food allergies
- Describe dietary measures used for treatment of patients with inflammatory bowel disease



## Immunology

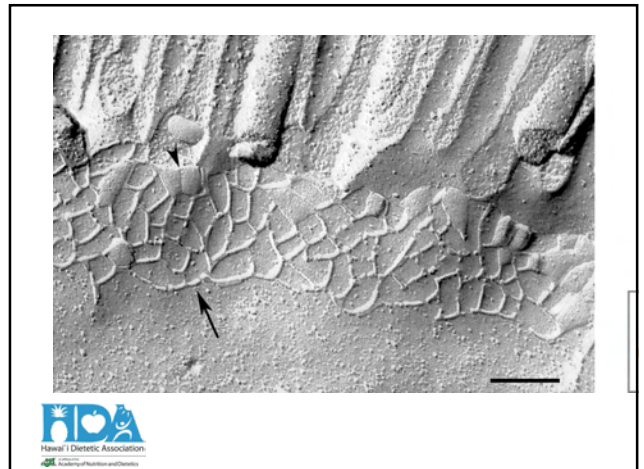
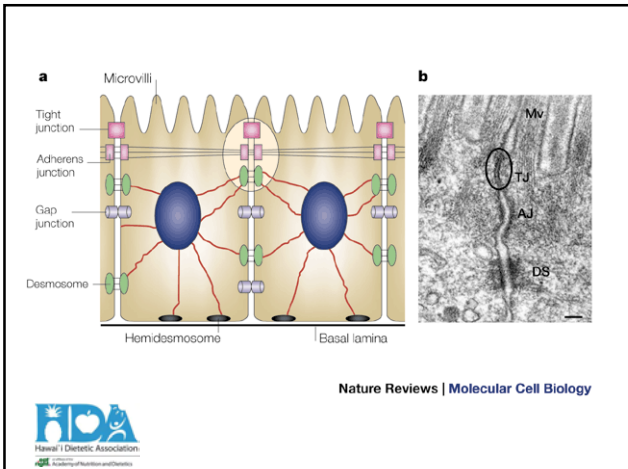
- Cow milk protein sensitive enteropathy
  - TH1 and TH2 pathways
  - Increased IE lymphocytes
  - Functional aberration of mucosal immune system with cytotoxic reactions
- Celiac Disease
  - Enterocyte apoptosis of IE lymphocytes
- CD-23 involved in both and IBD

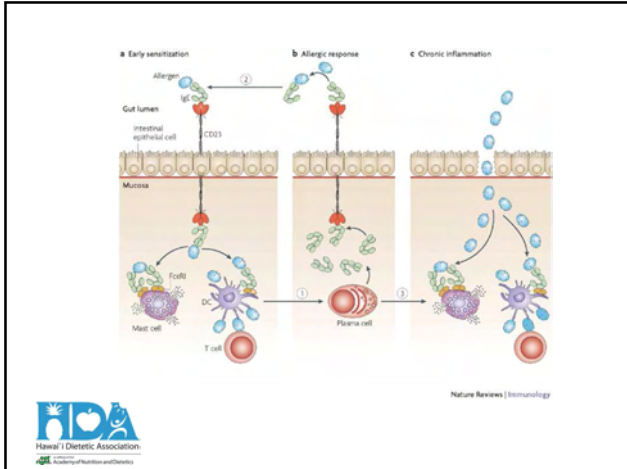




## Tight Junctions

- Dynamic
- Regulate trafficking of nutrients, fluids
- Role in intestinal morphogenesis, autoimmunity, differentiation
- Regulates cytoskeletal function, cell to cell adhesion





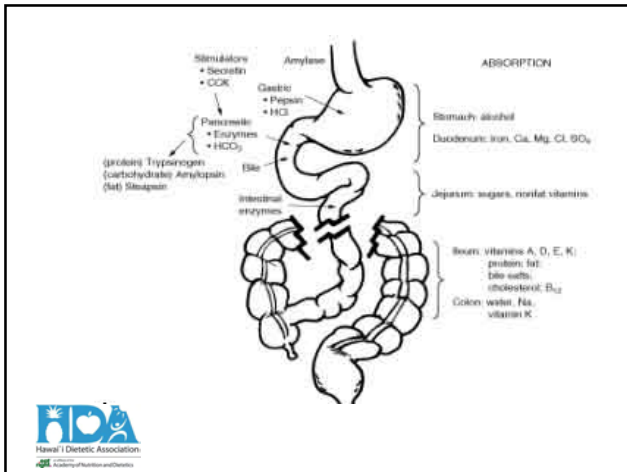
## Common Agents

- **Glutamine**
  - Maintains intestinal barrier and intercellular junctions
  - Decreases proinflammatory response
  - Prevents cytokine induced apoptosis
  - Deficiency associated with NEC

## Common Agents

- **Arginine**
  - Substrate for nitric oxide synthesis (vasodilation)
  - Precursor for glutamine
  - Low plasma concentration associated with NEC and colitis
- **AT 1001 – zonulin peptide inhibitor**
  - Prevents opening of tight junctions
  - Decreases colitis, intestinal permeability, ?celiac disease





## Short Bowel Syndrome- Etiology

- Gastroschisis (dysmotility)
- Necrotizing Enterocolitis
- Intestinal Atresia
- Long segment Hirschsprung's Disease
- Mid gut Volvulus
- Crohn's Disease
- Bowel infarctions
- Trauma
- Cancer



## SBS- Treatments

- Intestinal transplantation – 50% successful at 3 years
- Intestinal Rehabilitation
- Bowel lengthening procedures
- Hepatosparing TPN
  - Low fat protocols
  - Structured lipids (Omegaven)



## SBS- Treatments

- Enteral feedings
  - Breast milk
  - Stomal loss replacements
  - Low fat, simple carbohydrate diet
  - Increased fiber/bulk
  - Feed early and push volume to limits
- Oral feedings increase bowel adaptation better than G-Tube feedings



## SBS- Treatment Strategies

- TPN
  - Limit IV fat
  - Attention to line care; decrease sepsis
  - Eliminate unneeded IV additives
  - Consolidate IV fluids
  - 3:1 TPN vs. 2:1 TPN + lipids
- Enteral feedings
  - Push to tolerance limits
  - Elemental vs polymeric formulas



Antidiarrheal agents; Tx bacterial overgrowth  
Fiber

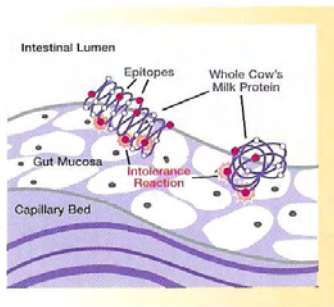


## Definitions

- Food Allergy
  - Immunologically mediated clinical response after ingestion of a dietary product
  - IgE- angioedema, eczema, urticaria, asthma, vomiting, anaphylaxis
  - IgE binding B cells



## GI Tract Interactions

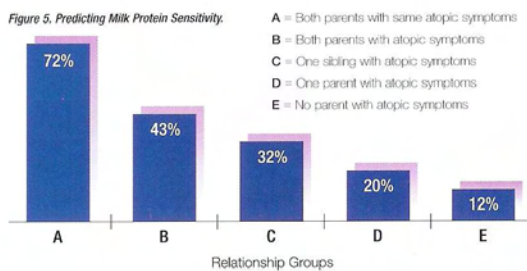


## Prevalence

- Milk protein allergy- 2-3% (1980's)
- 35% with cow milk allergy develop additional food allergies (A. Host- 1997)
- Food protein sensitivity- 6-8% (SA Bock- 1987)
- Birth Cohort Study, 13,019 newborns. Cumulative incidence 0.34%
- 50% resolve CMP sensitivity by 1 yr; 90% by 3 yrs of age



Figure 5. Predicting Milk Protein Sensitivity.



Adapted from Kjellman M.M. Atopic disease in seven-year-old children: Incidence in relation to family history. *Acta Paediatr. Scand.* 1977; 66: 1465-71.



## Food Allergy

- The following are associated with the development of food allergy. How?
  - Antibiotics
  - Preterm birth
  - Vitamin D deficiency
  - Hydrolyzed formula
  - Early exposure to dietary eggs
  - Early exposure to cow milk protein
  - Early exposure to rice protein



## Food Allergy

- Indirect exposure to antibiotics prenatally and via breast milk increases risk (Dom, Clin Exp All 2010)
- Preterm birth decreases incidence of atopy in adults (BW 1120gms; 29.2 weeks gestation) (Siltanen, J All Clin Imm, 2011)



## Food Allergy

- Vitamin D deficiency associated with higher rates of allergic sensitization in children and adults (NHANES data) (Shanif, J All Clin Imm 2011)
- Partial hydrolyzed protein infant formula for the first 6 months of life decreases food sensitization but not allergic disease (Kuo, Int Arch All Imm, 2011)



## Food Allergy

- Intact egg protein exposure at 4-6 months of age decreases egg allergy regardless of family history. 2590 infants, 8.9 % food allergy. (Koplin, J All Clin Imm, 2010)
- Early cow milk protein exposure (2 weeks of age) is protective against IgE mediated CMP allergy. (Katz, J All Clin Imm, 2010)



## Food Allergy

- Rice allergy, non-IgE mediated
- Enterocolitis pattern
- Hospitalization common (r/o sepsis picture, dehydration)
- Onset at 3-6 months of age
- Mehr, Arch Dis Child, 2009



## Diagnostic Testing

- Skin tests- food specific (IgE reactions)
  - 50% positive predictive value
- Blood tests
  - RAST-IgE- food specific
    - Cross reactivity with other foods in class
  - Total serum IgE
  - CBC with differential- eosinophilia
- Double blind placebo controlled food challenge



## Pediatric Allergy Testing AAP Jan 2012

- Sx: urticaria, angioedema, cough, wheezing, vomiting, diarrhea, rectal bleeding, anaphylaxis
- Dx: atopic dermatitis, eosinophilic esophagitis, allergic enteropathy, asthma



## Pediatric Allergy Testing AAP Jan 2012

- Indiscriminate test panels without history guidance are not recommended (peanut + in 8%, yet 1% are clinically allergic)
- A negative skin prick test (SPT) or sIgE does NOT exclude the diagnosis
- Cross reactivity among proteins result in higher sIgE than clinical reactions



## Pediatric Allergy Testing AAP Jan 2012

- Strong positive SPT correlate with increasing probability of clinical allergy
- High sIgE or SPT wheal size do NOT predict severity of reaction, but do predict likelihood of allergic reaction
- Total sIgE is not predictive
- Intradermal tests and IgG are not recommended





## Pediatric Allergy Testing AAP Jan 2012

- Food associated enterocolitis and proctocolitis (cell mediated rxns) are NOT associated with sIgE
- Supervised oral food challenges
- Elimination diets must be medically monitored

Practice Parameter: Ann All Asthma Imm 2006; 96: S1-S68.

Guidelines: doi: 10.1542/peds.2011-2382

J All Clin Imm 2010; 126: S1-S58



## Eosinophilic Disorders

- Eosinophilic esophagitis:
  - Increasing incidence nationally
  - Majority of patients are atopic, especially to cow milk protein
- Eosinophilic gastrointestinal disorders
  - Associated with failure to thrive and feeding disorders (learned, maladaptive) 16.5%



## Probiotics/Prebiotics

- Probiotic consumption during pregnancy and early lactation prevents allergic symptoms in first 2 years of life, but not asthma (Norway) (Dotterud, BJ Derm, 2010)
- Short and long chain oligosaccharide supplemented formula decreased atopic dermatitis by 44% in first year of life (Gruber, J All Clin Imm, 2010)



## Food Allergy Bullying

- Questionnaire- adults and teens
- 24% teasing or harassing about FA
- 86% multiple times
- 82% occurred at school (80% classmates; 21% teachers/staff)
- 57% physical events
- 66% sad or depressed related to events



## Dietary Adherence

JPGN 2012, 54:430-434

- Questionnaire, 92 pts, 25 states
- Lack of school support
- Lack of obvious symptoms when non-compliant
- Most common support = Web site
- RD support lacking



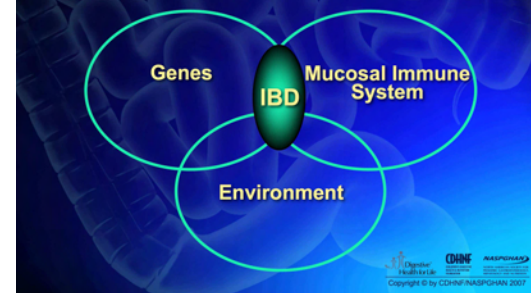
## Dietary Adherence

JPGN 2012, 54:430-434

- Reasons why:
  - I want to eat something not on diet 68%
  - No other choices 42%
  - I don't want to follow the diet 24%
  - It won't make me feel bad 24%
  - I don't want others to know 13%
  - Misc. reasons 38%



## Multi-factorial Pathogenesis of IBD



## IBD/Enteral Nutrition

- Introduced 1970-1980's
- 2006 European and Japanese groups published guidelines
- 2010 British IBD group guidelines
- 63% of European pediatric GI regularly use enteral nutrition therapy vs 4% North American pediatric GI



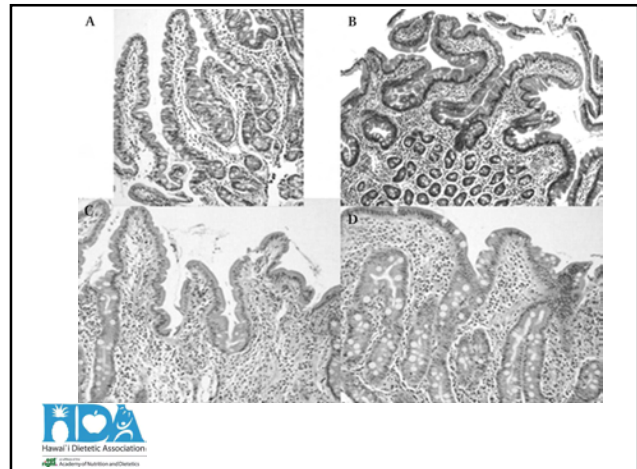
## IBD/Enteral Nutrition Mechanisms

- Elimination of antigen uptake
- Nutritional repletion
- Correction of intestinal permeability
- Decreased inflammation via decreased fat
- Micronutrient provision
- Altered gut flora



## IBD/Enteral Nutrition Outcomes

- Newly dx- 85% response rate for Crohn's
- Children >> adults
- Primary barrier is intolerance to protocol
- Remission tx- 50% response rate



## IBD/Enteral Nutrition Mucosal Healing

- Significant for adult patients, unknown for pediatrics
- EN improved mucosal healing regardless of formula type (elemental vs polymeric)
- Some had complete healing vs 0% for steroids
- Height velocity Z scores and body composition are independent of mucosal healing



healing

## IBD/Enteral Nutrition Partial EN

- British study, 50% formula with 50% normal food
  - Remission rate 42% with exclusive formula diet vs 15% with combo
  - No change in remission rate if up to 10% is regular food (unpublished data)
- (Griffins, Clin Opin Clin Nutr Metab 2006)



## Growth Failure in Crohn's Disease

- Decreased height velocity has been reported in patients before onset of gastrointestinal symptoms
- Up to 25% of patients may not achieve full adult height potential
- Corticosteroids may exacerbate growth impairment
- Interventions should be initiated before completion of puberty

Kanof et al, *Gastroenterology* 1988; 95:1523  
Hildebrand et al, *J Pediatr Gastroenterol Nutr* 1994; 18:165



## IBD/Enteral Nutrition Formula Type

- Adults: no change in outcome if elemental formula vs polymeric (OR 1.10)
- Children: better growth with non-elemental
- Better tolerance with non-elemental
- Better compliance with treatment goals with non-elemental



## IBD/Enteral Nutrition

- Disease location:
  - Studies lack power
  - Isolated colon Crohn's response << small bowel disease
- Complications
  - Non-compliance
  - Refeeding syndrome



## IBD/Enteral Nutrition

- Duration of treatment
  - Range 3-12 weeks; average 6-8 weeks
  - Inflammatory markers improve after 1 week
  - Consider changing treatment if no response in 3-4 weeks
- Route of Administration
  - PO common in UK, Australia
  - No change in outcome PO vs NG



## IBD/Enteral Nutrition

- Reintroduction of regular diet
  - Gradual vs abrupt change
  - No data on hypoallergenic diet
  - Most centers reintroduce over 1-3 weeks



## IBD/Enteral Nutrition Maintenance of remission

- Japan study (adults)
  - 50% elemental formula
  - 34.6% relapse vs 64% on unrestricted diet
- Canadian study (pediatrics)
  - 42% relapse vs 79% with no supplement
- Other protocols
  - Overnight NG feedings
  - Burst NG feedings
  - Oral supplements



## IBD/Enteral Nutrition

- Adult study (Japan) Post-ileal resection pts
  - Night-time drip elemental with low fat diet PO
  - Relapse rate 30% at 12 months vs. 70% for unrestricted diet patients
- Japanese study
  - Decreased relapse with 1200 kcal of formula vs TPN



## Barriers to EN

- Adherence (similar to allergy diet)
- Cost; insurance coverage
- Resource demands (RN, RD, MD)
- Experience
- Patient/Parent acceptance
- NG Tube fear
- Disruption of daily life



## Implementation

- Initial instruction – inpatient vs home care
- Re-evaluation at regular intervals
- NG vs PO vs mix vs G-Tube (taste fatigue)
- Goal setting – nutrition and duration
- Supplies
- Life changes – work, school, home



## Monitoring Nutritional Status: Laboratory Assessment

- Abnormal lab values may be related to inflammation rather than tissue stores or functional deficits
- Consider evaluating:
  - Albumin
  - Iron/ferritin
  - Zinc
  - Calcium
  - Phosphorus
  - Folate
  - Hemoglobin
  - Vitamins A, D, E, K, B12
  - Copper
  - Magnesium
  - Selenium
  - Pre-albumin



## Determinants of Adherence

- **Illness-related**
  - Disease activity
  - Disease duration
  - Dosing interval
- **Family-related**
  - Family functioning
  - Effect on siblings
  - Finances
- **Patient-related**
  - Psychological status
  - Depression
  - Assessment of physician
- **Physician-related**
  - Effective communication
  - Assessment of adherence

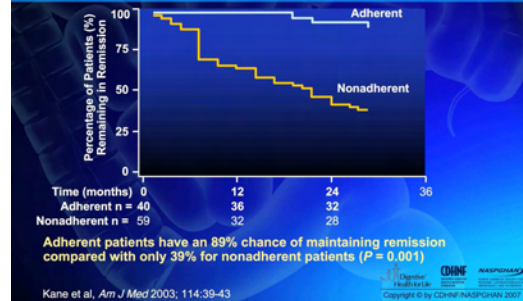
Levy et al, *Am J Gastroenterol* 1999; 94:1733-1742.

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## Importance of Adherence



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## IBD Nutrition

- Specific Carbohydrate Diet
  - No dairy, gluten, processed foods
  - No disaccharides and starches
  - No artificial sweeteners
  - Limits carbohydrates, no ketosis
- Yeast Free diet
- Microparticle diet
- Hypoallergenic diet- 14% food intolerance



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## IBD/EN References

- Dietary Guidelines
  - Brown et al *Expert Rev Gastr Hepatol* 2011;5; 411-425



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