Environmental enteric dysfunction: measures and implications for growth

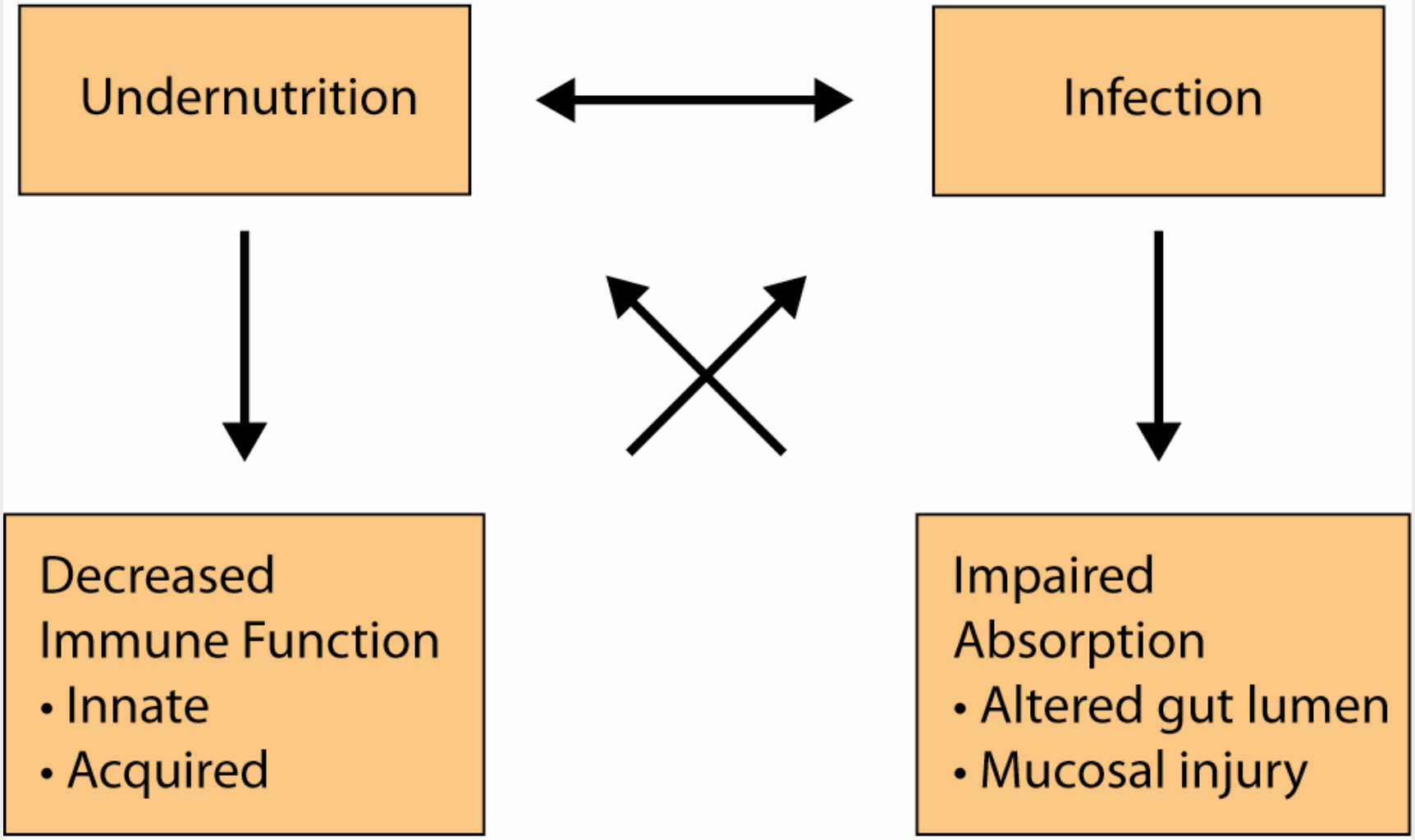
October 16th, 2017

21st International Congress of Nutrition (ICN), Buenos Aires, Argentina

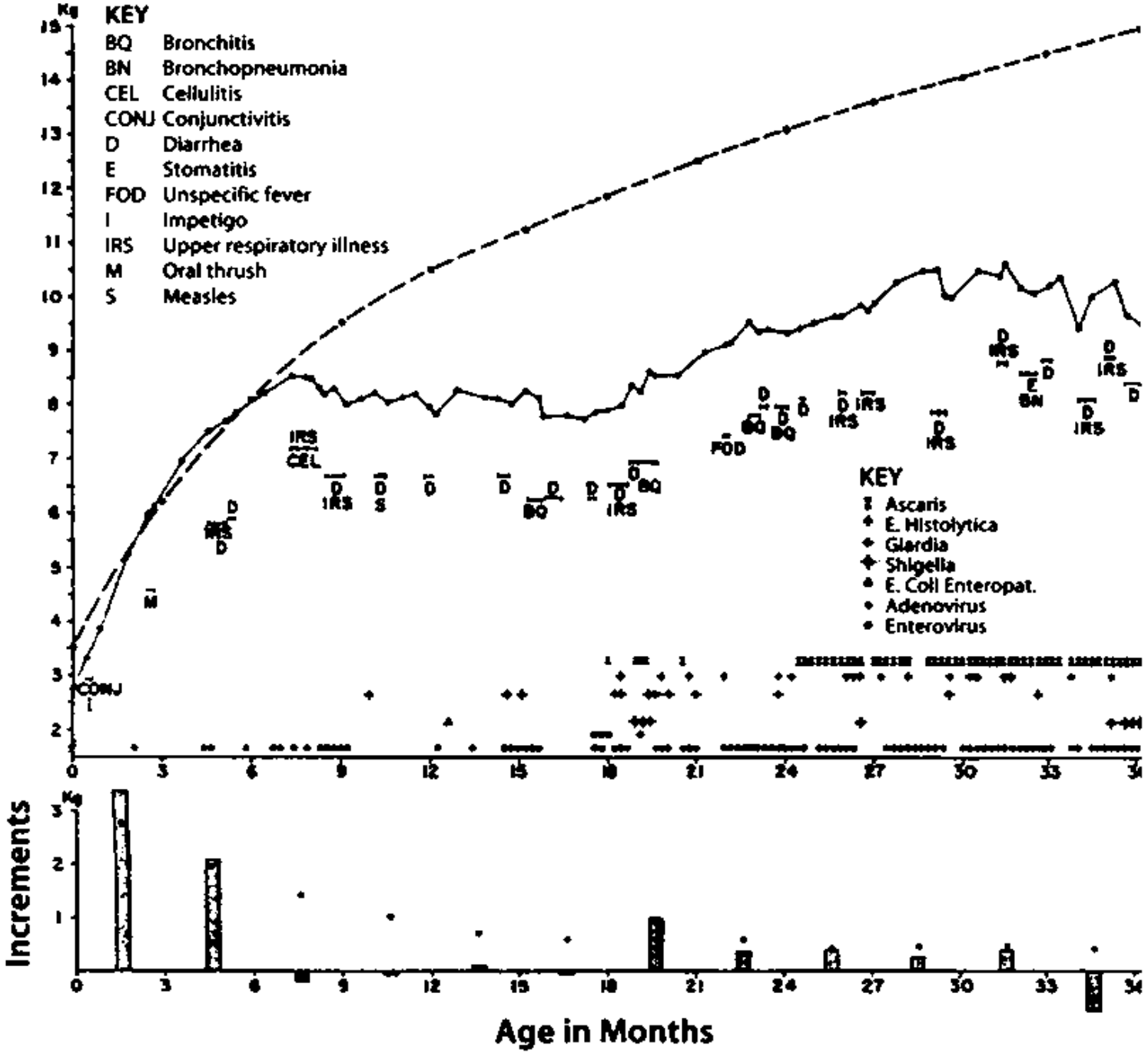
Dr. Irwin H. Rosenberg

Tufts University, Friedman School of Nutrition Science and Policy

Malnutrition Infection Interactions

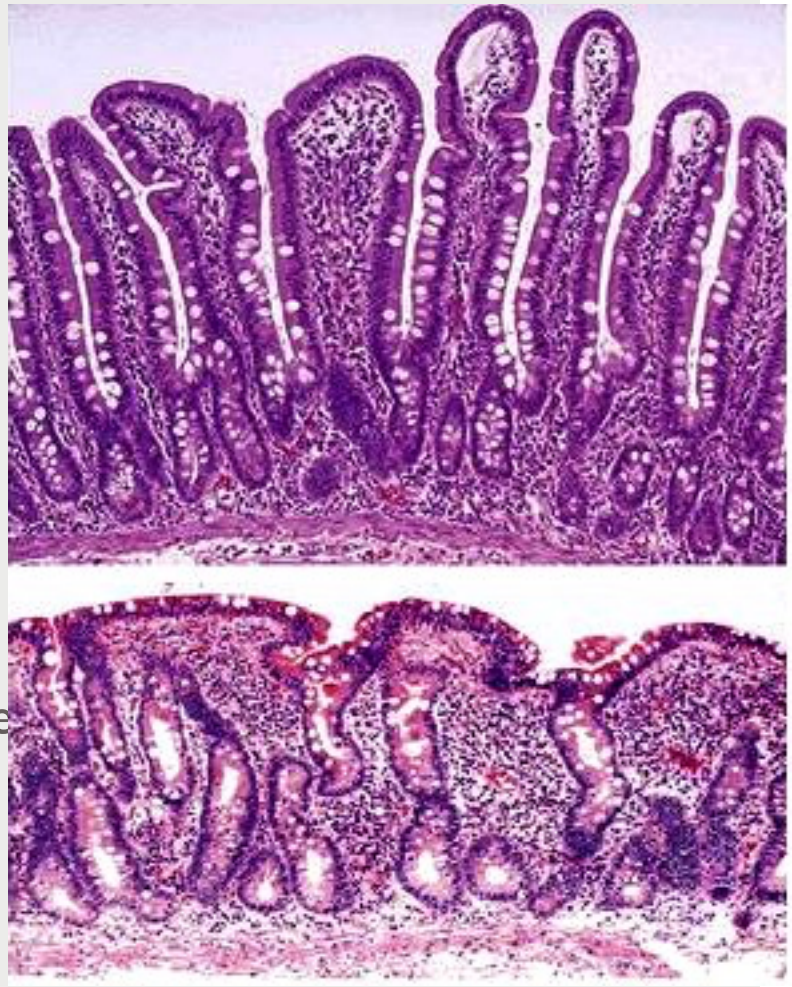


CTLT


KEY
BQ Bronchitis
BN Bronchopneumonia
CEL Cellulitis
CONJ Conjunctivitis
D Diarrhea
E Stomatitis
FOD Unspecific fever
I Impetigo
IRS Upper respiratory illness
M Oral thrush
S Measles
KEY
Ascaris
E. Histolytica
Giardia
Shigella
E. Coli Enteropat.
Adenovirus
Enterovirus
Increments
Age in Months

Environmental enteric dysfunction (EED), a subtle cause of malnutrition and stunting?

- 1960's, new methods available to biopsy small bowel revealed differences in mucosal structure between Western adults and adults in tropical developing countries, including shortened villi, mucosal inflammation, and reduced absorptive function
- Similar changes occurred in expatriates living in tropical environments, minimum symptoms, some weight loss so named tropical/sub-clinical malabsorption/jejunitis/enteropathy
- These changes reversed after returning home without Rx
- Etiology unclear but environmental factors were suspected
- Limited data, mostly functional, shows similar changes occur in young children early in life.
- Uncertain relevance so interest waned



EED: What, Why and So What?

- **What?** An acquired functional and structural change of the intestine (? just small bowel) in the absence of overt illness, serious growth faltering. We currently lack a clear standard definition. EED may begin early in life.
- **Why?** Factors encountered in the environment of still unknown type related to microbial contamination, diet, toxic factors in water or food, or others to be identified.
- **So what?** May lead to early malnutrition, and predispose to susceptibility to infection with pathogens and increase the severity of their consequences. Potentially reversible and if so could be as important as reducing exposure to pathogens or improving response to oral vaccines.

Recently interest in EED has increased as a reversible cause of malnutrition and stunting

- Is EED still recognized?
- What are its hallmarks?
- What are its causes?
- What are its consequences?

Most common studies performed:

- Dual sugar absorption (lactulose:mannitol) to assess gut permeability and absorption
- Pentose (xylose) or dissacharide (lactose) absorption
- Inflammatory markers (serum or stool)
- Fecal host mRNA and markers of inflammation: CD53, HLA-DRA, MUC12, CDX1, S100A8, REG1A, and TNF
- Microbiome changes

Problems with available data

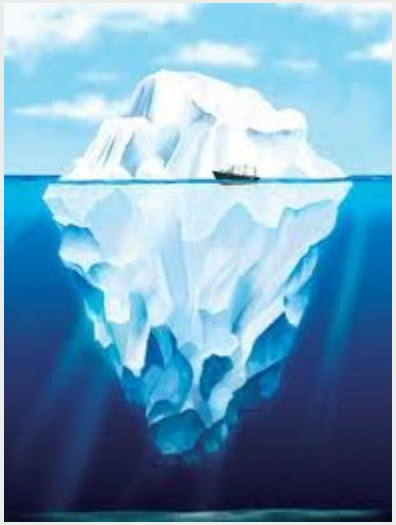
- Studies do not address whether or not EED precedes acute or persistent diarrhea or is a consequence of clinical disease
- Studies do not correlate early evidence of EED with growth, nutrition, immune function, susceptibility to infection
- Studies lack a consensus definition of EED that could be applied systematically and prospectively

But the results do suggest that we may have been asking the wrong question!

Not whether enteric infection causes enteropathy and malnutrition but rather does enteropathy cause malnutrition which exacerbates diarrhea and stunting?

Malabsorption/Tropical Sprue

Infection



Malnutrition

EED/Stunting

What needs to be done?

- First need a standard definition of EED
- New studies using this definition could provide clues to the relevance of EED as antecedent cause for malnutrition and increased infection
- Clues to etiologic factors may be obtained so intervention studies can be planned
- A new cost-effective strategy to combat EED and its consequences may result, particularly effective if applied right after birth (or before) to reduce impacts during rapid growth and development of infants and children