Congenital Diarrhea
Congenital Diarrhea

Chronic Diarrhea in the Neonatal Period or within the first week of life, in the hours or even in the uterus
Chronic Diarrhea and Malabsorption

- Diarrhea
  - chronic if persistent beyond 2 wks
  - wide variability in normal stool frequency and consistency

- Malabsorption
  - may/may not be associated with chronic diarrhea

Congenital Diarrhea always associated with Malabsorption
Post-natal Adaptation to Enteral Nutrition

- Rapid transition from parenteral to enteral nutrition at birth require
  - coordinated sucking and swallowing
  - gastric emptying
  - intestinal motility

- Process begins in utero with passage of amniotic fluid
Post-natal Development of Intestinal Function

- Gut highly differentiated at birth
- Pancreas and liver poorly developed
Ontogeny of Suckling and Swallowing

- “non-nutritive” at 18-24 wks gestation
- “nutritive” at 34-35 wks gestation
- sucking parallels intestinal motility
- weaning requires further adaptation
Post-natal Small Intestine Growth

- Elongates x 1000 in utero
- 200-300 cm at birth
- 5-6 m at maturity
The Gut as a Tube

- Surface area ↑300x
- $2 \times 10^6 \text{ cm}^2$
Types of diarrhea

- Secretory
- Exudative
- Osmotic
- Malabsorption
- Deranged motility

Voluminous, bulky, watery stools
Major Pathophysiologic Mechanisms

- **Maldigestion**:
  - CF (all nutrients)
  - Congenital Bile acid impairment (fat)
  - Congenital enterokinase deficiency (protein)

- **Fermentation**:
  - Congenital lactase deficiency

- **Malabsorption**:
  - Andersen’s disease, Celiac disease
Causes of Congenital Diarrhea and Malabsorption

- Milk and Soy Protein Intolerance
- Microvillus Atrophy
- Tufting Enteropathy
- Phenotypic, Abnormal Immunity
- Enterokinase Deficiency
- Lactase Deficiency
- Short Gut (Con/Surgical)
- Transport Defect
- Protracted Diarrhea
- Pancreatic
- Hepatobiliary

Rare:
- Autoimmune entropathy
- Hirschsprung’s disease
- Congenital hyperthyroidism
- Glycosylation defect
- Congenital myopathy deafness
Vicious Cycle of Protracted Diarrhea (Walker-Smith Speculation 1998)

- Acute gastroenteritis
- Initial mucosal damage
- Further mucosal damage
- Malnutrition
- Malabsorption
- Impaired immunity
Congenital absence or defects of transport processes can result in diarrhea.

<table>
<thead>
<tr>
<th>Example</th>
<th>Transport process</th>
<th>Ion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congenital Chloridorrhea</td>
<td>Cl/HCO₃</td>
<td>Cl</td>
</tr>
<tr>
<td>Glucose/Galactose Malabsorption</td>
<td>Na/glucose</td>
<td>Na</td>
</tr>
<tr>
<td>Congenital Secretary Diarrhea</td>
<td>Na/H</td>
<td>Na</td>
</tr>
<tr>
<td>Bile Salt Transport Deficiency</td>
<td>Na-dependent Bile Acid</td>
<td>Bile Salts</td>
</tr>
</tbody>
</table>
What are the Manifestation?

Watery Diarrhea
FTT
Edema
Vomiting
Dehydration
Recurrent Infection
Diagnostic tests

- Medical history & physical examination
- Stool: Ph, Na, Cl, K, Fat, Culture, RS, OP+oB, WBC, RBC, Bile acid
- Blood tests: ABG, Na, K, Cl, A/G, Immunity study
- EGD and biopsy
- Colonoscopy
<table>
<thead>
<tr>
<th>CONDITION (IN ORDER OF DECREASING SEVERITY)</th>
<th>DISTINCTIVE CLINICAL FEATURES</th>
<th>KEY LABORATORY INVESTIGATION</th>
<th>THERAPEUTIC DECISION</th>
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<tr>
<td>Congenital microvillus atrophy*97</td>
<td>Intractable* watery diarrhea</td>
<td>Intestinal biopsy (PAS stain)</td>
<td>Total parenteral nutrition</td>
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<td>Tufting enteropathy*98,99</td>
<td>Intractable watery diarrhea</td>
<td>Intestinal biopsy</td>
<td>Total parenteral nutrition</td>
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<td>Intractable diarrhea with phenotypic abnormalities*100</td>
<td>Intractable watery diarrhea</td>
<td>Immune system investigations</td>
<td>Total parenteral nutrition</td>
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<tr>
<td>Congenital glucose-galactose malabsorption</td>
<td>LBW</td>
<td></td>
<td></td>
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<tr>
<td>Congenital lactase deficiency</td>
<td>Acid diarrhea</td>
<td>Intestinal biopsy (Ussing chamber, brush border vesicles)</td>
<td>Replacement of glucose and galactose by fructose in the diet</td>
</tr>
<tr>
<td>Congenital chloride diarrhea</td>
<td>Acid diarrhea</td>
<td>Intestinal biopsy (assay of activity)</td>
<td>Lactose-free diet</td>
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<tr>
<td>Congenital defective jejunal Na*/H+ exchange*101</td>
<td>Hydramnios, intractable watery diarrhea</td>
<td>Assay of electrolytes in stools</td>
<td>IV then oral CI supplementation</td>
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<tr>
<td>Congenital bile acid malabsorption</td>
<td>Hydramnios, intractable watery diarrhea</td>
<td>Assay of electrolytes in stools</td>
<td>IV then oral Na* supplementation</td>
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<tr>
<td>Congenital enterokinase deficiency</td>
<td>Steatorrhea</td>
<td>Bile acid assay in plasma, stools</td>
<td>MCT, cholestyramine</td>
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<td>Failure to thrive, edema</td>
<td>Intestinal biopsy (assay of kinase activity)</td>
<td>Protein hydrolysate</td>
</tr>
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New Treatment

- PIP for Chloridorrha
- Interferon
- Somato