<table>
<thead>
<tr>
<th>Session Title:</th>
<th>Recurrent Infections in Pediatrics: Allergies or Immunodeficiency?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Objectives:</td>
<td>Describe the factors that increase the risk of recurrent infections. Describe the workup of patients to determine if a clinically significant immune defect is present. Explain the &quot;red flags&quot; for rare vs. common presentations of routine infectious presentations to the allergy office.</td>
</tr>
</tbody>
</table>

**Discussion Leaders**

<table>
<thead>
<tr>
<th>Dr. Jason Caldwell MCS DO Assistant Professor of Internal Medicine and Pediatrics Section of Pulmonary Critical Care Allergic and Immunological Diseases Wake Forest School of Medicine Winston-Salem, USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laurence E. Cheng, MD PhD Assistant Professor of Pediatrics Director, Pediatric Allergy Clinic UCSF Benioff Children’s Hospital University of California, San Francisco</td>
</tr>
</tbody>
</table>
Approaching Immune Defects

• How do the different components of the Immune System lead to a diagnosis?
• Think about the causes of recurrent infections in children
• What is the pattern of infection
• Use the incidence and classification of primary immune deficiency to guide the work up
• Warning signs and “red flags”
• Basic screening and diagnostics
Components of the Immune System

Adaptive Immunity
- T cells
- B cells

Innate Immunity
- Phagocytic Cells
- Complement
- NK cells
<table>
<thead>
<tr>
<th></th>
<th>Adaptive</th>
<th>Innate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response time</td>
<td>Delayed</td>
<td>Immediate</td>
</tr>
<tr>
<td>Number of ready responders</td>
<td>Very few at first</td>
<td>Potentially Many</td>
</tr>
<tr>
<td>Specificity</td>
<td>Yes</td>
<td>Yes and No</td>
</tr>
<tr>
<td>Plasticity</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Memory</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
Causes of Recurrent Infections in Children

- Normal: 50%
- Atopy: 30%
- Chronic Condition: 10%
- PID: 10%
Pattern of Infections

- **Bacterial**
  - Location of infection
    - Skin
    - Sino pulmonary
    - Severe Pneumonia
    - Meningitis
  - Characteristics
    - Catalase Positive
    - Encapsulated
    - Intracellular
    - Opportunistic
    - Weird

- **Viral**
  - Vaccine associated
  - Chronic
  - Type specific

- **Fungal**
  - Cutaneous
  - Invasive

- **Parasitic**
  - Opportunistic
  - Impaired Clearance
Primary Immune Deficiencies

Relative Incidence

- Antibody Deficiency: 53%
- Complement Deficiency: 1%
- Phagocytic Disorders: 14%
- T cell Deficiency: 7%
- Others: 2%

Annals of Allergy, Asthma, & Immunology (2005)
**Warning Signs and Red Flags**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td><strong>8</strong></td>
</tr>
<tr>
<td>Eight or more new ear infections within 1 year.</td>
<td>Recurrent, deep skin or organ abscesses.</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td><strong>7</strong></td>
</tr>
<tr>
<td>Two or more serious sinus infections within 1 year.</td>
<td>Persistent thrush in mouth or elsewhere on skin, after age 1.</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td><strong>9</strong></td>
</tr>
<tr>
<td>Two or more months on antibiotics with little effect.</td>
<td>Need for intravenous antibiotics to clear infections.</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td><strong>10</strong></td>
</tr>
<tr>
<td>Two or more pneumonias within 1 year.</td>
<td>Two or more deep-seated infections.</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td></td>
</tr>
<tr>
<td>Failure of an infant to gain weight or grow normally.</td>
<td>A family history of Primary Immunodeficiency.</td>
</tr>
</tbody>
</table>
Warning Signs and Red Flags

• Failure to Thrive
• Skin findings
• Dysmorphic features
• Dentition
• Autoimmunity
• Skeletal abnormalities
Associated Diseases

- Failure to Thrive (SCID, chronic infection)
- Skin findings (SCID, Hyper IgE Syndrome, Wiskott Aldrich syndrome, NEMO)
- Dysmorphic features (Hyper IgE syndrome, DiGeorge Syndrome, Cartilage Hair Hypoplasia, NEMO)
- Dentition (Chronic Granulomatous Disease, Leukocyte Adhesion defect, Hyper IgE Syndrome)
- Autoimmunity (CVID, DiGeorge Syndrome, atypical SCID)
- Skeletal abnormalities (Hyper IgE syndrome)
Screening and Diagnostics

- Antibody Deficiency
- Combined Immune Deficiency
- Neutrophil Disorders
- T cell Defects
- Complement Defects