

# The Wheezy Baby

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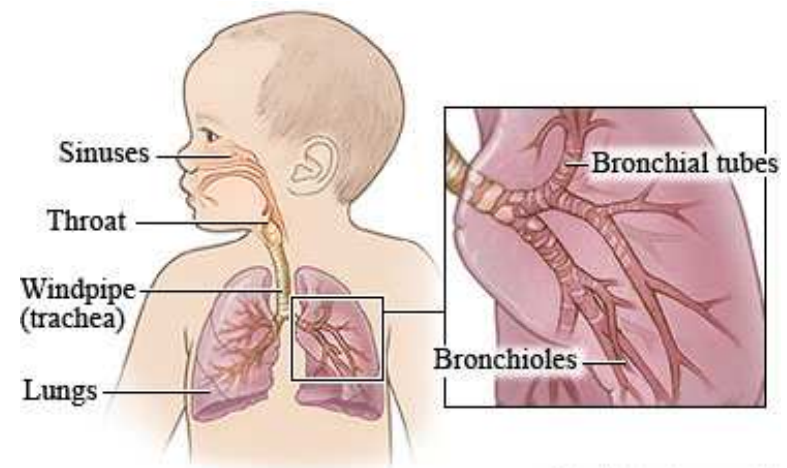
# Wheezing

- A continuous musical whistling sound heard via chest auscultation during expiration



# Causes of wheezing

- Caused by increased turbulent airflow through obstructed intrathoracic airways
- Transient or Persistent
- May be caused by:
  - Bronchospasm
  - Edema
  - Space-occupying lesion



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Most transient wheezing is associated with viral infections

# Wheezing vs Stridor

- Wheezing is generally caused by intrathoracic obstruction and occurs on exhalation
- Stridor is an inspiratory noise
- Stridor in the infant is associated with
  - Croup
  - Bacterial tracheitis
  - Epiglottitis
  - Retropharyngeal or peritonsillar abscess
  - Laryngeal abnormality



# Wheezy Infants



- Foreign body
- Non-hereditary anatomic causes
  - Enlarged lymph nodes
  - Tumor
  - Chronic lung disease of prematurity (formerly BPD)
- Hereditary and biochemical disorders
  - Congenital deformities
  - Laryngotracheobronchomalacia
  - Cystic fibrosis
  - GE reflux
  - Tracheoesophageal fistula

# Foreign Body Aspiration

- May present as wheezing or stridor, depending on location of the object
  - Laryngeal or tracheal FB may manifest as cough and stridor or voice change
  - Bronchial FB may manifest as cough, dyspnea, unilateral wheeze or decreased air movement



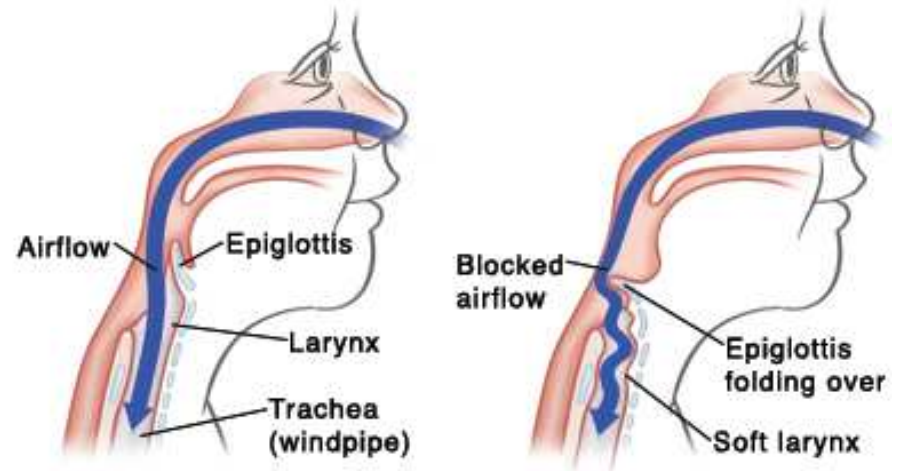
# Tracheomalacia/Laryngomalacia

- “Happy Wheezer”
- Wheeze begins 4-8 wks old
- Noise increases with activity
- May be confused with bronchiolitis, asthma, CF
- No improvement with bronchodilator



# Exam: Tracheo/Laryngomalacia

- Lungs with good air entry
- Tracheo: wheeze throughout exhalation and sounds the same in all lung fields
- Laryngo: abnormal sounds on inspiration and exhalation
- Voice and cry are normal





# Causes Tracheo/Laryngomalacia

- Most cases isolated and idiopathic
- Transient defects in tracheal cartilage development
- Vascular anomalies or other causes of airway compromise
- Common after repair of T-E fistula
- May occur with or complicate other disorders
  - GE reflux
  - Recurrent aspiration
  - Chronic lung disease of prematurity



# Chronic Lung Disease after Premature Birth

- Lung injuries early in life may have lifelong consequences
- Bronchopulmonary dysplasia is the most common chronic lung disease of infancy
  - Defined as need for supplemental O<sub>2</sub> for at least 28 days after birth
  - Severity graded according to respiratory support needed near term
  - Accurate markers of chronic lung damage in premature infants are lacking

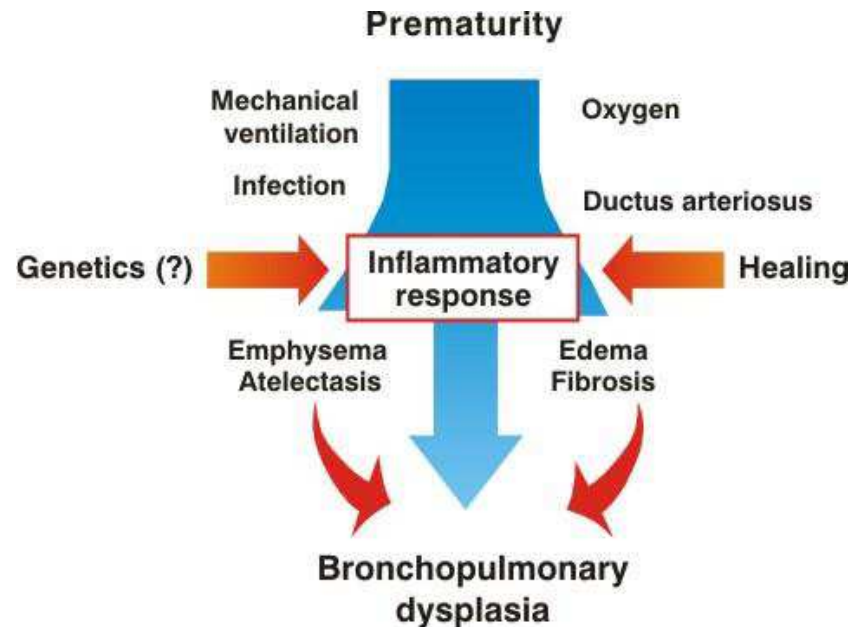
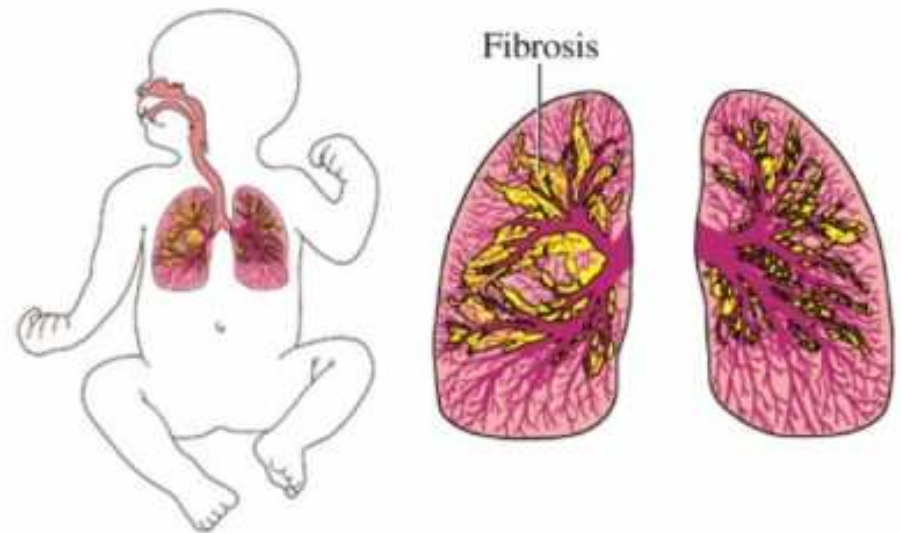


Figure 1 - Pathogenesis of bronchopulmonary dysplasia<sup>1</sup>

# Chronic Lung Disease

- “Old” BPD originally described in slightly preterm newborns with respiratory distress syndrome exposed to aggressive mechanical ventilation and high concentrations of inspired O<sub>2</sub>.
  - Diffuse airway damage
  - Smooth muscle hypertrophy
  - Neutrophilic inflammation
  - Fibrosis
- Measures to prevent and treat RDS have decreased this form
  - Corticosteroids
  - Surfactant replacement



# Chronic Lung Disease

- “New” BPD with improved survival among infants born at earlier gestational ages with different pattern of lung injury
- Developmental disorder
  - Mild respiratory distress at birth
  - At this early developmental stage, even minimal exposure to injury may affect lung growth/development
  - Normal structural complexity of the lung may be lost; fewer alveoli develop, decreased surface area for gas exchange



# Chronic Lung Disease

- Multisystem disorder may be associated with
  - Growth retardation
  - Pulmonary hypertension
  - Neurodevelopmental delay
  - Hearing defects
  - Retinopathy of prematurity



# Chronic Lung Disease

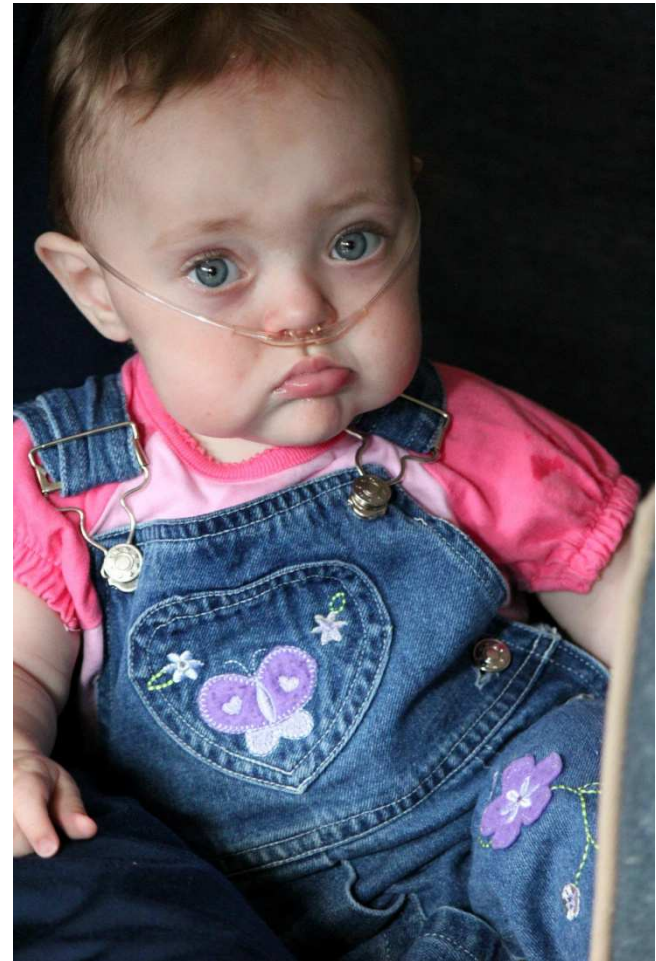
## Symptoms

- Recurrent wheezing
  - High rate of admission to hospital for complications of respiratory infections
  - High risk for viral infections
- Chronic cough
- Tend to improve over time



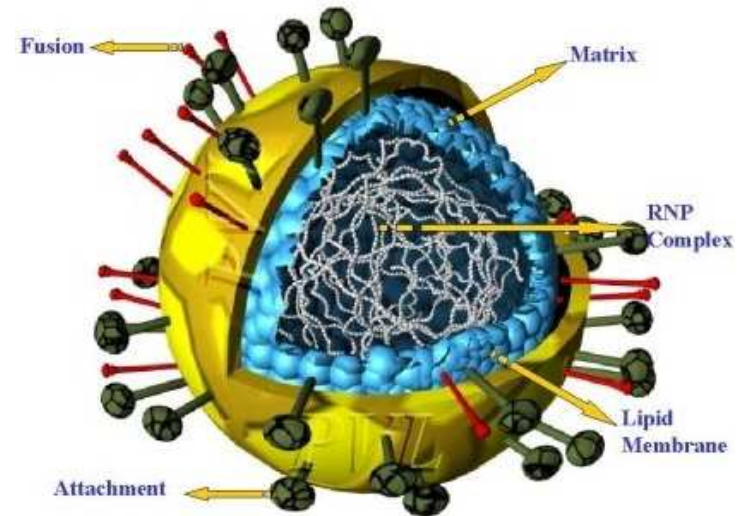
# Chronic Lung Disease

- Asthma-like, but not asthma
- Airway obstruction, but only partially bronchodilator responsive
- No eosinophilic inflammation
- Non-atopic
- Fibrotic changes
- No benefit from use of inhaled corticosteroids
- Consider diuretics
- MDIs better than nebs



# RSV

- Bronchiolitis or pneumonia
- Peak incidence 2-8 months
  - 4-5 million kids/yr 125K hospitalizations annually
  - Virtually all kids get it by age 3 yr
- Inoculation via respiratory route
- Begins with symptoms of URI then progresses rapidly along intra-cytoplasmic bridges (syncytia) from upper to lower respiratory tract





# RSV Risk Factors

- Childcare
- Older siblings in school
- Crowding/lower socioeconomic status
- Exposure to cigarette smoke/environmental pollutants
- Multiple births
- Minimal breastfeeding



# RSV Prevention



## High risk infants

- Eliminate cigarette smoke exposure
- Avoid settings where RSV transmitted
- Hand hygiene in all settings including home
- Palivizumab prophylaxis
- Immunize all babies  $> 6$  mos and contacts for influenza

# RSV Risk for Severe Disease

Consider hospitalization

- Prematurity < 35 wks
- < 3 months at time of infection
- Chronic lung disease
- Congenital heart disease
- Congenital immune deficiency
- Toxic at presentation
- Resp rate > 70 or room air O<sub>2</sub> sat < 95%
- Atelectasis or pneumonia on CXR



# RSV Palivizumab



High risk: premature infants, infants with chronic lung disease, congenital heart disease, immune deficient

- Humanized murine monoclonal antibody with neutralizing and fusion inhibitory activity against RSV
- IM monthly injection during RSV season
- First dose at 48-72 hrs of discharge then Q 30 days Nov through March
  - 15mg/kg
  - Results in 45-55% decrease in hospitalization due to RSV in high risk infants

# Initial management of bronchiolitis

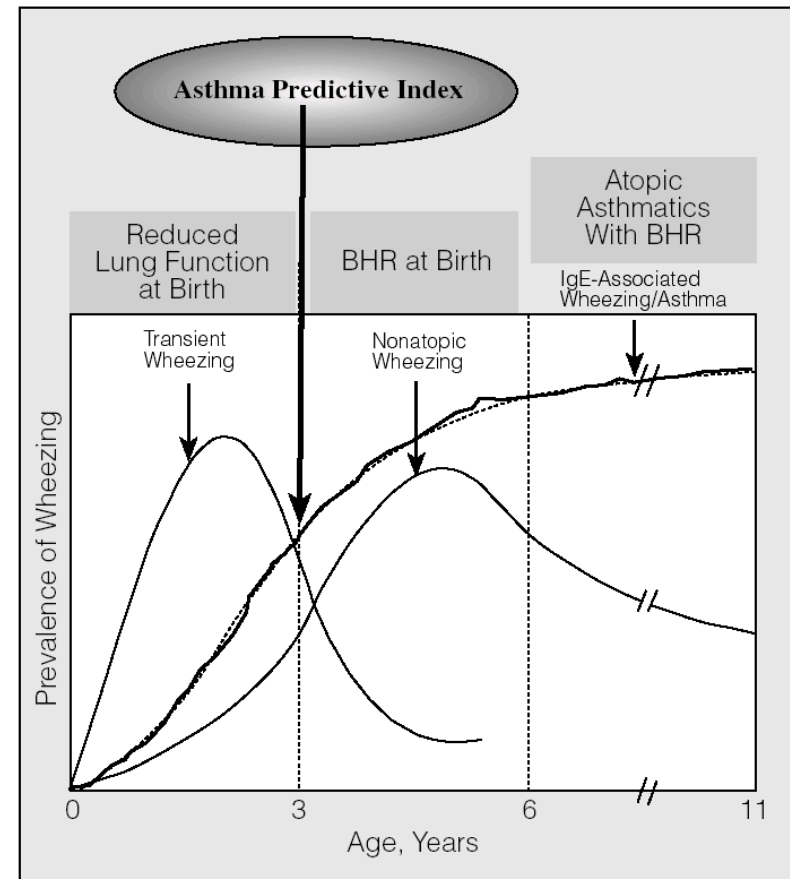
- Short term bronchodilation
- Oral steroid
- Montelukast ?
- Epinephrine ?
- Supplemental oxygen
- Hydration
- Nutrition

Close follow-up is KEY



# Transient Wheezing

- Wheezing in discrete episodes of 2-4 wks in duration
- Child is well between episodes
- Usually has viral trigger
- Usually not associated with atopy
- Rarely progresses to asthma



# Persistent Wheezing

- Distinct severe episodes of wheezing AND intermittent symptoms
  - Cough/ wheeze at night
  - Exercise
  - Crying
  - Laughing
  - Cold air
- Viral trigger for severe episodes is common
- Other triggers: passive smoking, allergen exposure, air pollution

# Persistent Wheezing

- Highly associated with atopic sensitization even as early as 1 yr of age
  - Food allergies to milk and eggs
  - Sensitization to indoor allergens
- Atopic dermatitis
- Progresses often to asthma





# Other risk factors for wheezing

- Acetaminophen use
- Lack of breastfeeding
- Tobacco smoke exposure
- Low birth weight



# Acetaminophen...really?

International Study of Asthma and Allergies in Childhood (ISAAC)

205,487 children 6-7yr old from 73 centers in 31 countries

- Treatment with paracetamol during first year of life increased risk for asthma at age 6 by 46%
- Also showed increased risk of eczema and rhinoconjunctivitis

Lancet (2008)372.1039-1048



# Breastfeeding

- 4 months of exclusive breastfeeding is protective against later asthma
  - JACI (2010) 125. 1013-1019
- Each month of exclusive breastfeeding is associated with significant decreases in current asthma ages 2-6yrs
  - JPeds (2012) 160. 991-996



# Maternal Smoking

- Smoking during pregnancy and nursing increases risk for later asthma and allergic sensitization



# Birth weight

- Newborns with low birth weight (small for gestational age) are at high risk for later asthma



# Questions ?

