

***Pulmonary Hemorrhage in Infants  
and Pediatric Patients***

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**Pulmonary Hemosiderosis:**

Hemosiderin often forms after bleeding, or a hemorrhage. Blood leaves vessel, the cell dies and the hemoglobin of the red blood cells is released into the extracellular space. Leukocytes or white blood cells phagocytize hemoglobin to degrade it, producing hemosiderin and porypherin.

Idiopathic Pulmonary Hemosiderosis (IPH)  
Acute Idiopathic Pulmonary Hemorrhage (in infants) (AIPH) *Stachybotrys atra*

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**Pulmonary Hemorrhage in Newborn Infants**

Pulmonary Hemorrhage present in 7 to 10% of neonatal autopsies, but up to 80% of autopsies of very small, preterm infants. Some sudden infant death autopsy results find pulmonary hemorrhage. The incidence is 1 in 1,000 live births. Pulmonary hemorrhage mortality rate is 30% to 40%.

Other common factors Pulmonary Hemorrhage are...

- Prematurity
- Perinatal asphyxia
- Toxemia of pregnancy,
- Maternal cocaine use,
- Erythroblastosis fetalis
- Breech delivery Hypothermia

Infection

Acute respiratory distress syndrome in infants (ARDS),  
administration of exogenous surfactants  
extracorporeal membrane oxygenation (ECMO)

Source: 2004 UCSF Intensive Care House Staff Manual available at:  
[http://www.ucsfhealth.org/childrens/health\\_professionals/manuals/29\\_PulmHemorrhage.pdf](http://www.ucsfhealth.org/childrens/health_professionals/manuals/29_PulmHemorrhage.pdf)

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The following International Classification of Diseases (ICD) - 9 codes are used to code hospitalizations of infants with pulmonary hemorrhage:

- 516.1 Idiopathic pulmonary hemorrhage  
Blood in lungs or airways not secondary to trauma, abuse, surgical or penetrating injury.
- 786.3 Hemoptysis
- 578.0 Hematemesis
- 275.0 Dis Iron Metabolism
- 486 Pneumonia, Organism NOS
- 518.81 Respiratory Failure
- 786.09 Respiratory Abnorm NEC

Available at: [http://pedscm.org/RESEARCH/Pulmonary\\_hemorrhage.html](http://pedscm.org/RESEARCH/Pulmonary_hemorrhage.html)

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'cluster' cases -1993 to 1998, a total of 37 cases of IPH were found in the Cleveland area. Twelve of these infants died. Other 'cluster' cases in Kansas, Chicago and other urban communities. Blood in airways, macrophages engulfing RBCs, distress, hypoxemia, and eventual intubation and efforts at resuscitation. Suspected causes of pulmonary hemorrhage in an infant or pediatric patient:

- bacterial pneumonia
- septicemia
- tuberculosis
- bronchiectasis
- pulmonary malignancy
- Gaucher's disease
- Wegener's granulomatosis
- cardiac abnormalities
- vascular anomalies

Source: <http://lebo.netis.nih.gov/members/1999/107e927-930#scopar#scopar-full.html>

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**30 cases in Cleveland (2002) PEDIATRICS Vol. 110 No. 3 September 2002, pp. 627-637**

**Differential Diagnosis of Acute, Isolated Alveolar Hemorrhage in Infancy, beyond the newborn period, ie, after discharge from newborn nursery.**

**Three quarters of the patients required ventilator support and blood transfusions.**

**Eleven patients had transitory hemoglobinuria.**

**Five patients died, but infants who survived did well.**

**Rebleeding from the lower respiratory tract decreased from 5 of 7 infants to 1 in 21.**

**Frequently accompanied by hematemesis and epistaxis.**

Available at:  
<http://pediatrics.aappublications.org/cgi/content/full/110/3/627>

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**30 cases in Cleveland (2002) PEDIATRICS Vol. 110 No. 3 September 2002, pp. 627-637**  
**Respiratory distress including grunting, nasal flaring, retractions, cough, wheeze, or color change such as pallor or cyanosis.**  
**Cleveland case inclusion /exclusion causes:**  
- **Necrotizing pneumonia**  
- **Sepsis with acute respiratory distress syndrome**  
- **Congenital heart defect with congestive heart failure or pulmonary venous hypertension**  
- **Trauma**  
- **Foreign body**  
- **Suffocation**  
- **Arteriovenous malformation**  
- **Antibodies to cow milk proteins (Heiner's syndrome)**  
- **Idiopathic cause(s)**  
**Available at:**  
<http://pediatrics.aappublications.org/cgi/content/full/110/3/627>

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**Cases:** The cluster cases of AIPH in Chicago, Detroit, Kansas City, and Cleveland  
**Risk factors for illness in the cluster cases included...**  
- male sex  
- lack of breast-feeding  
- residence in households with smokers  
- residence in homes where water damage had occurred during the previous 6 months;  
- residence in homes with increased quantities of fungi, including *S. atra* (however, analysis revealed sources and high amounts of fungal spores other than *S. atra* in inhaled environment.  
CDC may term these cases as acute idiopathic pulmonary hemorrhage (AIPH).  
References: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5302a1.htm>  
<http://www.cdc.gov/mmwr/PDF/rr/rr5302.pdf>

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**Therapy options in pulmonary hemorrhage**  
**Cleveland recommendations:**  
Investigate cause  
Use PEEP  
Transfusion  
Steroids  
Remove infant from home environment and second hand smoke  
**Source:** <http://pediatrics.aappublications.org/cgi/content/full/110/3/627>  
  
**Treatment with in very low birthweight infants with PH using Activated Recombinant Factor VII (rFVIIa) to improve clotting factors.**  
**Source:** Olomu, Kulkarni, & Manco-Johnson Available at: <http://www.nature.com/journal/v22/n8/full/7210787a.html>

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Commonly considered a side effect of surfactant instillation. Cochrane analysis suggested that risks of withholding surfactant therapy far greater than probability of pulmonary hemorrhage.

Source:

<http://www.nichd.nih.gov/cochrane/SOLL8/SOLL.HTM>

Immediate treatment of PH should include tracheal suction, oxygen and positive pressure ventilation. To assist in decreasing P-Hem, mean airway pressure should be increased, either by a relatively high PEEP of 6 to 10 cmH<sub>2</sub>O or by high frequency ventilation.

Correct underlying abnormalities, especially disorders of coagulation.

When blood loss is large, prompt blood transfusion may be needed to maintain an adequate circulating blood volume. The outcome is dependent on the cause of PH. Mortality is 30 to 40%.

UCSF, *ibid*.

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