

distress of a nonpulmonary origin in neonates may also be caused by sepsis, cardiac defects (structural or functional), exposure to cold, airway obstruction (atresia), intraventricular hemorrhage, hypoglycemia, metabolic acidosis, acute blood loss, and drugs. Pneumonia in the neonatal period may result in respiratory distress caused by bacterial or viral agents and may occur alone or as a complication of RDS.

Pathophysiology

Preterm infants are born before the lungs are fully prepared to serve as efficient organs for gas exchange. This appears to be a critical factor in the development of RDS. The effects of lung immaturity are compounded by the presence of more cartilage in the chest wall, leading to increased compliance of the chest wall, which collapses inward in response to less compliant (stiffer) lung tissue.

There is evidence of fetal respiratory activity before birth. The lungs make feeble respiratory movements, and fluid is excreted through the alveoli. Because the final unfolding of the alveolar septa, which increases the surface area of the lungs, occurs during the last trimester of pregnancy, preterm infants are born with numerous underdeveloped and many uninflatable alveoli. Pulmonary blood flow is limited as a result of the collapsed state of the fetal lungs, poor vascular development in general, and an immature capillary network. Because of increased pulmonary vascular resistance (PVR), the major portion of fetal blood is shunted from the lungs by way of the ductus arteriosus and foramen ovale.

At birth, infants must initiate breathing and keep the previously fluid-filled lungs inflated with air. At the same time, the pulmonary capillary blood flow increases by approximately tenfold to provide for adequate lung perfusion and to alter the intracardiac pressure that closes the fetal cardiac shunts. Most full-term infants successfully accomplish these adjustments, but preterm infants with respiratory distress are unable to do so. Although numerous factors are involved, a lack of stable surfactant plays a central role.

Surfactant is a surface-active phospholipid secreted by the alveolar epithelium. Acting much like a detergent, this substance reduces the surface tension of fluids that line the alveoli and