

Air pollution and respiratory health

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The respiratory system is a complex organ system composed of multiple cell types involved in a variety of functions. Development of the respiratory system spans from embryogenesis to adult life, passing through several distinct stages of maturation and growth. Exposure to a wide range of chemicals and environmental toxicants during perinatal life has the potential to significantly affect the maturation, growth and function of this organ system. Although the potential targets in the lungs for exposure to toxicants are not precisely known, they are likely to affect critical signals and mediators expressed during distinct stages of development. Oxidant gases, particulate matter and environmental tobacco smoke are common air pollutants that may have significant impacts on cardiopulmonary and neurological development in children during both pre- and post-natal periods of life. Potential mechanisms of neonatal susceptibility to environmental pollutants may be found in the direct or indirect effects exerted on a variety of cell types in terms of their cellular differentiation, proliferation and maturation as well as alterations in the developmental profile of metabolic, immune and neurological functions. Cellular differentiation, cellular proliferation and cellular physiological function of the lungs are continually changing during gestational and postnatal growth. The sensitivity of these cells and their response to environmental insults are likely to be completely different compared to that found in the adult. The route of delivery of an environmental toxicant to the respiratory system is completely different during the fetal period compared to the postnatal period. Passage through other organ systems and the vasculature as well as through maternal organ systems must be taken into consideration when understanding the impact of an environmental toxicant during development. An understanding of critical windows of exposure of the respiratory system on children's health requires consideration that lung development is a multi-step process and cannot be based on studies in adults.