

Latzin Ph. / Kinderspital, Inselspital Bern, Switzerland

Air pollution during pregnancy and lung function in newborns: a birth cohort study

Background

There is growing evidence that air pollution has adverse effects on lung function and development. Exposure to air pollution has been shown to be associated with diminished lung growth in children during school age. Similarly, an effect of air pollution on lung inflammation has been shown in both asthmatic and non-asthmatic subjects. Although exposure to air pollution during pregnancy might influence lung development in a comparable way as it is known for exposure to tobacco smoke, the effect of air pollution during pregnancy on lung development of the newborn is unknown.

Aims

We aimed to determine whether prenatal exposure to air pollution is associated with lung function changes in the newborn.

Methods

In a prospective birth cohort of 241 healthy term-born neonates we measured tidal breathing, lung volume, ventilation inhomogeneity and exhaled nitric oxide (eNO) during unsedated sleep at age 5 weeks. We measured maternal exposure to particulate matter with an aerodynamic diameter of less than 10 μm (PM_{10}), nitrogen dioxide (NO_2), ozone (O_3), and distance to major roads during pregnancy. The association between these exposures and lung function was assessed using multivariable linear regression analysis adjusted for confounders.

Results

Minute ventilation was higher in infants with higher prenatal PM_{10} exposure (24.7 mL/min per $\mu\text{g}/\text{m}^3$ PM_{10} ; 95%-CI, 8.9 to 40.5; $p=0.002$). This association was stronger in newborns of mothers who lived closer to a major road and those whose mothers smoked during pregnancy. Exhaled NO was increased in infants with higher prenatal NO_2 exposure (0.96 ppb per $\mu\text{g}/\text{m}^3$ NO_2 ; 95%-CI, 0.44 to 1.48; $p<0.001$). Postnatal exposure to air pollution did not influence these findings.

The association between exposure to air pollution and lung function changes was strongest for exposure during the last trimester of pregnancy.

No association was found between air pollution and lung volume or ventilation inhomogeneity. Exposure to ozone was not associated with any of the investigated outcomes.

Conclusions

Although we can only speculate about possible mechanisms, our results suggest that prenatal exposure to air pollution is associated with higher respiratory need and airway inflammation in newborns. Such alterations during early lung development are known to influence long-term lung growth and thus may contribute to increased respiratory morbidity.