

Research brief: Ammonia, ammonium and the risk of asthma - A nationwide study in preschool children



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Summary

At present, few studies have explored the influence of ammonia and ammonium on respiratory disease, including asthma. Our findings showed that high levels of ammonia and ammonium may be associated with an increased risk of developing asthma in preschool children.

Conclusions

- Our preliminary findings showed that ammonia and ammonium exposure may be risk factors of onset asthma in preschool children. However, we cannot rule out the possibility that some unknown factors related to region may have affected the result and hereby caused confounding. Therefore, further prospective exploration in large-scale populations is needed to confirm the result and foreclose the possibility of confounding.

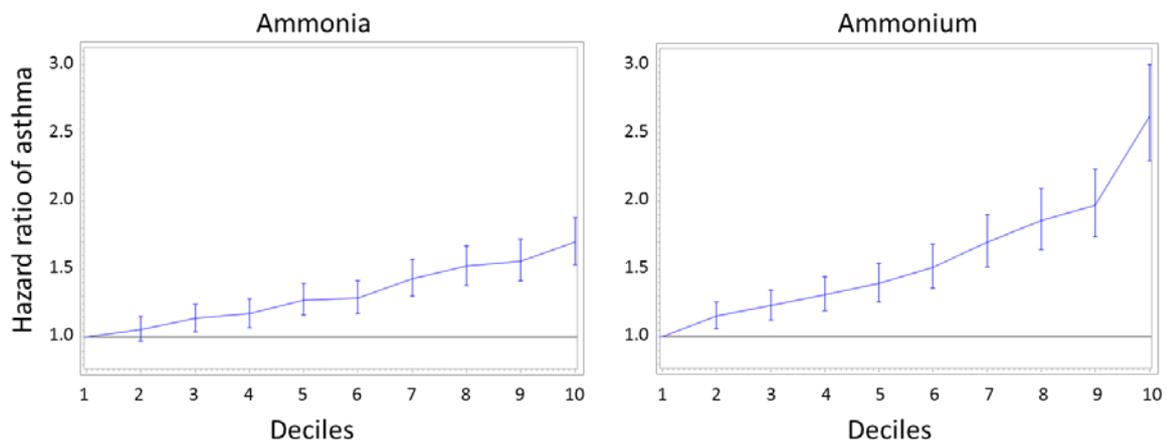
Background & Methods

Asthma is a common respiratory disease in children. Fine particulate matter has repeatedly been associated with exacerbation of asthma and respiratory symptoms, but the health effects of particulate precursors and constituents such as ammonia and ammonium are, however, less clear. To investigate this topic, we used a register-based design where we made a linkage between modelled exposure data on ammonia and ammonium related to children's addresses and information on doctor-diagnosed asthma derived from the Danish National Patient Register. Overall, our study comprised 12,948 children diagnosed with asthma from their 1st to the 6th birthday during the years 2006-2012 and a reference group of 323,700 children having no asthma diagnosis.

Results

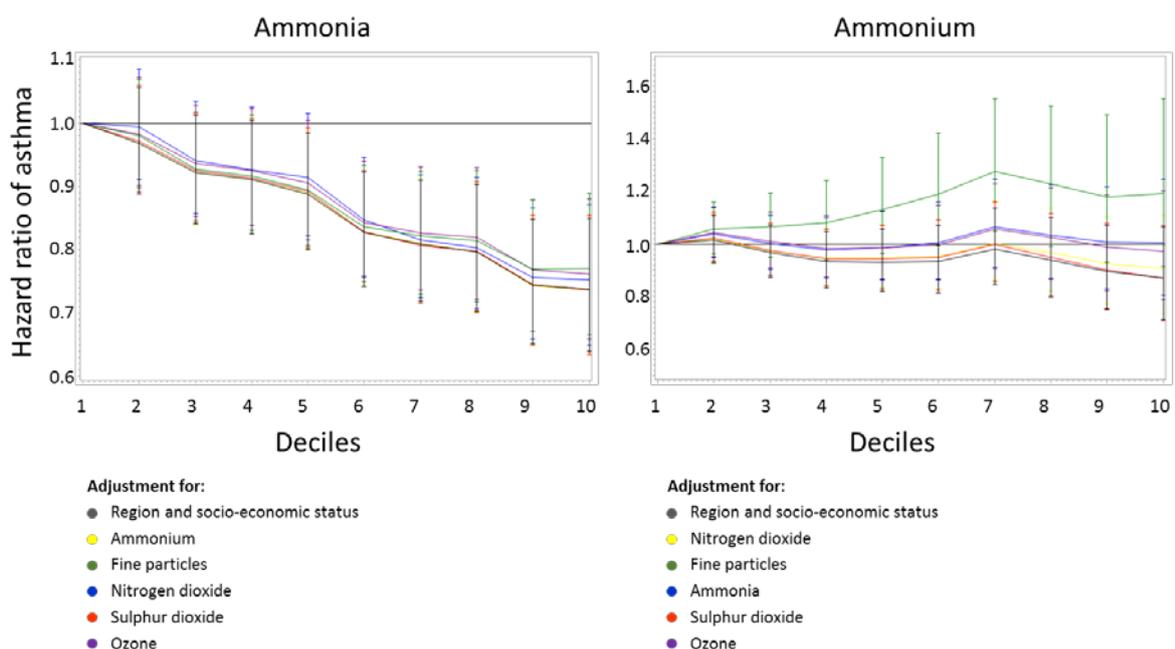
The figures show the effects of ammonia and ammonium on the risk of asthma.

UNADJUSTED ANALYSES



Children exposed to the highest level of ammonia had a 1.74 fold increased risk of asthma compared to children exposed to the lowest level of asthma. Correspondingly, for ammonium the risk of asthma was 2.33 fold higher. Direction of these associations changed however, when adjusting for region and socio-economic status, but remained when ammonium was adjusted for fine particles. These results are shown in the figures below.

FULLY ADJUSTED ANALYSES



- Adjustment for:
- Region and socio-economic status
 - Ammonium
 - Fine particles
 - Nitrogen dioxide
 - Sulphur dioxide
 - Ozone

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Recommendations & Perspectives

- Our findings suggest that ammonia and ammonium exposure is potentially an important public health problem affecting a significant number of children. In order to protect highly exposed populations of children from developing asthma that may affect them and the society throughout their lives, there is a crucial need to pay attention to air pollution policies continuously.
- Although the EU policy to reduce ammonia has led to a decline in the total ammonia emissions of European countries by 27 % between 1990 and 2013, the onwards call for reductions in ammonia emissions set in the directive 2003/35/EF of the of the European Parliament and of the Council seems unambitious given the potential detrimental influence on health for ammonia and ammonium in themselves, but also the fact that these pollutants contribute substantially to the formation of secondary fine particulate matter that is recognized as a significant burden of disease and mortality.

More information

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