Role of HONO in the relationship between NO₂ and mild asthma attacks

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Background: The relationship between NO₂ and asthma has been investigated; however, the WHO (2005) has reported that it is unclear to what extent the health effects observed in epidemiological studies are attributable to NO₂ itself or to the other primary and secondary combustion-related products with which it is typically correlated.

Objectives: To obtain a reasonable hypothesis for the contradictions concerning relationships between NO₂ and asthma symptoms by this descriptive epidemiological study.

Methods: We examined the relationships between indoor and monitoring station NO₂, indoor HONO (primary combustion-related products, decomposed by sunlight, generated from NO₂ after sunset), and self-reported asthma symptoms from 2010 through 2012 for five childhood asthma patients per year in Kishiwada, Japan, from autumn to winter. We used a simple Mann-Whitney *U*-test and *r*² to examine relationships between the various data for the entire study period and for the first half of the study period.

Results: Monitoring station NO₂ was significantly associated with self-reported mild asthma attacks in the first half of the study period in 2012, 2011-2012, and 2010-2012 according to *U*-tests, but not over the entire study period. Moreover, indoor NO₂, which was usually higher in concentration than monitoring station NO₂, was not significantly associated with self-reported mild asthma attacks in both study periods or any year. Indoor HONO was significantly associated with self-reported mild asthma attacks in the first half of the study period in 2010, 2010-2011, and 2011-2012. Indoor HONO was correlated with monitoring station NO₂ in 2011 (*r*² = 0.97) and 2012 (*r*² = 0.55), as well as with indoor NO in 2010 (*r*² = 0.75) in the first half of the study period.

Conclusion: We hypothesize that HONO is a more important nitrogen oxide in mild asthma attacks than NO₂ and that the significant association between monitoring station NO₂ and mild asthma attacks depends on HONO generated from outdoor NO₂ at night.