

# Study strengthens link between tobacco smoke and behavioral problems in boys with asthma

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Boys with asthma who are exposed to environmental tobacco smoke have higher degrees of hyperactivity, aggression, depression and other behavioral problems, according to researchers at Cincinnati Children's Hospital Medical Center.

In a study posted online ahead of print by the *Journal of Developmental and Behavioral Pediatrics*, the researchers said behavioral problems increase along with higher exposure levels, but they added even low levels of tobacco smoke may be detrimental to behavior.

"These findings should encourage us to make stronger efforts to prevent childhood exposure to tobacco smoke, especially among higher risk populations, such as children with asthma," said Kimberly Yolton, Ph.D., lead author of the study and a researcher at the Children's Environmental Health Center at Cincinnati Children's.

Interestingly, although girls in the study were on average exposed to higher levels of tobacco smoke than boys, the exposure did not lead to an increase in behavioral problems among them, investigators said. In boys, however, behavioral problems increased about two fold with each doubling in their tobacco smoke exposure, said Dr. Yolton.

There have been studies involving adults and animals pointing to a difference in tobacco smoke's behavioral impact on males and females.

Even so, the Cincinnati Children's authors said additional research is needed to explain why they observed different degrees of behavioral impact among the 220 boys and girls, ages 6-12, in the study.

"The largest increase we observed was in overall behavioral problems, but it was interesting that in addition to externalizing behaviors – like hyperactivity and aggression – we also saw an increase in internalizing behaviors, such as depression," explained Dr. Yolton. "Few studies have found a link between tobacco smoke and depression in children."

Although no data exist to specifically explain why tobacco smoke causes behavioral problems in children with asthma, Dr. Yolton said there is "quite a bit of evidence" that nicotine in tobacco smoke affects development and functioning of the nervous system, as well as child development and behavior.

According to estimates provided by parents, children in the current study were exposed to an average of 13 cigarettes a day. Parent estimates are frequently used in research as a gauge of child tobacco smoke exposure, but the current study went a step further because parental estimates can be inaccurate, said Dr. Yolton, also an assistant professor of pediatrics at the University of Cincinnati College of Medicine.

Investigators also measured the cotinine levels in the children's blood. Cotinine is a byproduct, or metabolite, of nicotine and is often used as a biomarker to more accurately measure tobacco smoke exposure.

The researchers compared cotinine levels to behavioral patterns observed in the children during the previous two weeks. Behavioral patterns were reported by parents using the Behavioral Assessment System for Children (BASC). The BASC is a standardized survey for measuring specific behaviors like hyperactivity, anxiety, attention problems, conduct problems, depression and somatization (complaining about

physical problems that have no physical explanation or basis).

Researchers also accounted for other factors that might affect child's behavior. These included socioeconomic factors, like a parent's education and household income, parent mental health, asthma severity and medications used. The researchers also assessed physical and nurturing qualities of the home by using a tool called the Home Observation for Measurement of Environment (HOME). The investigators also included whether mothers smoked during pregnancy, which Dr. Yolton said allowed researchers to strengthen findings related to environmental tobacco exposure.

Among 220 children in the study, 61 percent were boys, 56 percent were African American and 77 percent had moderate to severe asthma, with the rest having mild asthma. Inclusion in the study required that, other than asthma, the children have no other health problems, including mental retardation, and that they be exposed to at least five cigarettes a day. Families participating in the research were all participants in the Cincinnati Asthma Prevention Study.

Source: Cincinnati Children's Hospital Medical Center

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