

Toddlers affected most by secondhand smoke exposure at home

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Secondhand smoke in the home appears to induce markers for heart disease as early as the toddler years, researchers reported at the American Heart Association's 48th Annual Conference on Cardiovascular Disease Epidemiology and Prevention.

It has long been known that many forms of cardiovascular disease in adults are initiated and progress silently during childhood. Now researchers have found a young child's response to smoke may not just affect the respiratory system, but the cardiovascular system as well.

"This is the first study that looks at the response of a young child's cardiovascular system to secondhand smoke," said Judith Groner, M.D., lead author of the study, pediatrician and ambulatory care physician at Nationwide Children's Hospital and Research Institute in Columbus, Ohio.

The study included 128 children, 2 to 5 years old and adolescents 9 to 14. Researchers found that children ages 2 to 5 absorbed six times more nicotine than children 9 to 14 from the same levels of parental smoking. That exposure resulted in a dramatic increase of markers of inflammation and vascular injury signaling damage to the endothelium, the inner lining of the vessel walls.

Hair samples of children ages 2 to 5 showed this age group had average nicotine levels of 12.68 nanograms per milligram of hair compared to the 9 to 14 year age group, which had 2.57 nanograms per milligram of

hair. Toddlers had significantly higher levels of the inflammatory marker soluble intracellular adhesion molecules (ICAM).

“Toddlers in the homes of smokers not only had higher levels of nicotine, but also had higher levels of markers for cardiovascular disease in the blood,” said John Bauer, Ph.D., senior author of the study and director of the Center for Cardiovascular Medicine at Nationwide Children’s Hospital and Research Institute in Columbus, Ohio. “The dose of smoke is greater in toddlers than adolescents who are able to move in and out of the home. Toddlers are like a fish in a fishbowl. They are exposed at a higher dose. And it appears that toddlers also are more susceptible to the cardiovascular effects of smoke.”

Most of the children in the study had varying levels of secondhand smoke exposure, measured by the number of adult smokers a child was exposed to in 24 hours. Researchers took hair samples to determine nicotine levels in the body and drew blood to determine endothelial progenitor cell (EPC) levels by flow cytometry. Endothelial progenitor cells replenish the endothelium and serve as a biological marker for vascular function.

Researchers also measured known inflammatory markers, such as ICAM, in the blood.

“When we analyzed our data by looking at the relationships between the number of smokers in the home and the EPC levels, we found that in toddlers, there was an inverse relationship between secondhand smoke exposure and EPC prevalence,” Groner said. “In other words, the more smokers the toddler was exposed to, the fewer EPC cells were circulating in his bloodstream. This relationship was not present among the adolescents.”

The vascular endothelium (the inner lining of arteries and blood vessels)

plays a key role in promoting cardiovascular health by maintaining the tone and circulation of the arteries. ICAM is a specific marker of endothelial cell stress, which contributes to artery clogging and atherosclerosis, raising the risk of heart disease.

“The combustion of the cigarettes appears to be causing endothelial damage which is reflected in the increase in soluble ICAM in exposed children,” Groner said. “Toddlers who are in the vicinity of smokers in the home have a higher dose of tobacco chemicals. They live at home and can’t escape. Young children also breathe faster, taking more smoke into their respiratory system.”

Past studies found that the levels of EPC are lower in adult smokers. EPCs have not been studied previously in non-smokers who are exposed to secondhand smoke.

This study indicates that cardiovascular effects of tobacco exposure in children is very similar to that of adults in the affect on the vascular wall, Groner said.

She noted the study is a “snapshot in time” and doesn’t give a long-term picture of the effects of secondhand smoke on the developing cardiovascular system of children.

“The results are intriguing, but further study is needed,” she said. “We’re not sure what happens to kids if they stay in a smoking environment or if they have multiple risk factors such as being overweight or having high blood pressure. Until then, parents and others should not smoke in homes with children, and should be especially attentive to this issue around toddlers.”

Source: American Heart Association

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