

Secondhand cigarette smoke worsens symptoms in children with asthma

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The physician who fails to ask the parents of a child with asthma whether they smoke is taking an incomplete history. And if they do smoke, the treatment of the child is likely to be optimal only if the physician persuades them not to smoke, at least when at home.

Cigarette smoke contains high concentrations of irritants, such as formaldehyde, acrolein, ammonia and nitrogen oxides. Pulmonary damage results not only from mainstream smoke (that inhaled by the smoker) but also from sidestream smoke, the visible smoke that comes from the tip of a burning cigarette and is inhaled involuntarily by nonsmokers who are nearby.¹

Adverse effects of cigarette smoke have been shown both in controlled laboratory settings and under everyday conditions. When adults with asthma are placed in an environmental chamber and exposed to sidestream smoke for 1 hour, there is a significant decrease in forced expiratory volume in 1 second (FEV₁) and forced expiratory flow at 25% to 75% of forced vital capacity (FEF_{25%-75%}).² Under the natural conditions of a typical work environment, nonsmokers also absorb a considerable amount of tobacco smoke, the amount being comparable to that taken in by "light" smokers.³ As in those exposed to smoke under experimental conditions, there is a decrease in FEF_{25%-75%}.⁴ As well, cigarette smoke appears to

increase bronchial responsiveness. Adults who smoke have bronchial hyperirritability,^{5,6} and hyperirritable bronchi more readily go into spasm when exposed to irritants such as cold air, exercise and smoke.⁷

Some of the effects of tobacco smoke are known. It may cause increased respiratory epithelial permeability^{8,9} as well as altered structure and function of pulmonary macrophages.¹⁰ But the exact way in which tobacco smoke increases bronchial irritability and decreases airflow rates is unclear. Immunologic mechanisms are suspected since tobacco components can stimulate the production of IgE antibodies in the mouse¹¹ and since IgE levels are higher in people who smoke than in those who do not.¹² However, evidence that tobacco smoke is antigenic in humans is scanty.¹³

Results of epidemiologic surveys on the effects of parents' cigarette smoke on their children were initially equivocal but have become more consistent since the appropriate questions have been asked. When workers inquired simply whether the parents smoked^{14,15} or whether one or both smoked,¹⁶ they were unable to show a significant difference in the prevalence of wheezing or a difference in pulmonary function between two groups of children. Only when the mother's and father's smoking habits were considered separately did it become evident that the mother's smoking was more important.

In a large sample of schoolchildren, Hasselblad and colleagues¹⁷ found a dose-response relation between the amount smoked by the mother and the decrease in the child's FEV_{0.75}. No effect due to the father's smoking habits was observed. Gortmaker and associates¹⁸ conducted two random surveys in which they telephoned a total of 3966 households with children aged 17 years or less. In 18% of the children who were said to have

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wheezing in one survey and in 34% in the other survey, the wheezing was attributable to maternal smoking. Tashkin and coworkers¹⁹ studied 971 nonsmoking schoolchildren and found that flow rates were significantly lower in younger boys and older girls whose mothers were smokers. Ekwo and collaborators²⁰ had 1355 children inhale isoproterenol and found a small but highly significant increase in flow rates in children whose parents were smokers but not in those whose parents were nonsmokers. Vedal and colleagues²¹ performed spirometric tests in all students at 14 primary schools. They found that parental smoking, particularly by the mother, was associated with lower flow rates. However, although the difference in mean values between children of smokers and children of nonsmokers was statistically significant, it was small, being no greater than 5% for any mean measurement. The small difference may have been due to the fact that only a minority of children in a representative population are prone to asthma and liable to have bronchospasm.

To determine whether the differences in pulmonary function between children of smokers and children of nonsmokers in a more susceptible population would be greater, Murray and Morrison²² examined 94 children aged 7 to 17 years who had been consecutively referred to an allergy clinic and who had a history of wheezing. The asthmatic symptoms were 47% more severe in the group whose mothers were smokers than in those whose mothers did not smoke, the FEV₁ was 13% lower, the FEF_{25%-75%} was 23% lower and the mean degree of bronchial irritability was four times higher. There was a highly significant correlation between each of these indications of asthma severity and the logarithm of the number of cigarettes that the mother smoked in the house, which suggests a dose response to cigarette smoke. There was also evidence that the length of exposure had an effect. The older children, who had presumably been exposed to cigarette smoke for more years than the younger ones, were more severely affected.

In contrast, the father's smoking habits appeared to have little effect on the child's asthma, probably because he smokes significantly fewer cigarettes at home than the mother does²² and spends less time with the children, and perhaps because the estimates of number of cigarettes smoked were more accurate for the mother than for the father, as the mother usually provided the history.

In addition, given that over 50% of mothers now work outside the home, the smoking habits of private day-care givers may affect children's health. Infants admitted to hospital for chest problems have been found to have significantly more day-care givers who smoked than did control infants (A. Cherian and W. Feldman: personal communication, 1986).

Active smoking in children is also thought to impair pulmonary function: it is associated with a

significant decrease in the rate of increase of the FEV₁ and FEF_{25%-75%}.²³

There is little doubt that cigarette smoke worsens asthma, but it is uncertain whether the damage to the child's lungs is permanent. Available evidence suggests that the changes that aggravate asthma are reversible. Vedal and colleagues²¹ reported that the pulmonary function of children whose mothers were ex-smokers was not significantly different from that of children whose mothers were nonsmokers.

If, as seems to be the case, passive smoking results in changes that obstruct airflow, and if these changes are reversible, the parents of children with asthma should be persuaded not to smoke in their children's presence. This can be achieved easily with some concerned parents, who will stop smoking as soon as they learn that it is harming their child. Those who are less anxious about their child's health may reject the idea that their smoke is harming the child and will continue to smoke as much as ever. In between these two extremes are parents who will smoke fewer cigarettes, try not to smoke in the house, smoke only when standing by an open window, or install various filtering mechanisms, such as electrostatic air cleaners. The efficacy of these devices is not known, but they are unlikely to be beneficial. Standard filtration systems do not remove the toxic substances in the gaseous phase of tobacco smoke.²⁴

Whether the parents stop smoking depends not only on their personal motivation but also on the advice and help given by the physician. He or she can recommend a self-help smoking cessation program, such as that developed by the Canadian Lung Association, or attendance at an organized smoking cessation clinic. Success rates of these programs vary from 40% to 97%, though some of those who quit have resumed smoking by 1 year.²⁵

Physicians who are consulted about the care of children with asthma have the duty to inquire about the smoking habits of the family and of day-care givers and to advise those who smoke to refrain from doing so, at least while in the house or in the car with the child. Needless to say, the children should be questioned, in private, as to whether they smoke.

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