The health effects of cooking with gas

The clean-burning virtues of natural gas have been extolled for years. But the fact remains, gas-cooking ranges are one of the primary combustion appliances whose emissions are exhausted directly into the household atmosphere. And it now appears the indoor air pollution they produce may be affecting the respiratory health of their users. Below-normal pulmonary (lung) function was shown to correlate with the use of gas ranges in two studies presented in Amherst, Mass., last week at the International Symposium on Indoor Air Pollution, Health and Energy Conservation.

These are not the first reports of such correlations. What makes them interesting, though, is that one shows effects in adults—previous studies concentrated on children—and that the other contradicts the common "wisdom" that a range's nitrogen-dioxide (NO_2) output is responsible for observed respiratory problems.

NO_2 forms during high-temperature combustion, and five studies have shown that average indoor concentrations may be at least five times higher than outdoor NO_2 levels. Since it had been established that lung-tissue damage and increased infection rates occur among persons exposed to NO_2 at very high levels—those far exceeding levels normally encountered in gas-cooking homes—many researchers therefore assumed NO_2 is responsible for the adverse health effects that had been reported.

But preliminary research by Richard Letz, John Spengler and colleagues at the Harvard School of Public Health casts doubt on that supposition. As part of a larger survey, they studied both the NO_2 levels in 137 gas-cooking homes in Portage, Wis., and the lung function of 190 children dwelling in them. What they found in Portage, as in each of five other cities they are surveying, is that all other factors being equal, children in homes using electric ranges have slightly higher lung function than children in homes with gas cooking. The difference in "forced vital capacity" measured (a term for the total volume of breath that can be forcefully exhaled), was small between groups, yet statistically significant.

However, contrary to their expectations, the researchers were able to uncover no trend linking higher degrees of reduced lung function with those gas-cooking homes where NO_2 levels were highest. (NO_2 levels vary greatly, depending on the combustion temperature and home ventilation.) This finding is confusing to the scientists because the other major gas-range combustion products—notably carbon monoxide (CO), water vapor, nitric oxide (NO) and formaldehyde—would not be expected to cause the respiratory symptoms seen.

Shoring up the contention that gas ranges affect respiratory function is a study by Knud Helsing, Melvyn Tockman and colleagues at the Johns Hopkins University. Their research—involving 1,950 adults in Washington, Co., Md.—measured the apparent relative risks posed to nonsmokers by tobacco smoke and gas-range emissions. And the results are clear. "There is a definite, unquestionable, statistically significant risk [of respiratory problems] associated with a history of gas cooking," Tockman explains. Double the number of residents reported chronic coughing in gas-cooking homes compared with electric-cooking homes. And there was nearly a three-fold increase in the percentage of persons exhibiting impaired lung function. On the other hand, passive smoking (breathing in another person's cigarette smoke) seemed to elevate one's risk of developing those same respiratory problems—cough, phlegm and reduced vital capacity—"but the risk is relatively small, perhaps 20 percent," Tockman says.

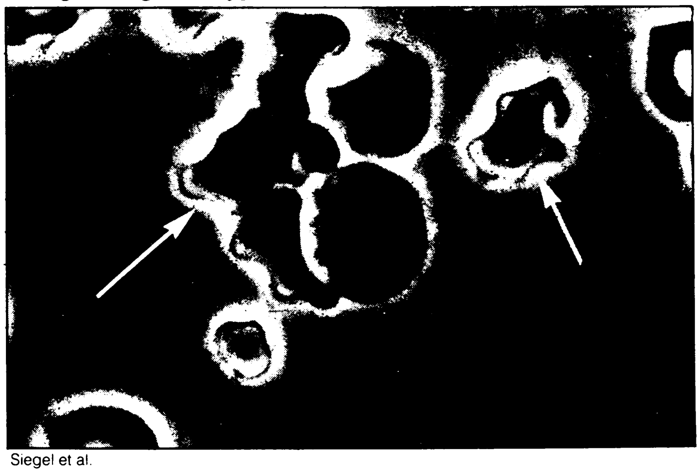
Tockman notes that while it's conceivable gas cooking itself is not responsible—but merely an "index" of another respiratory hazard—he considers such an explanation for the respiratory symptoms "unlikely." It's also possible there is a synergistic effect between tobacco smoke and range-emissions, he said, although the data suggest that too is unlikely. Finally, since the study controlled for such factors as the number of years persons lived in their present home and for occupational exposure to heavy dust, Helsing said, "I think it would be safe to rule them out" as causal factors.

Though "the lung function that we're seeing in most of these people is significantly below the normal," Tockman told SCIENCE NEWS, "it's probably not clinically important." He added, however, that work by himself and others is beginning to suggest that "impairment of pulmonary function may well be a non-specific risk factor for mortality." □

Red cell defenders cross the color line

White blood cells have long been known as defenders of the body against disease, and red blood cells as carriers of oxygen and other gases. Yet there is growing evidence that the red cells may sometimes cross this "color line" to assist the white cells in their immune functions. The evidence is reported in the Sept. 12 LANCET by Israel Siegel, Tian Lin Liu and Norbert Gleicher of the Mount Sinai Hospital Medical Center of Chicago.

Some of the first evidence that red cells help the immune system came from Robert A. Nelson Jr. of the Johns Hopkins School of Hygiene and Public Health in 1952. He found that red cells adhere, in primates, to complexes of antibodies, complement and antigen. (Antibodies and complement are protein components of the body's immune system; antigens are substances that the immune system considers foreign and wants to destroy.) Only now, however, has the same phenomenon been observed in nonprimates (rabbits), by Siegel and his colleagues, further strengthening the hypothesis that red cells have an immune function of some kind. What's more, Siegel and his coworkers have made two other observations that further support red cells' immune role, One is that red cells adhere to T cells (white blood cell components of the immune system) as well as to thymocytes (T cell precursors in the thymus gland). The other finding is that red cells adhere to antigen-antibody-complement complexes at the same time that they adhere to thymocytes and T cells. Taking all these observations together, red cells thus appear to assist the immune system in this manner: First, antibodies and complement proteins hook up to antigens; red cells then adhere to the antigen-antibody-complement complexes and also to thymocytes and T cells; finally, the red cells bring the antigens in the complexes into contact with the thymocytes and T cells so that the thymocytes and T cells can destroy the antigens, assist B cells (bone marrow cells that make antibodies) in their immune responses or keep the immune system from overreacting. □



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Rabbit red blood cells (white arrows) adhere to antigens (outside black arrow) at the same time that they adhere to thymocytes (center black arrow). Thus the red cells bring the antigens into contact with the thymocytes so that the thymocytes can destroy the antigens or otherwise act upon them.