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News

The University of Texas Health Science Center at Dallas
5323 Harry Hines Boulevard Dallas, Texas 75235 (214) 688-3404

CONTACT: Susan Rutherford
Office: 214/688-3404
Home: 214/349-7820

***Toxicologist investigates new explanation
for fire deaths.

DALLAS--Most people who succumb to structural fires die without traces of the cause of death.

Many experts believe burning plastics, which release toxic gases, are the culprit. But it doesn't matter what's burning according to one Dallas toxicologist. Toxicity leading to death from smoke inhalation is due instead to the rate of burning and the heat intensity, says Dr. William Lowry, associate professor of Pathology at The University of Texas Health Science Center at Dallas.

Slow-burning, smoldering fires of whatever material are often the most dangerous, says Lowry, because the first step in combustion seems to be the most deadly.

Lowry explains it this way: For materials to burn, they must be converted to a gaseous state. The first breakdown of burning material into gas involves the release of tiny organic molecules. Floating free into the surrounding atmosphere, these molecules search for something with which to bind. Called "free radicals", the high energy molecules may cause suffocation by reacting with the substance covering the inside of the lungs. Or they may react by binding with molecules of oxygen in the lung. The reaction of free radicals with "surfactant" covering the lungs or with the oxygen itself would reduce oxygen uptake into the bloodstream and cause asphyxiation.

"We know that people die in minor fires. On autopsy their lungs are clear and their blood usually shows sub-lethal levels of toxic substances. It's known that people die quickly in these fires. Sometimes victims are found dead with their hands on the doorknob. A couple of seconds could have made the difference."

As materials burn, they produce first the free radicals, then carbon monoxide and, finally, carbon dioxide when combustion is complete. In intense fires where there is much poisonous carbon monoxide, there is searing of the trachea and lungs in victims.

In a series of 100 fires studied by Lowry, a member of the Dallas County medical examiner's team, 90 percent of the fires produced toxic gas amounts that were insufficient to kill. Deadly levels of carbon monoxide were present in 10 percent of the fires, the only exception. Instruments worn by firefighters to measure poisonous gases produced during the fires showed the

gases and their concentrations were approximately the same in burning chemical companies and wood residences alike, providing the intensity of the fire was the same, says Lowry.

As he explains, there is a controversy about the toxicity of burning plastics. There have been no studies to prove that plastics are responsible for more deaths than natural organics.

"Burning urethane foam produces cyanide, and people know that cyanide kills. But just because it's produced doesn't mean it's produced in quantities that can kill," says Lowry. "Everybody talks about how plastics produce toxic gases in structural fires, yet nobody has shown it to be true."

Plastics may be hazardous, but so is everything else that burns, says Lowry. While burning plastics may give off hydrogen chloride, natural materials such as wood and cotton give off such dangerous substances as carbon monoxide, cyanide and aldehydes. When wool carpet or upholstery catches fire, deadly cyanide gas can be produced. No material is hazard-free.

Yet Lowry's investigation is showing that toxic gases are usually not elevated to lethal levels.

Smoke inhalation seems identical to chlorine gas exposure, says Lowry. Chlorine, in the presence of light, breaks down from a molecule consisting of two chlorine atoms to two chlorine radicals. With chlorine poisoning, a radical reacts with oxygen and surfactant on the lining of the lungs, reducing the amount of available oxygen as well as reducing the rates of oxygen uptake into the bloodstream.

The result of inhalation of free radicals in a fire may be synergistic with carbon monoxide. That is, the radicals would enhance the effect of carbon monoxide as well as other toxic gases possibly present in smoke.

Lowry and co-workers are also investigating the health effects resulting from chronic exposure to sub-lethal quantities of smoke by firefighters. Heart disease is under study as one possible result of exposure to free radicals. With these studies researchers may understand more about the relationship between smoking and heart disease.

What should people do in case of fire? "Regardless, get out of the building as soon as possible. If you can't see because of smoke, crawl on the ground to get out. But if you can see, crawling on the ground can impair movement and waste precious time. Carbon monoxide, lighter than air, can be avoided by crawling, but free radicals, which are not lighter than air, cannot be avoided by crawling. A moist cloth can be very beneficial by capturing the free radicals, stabilizing them, making them much less harmful, thus allowing oxygen to enter the bloodstream."

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