

Researchers demonstrate health risks posed by 'third hand' tobacco smoke

July 16 2014

Research led by the University of York has highlighted the potential cancer risk in non-smokers – particularly young children – of tobacco smoke gases and particles deposited to surfaces and dust in the home.

Until now, the risks of this exposure known as 'third hand tobacco smoke' have been highly uncertain and not considered in public policy.

However, a new study published in the journal *Environment International*, has estimated for the first time the potential [cancer risk](#) by age group through non-dietary ingestion and dermal exposure to third hand smoke. The results indicate potentially severe long-term consequences, particularly to children.

The research was carried out by York's Wolfson Atmospheric Chemistry Laboratories, the National Centre for Atmospheric Science, and the Chromatography and Environmental Applications research group at the Universitat Rovira i Virgili, Spain.

The study, which was supported by the UK Natural Environment Research Council (NERC) and the General Research Directorate of the Government of Catalonia, also demonstrates for the first time the widespread presence of tobacco related carcinogens in [house dust](#), even in 'smoke-free' environments.

Scientists collected [dust samples](#) from private homes occupied by both smokers and non-smokers. Using observations of house dust

composition, they estimated the cancer risk by applying the most recent official toxicology information.

They found that for children aged one to six years old, the cancer risks exceeded the limit recommended by the US Environmental Protection Agency (EPA) in three quarters of smokers' homes and two thirds of non-smokers' homes. The maximum risk predicted from the third hand smoke levels in a smoker occupied home equated to one extra cancer case per one thousand population exposed.

Lead investigator, Dr Jacqueline Hamilton, from York's Wolfson Atmospheric Chemistry Laboratories, said: "The risks of tobacco exposure do not end when a cigarette is extinguished. Non-smokers, especially children, are also at risk through contact with surfaces and dust contaminated with residual smoke gases and particles, the so-called third hand smoke. This risk should not be overlooked and its impact should be included in future educational programs and tobacco-related public health policies."

Each year 600,000 people die worldwide through passive inhalation of environmental [tobacco smoke](#), also known as second hand smoke. As numerous countries have introduced smoking bans in public places, the home has become the main source of passive smoking exposure.

Professor Alastair Lewis, from York's Wolfson Atmospheric Chemistry Laboratories and the National Centre for Atmospheric Science, said: "Over 40 per cent of children have at least one smoking parent and whereas there is a general public awareness about the harms of second hand smoke, there is little knowledge about the dangers of third hand smoke. Carcinogenic materials can be passed from smokers to non-smokers during shared contact, for example between clothes and surfaces and also enter homes via airborne transport of cigarette smoke."

The researchers examined exposure to carcinogen N-nitrosamines and tobacco specific nitrosamines (TSNAs) in the dust samples. These are produced when nicotine deposits on indoor surfaces and then is released again to the gas phase or reacts with ozone, nitrous acid and other atmospheric oxidants. They are classified as carcinogenic for humans.

Measurements were made using a comprehensive two-dimensional gas chromatography system, which was originally funded by NERC to study particulate matter in the atmosphere.

Professor Rosa Maria Marcé, from the Universitat Rovira i Virgili, Tarragona, said: "This highly selective and sensitive instrument has allowed the small amounts of TSNAs stuck to the surface of house dust to be measured for the first time."

Dr Noelia Ramirez, a Postdoctoral Research Fellow from York's Wolfson Atmospheric Chemistry Laboratories who started this research line, said: "While TSNAs have been suspected to form part of third hand smoke as a result of laboratory studies, we have demonstrated for the first time the presence of carcinogenic tobacco-specific compounds, such as TSNAs, in settled house dust found in a panel of smokers' and non-smokers' homes.

"The TSNAs concentrations found in smoke-free homes would suggest that TSNAs formed in smoking environments can persist for extended periods, possibly due to partitioning to ambient particles, and subsequently be transported into non-smokers' homes from outside."

Provided by University of York

Citation: Researchers demonstrate health risks posed by 'third hand' tobacco smoke (2014, July 16) retrieved 26 April 2024 from <https://medicalxpress.com/news/2014-07-health-posed->

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