

Study monitors asphalt exposures

Harvard University researchers develop methods for determining effects of asphalt fumes on paving, roofing workers

By Tracy D. DeStazio & Sandy Lender

Researchers in the School of Public Health at Harvard University, Boston, are nearing the end of a study aimed at measuring and monitoring the effects of asphalt fume exposures on humans working with asphalt in paving and roofing applications. The research study, funded by a grant from the National Cancer Institute, was proposed by Dr. Robert Herrick, lecturer on industrial hygiene with the department of environmental health at Harvard's School of Public Health. Members of the Asphalt Institute (AI), Lexington, Ky., are assisting by providing any necessary information on asphalt that might be needed to conduct the research. Other organizations that are contributing information or assistance include Heritage Research, the Laborers and Roofers Union, the National Asphalt Pavement Association (NAPA), the National Institute for Occupational Safety and Health (NIOSH) and the Operating Engineers Union. Several companies, such as Ashland, CITGO, Exxon, Johns Manville and Shell, are also providing help with the study.

Says Ken Darmer, chairman of AI's health, safety and environment committee, "The Asphalt Institute is not officially involved with the study, but we are acting as a resource for the Harvard researchers. We can offer suggestions and provide a perspective on how this study fits into the overall picture (of the asphalt paving industry)."

The study involves measuring the amount of fume workers are exposed to while working with asphalt in paving or roofing, and what effects those exposures might have on the workers. Using humans (approximately 70 paving workers and 10 roofing workers) as their test subjects, researchers are focusing on what is known as an adduct, a chemical reaction between a chemical molecule and a biological molecule. Explains Darmer, "What happens is the chemical molecule attaches itself to the human cell and interacts with the cell's DNA."

In the case of DNA adducts, they are produced when a chemical enters the body, reacts and is then bound to the DNA. The chemical molecules, or compounds, that are found in asphalt are called polycyclic aromatic hydrocarbons (PAH). "A great deal of the work on the adducts that are formed when PAHs react with DNA to form PAH-DNA adducts has been done on cigarette

smokers,” says Herrick. “Since some of the same PAH chemicals found in cigarette smoke are also found in asphalt fume, we are looking for the same sort of adducts in workers who come into contact with asphalt.”

Researchers will examine workers’ DNA to see if there are any signs of adducts, which would then indicate whether the chemicals from the fume are indeed affecting the person’s cells, and to what extent. The researchers could then evaluate at what level of exposure asphalt fume causes elevated levels of these DNA adducts.

The research team is looking at exposures by taking samples using two different methods. One, they are taking blood samples from the workers to study their DNA. Darmer says that the researchers are obtaining these biological samples at different times of the year to see if the presence of adducts is greater during certain months, such as during the main paving or roofing seasons.

And two, they are taking air samples from around the paving or roofing site to measure the amount of fume produced and released into the air in the workers’ presence. This method is accomplished by clipping a monitoring device onto the worker’s shirt. The device then collects and measures the fume on and around the worker. They are also taking urine samples to measure the amount of asphalt-related compounds eliminated by the workers.

The purpose of the study, explains Herrick, is to evaluate the association between occupational exposure to asphalt fume and changes in the level of PAH-DNA adducts in roofing and paving workers. Says Herrick, “One way to think of adducts is that they measure the amount of a chemical, or group of chemicals, that enters the body and makes it to the genetic material, or the DNA in the cells.” Herrick adds that through the study, researchers hope to develop an intervention strategy to reduce occupational PAH exposures, if necessary.

Two Harvard students are involved in the study, which is taking place in Boston. Rick Rinehart, a graduate student at Harvard pursuing his Doctor of Science degree, is conducting the actual field study, including the sample gathering and evaluation. His focus is on studying the exposures to roofers and pavers. Another student, Mike McClean, also pursuing his Doctor of Science degree at Harvard, is collecting the blood samples and will look at the presence of DNA adducts in the workers. Rinehart is in the process of preparing his dissertation on the study and will present his findings in late spring of this year when he completes his graduate work.

McClean will continue his work on the DNA adducts through the year 2000. At that time, the final results of the study will be published.

