

Exposure of asphalt workers to bitumen fumes

Independent epidemiological study by IARC

Bitumen is a product with a long history of use as construction material in a wide variety of applications, such as road paving.

Under normal ambient conditions bitumens are solid and do not present health or environmental hazards. However, most bitumen applications are carried out at high temperatures (from 150 to 230°C) at which fumes may be generated. Excessive exposure to these fumes can cause respiratory irritation. Occupational exposure limits have therefore been set in many countries while bitumen suppliers promote good working practices, including temperature control.

Several years ago a number of studies investigating a possible cancer risk in workers exposed to bitumen fumes were published. During EU hazard classification discussions at the time, it was concluded that these studies did not provide a clear indication of bitumen fume carcinogenicity, as they had not been adjusted to take into account other occupational exposures and lifestyle factors of the workers.

Industry, including CONCAWE, Eurobitume and the European Asphalt Paving Association, therefore took the initiative of supporting an independent epidemiological study to address this issue.

The study was designed and managed by the world-renowned International Agency for Research on Cancer (IARC) in France, which is part of the UN's WHO (World Health Organization). Many national organisations and research institutions took part, and supporting funding was obtained from the EU's Research Directorate General as well as several EU Member States and research bodies. The study design involved a feasibility investigation, followed by the establishment of a cohort of exposed workers and, contingent on the outcome of the cohort analysis, a more in-depth 'nested case-control' study, taking into account all possible risk factors.

In 2001 IARC published the internal technical report of the cohort phase. This contained the results of the epidemiological investigation of causes of death in a large-scale international cohort of 80,695 workers employed between 1913 and 1999 in road paving and asphalt mixing companies in seven European countries (Denmark, Finland, France, Germany, the Netherlands, Norway and Sweden) and in Israel. This same body of work, supplemented by further analyses of national patterns, has now also been published in the open scientific literature.¹

The cohort analysis indicated reduced mortality from all causes compared with the general population, a phenomenon not uncommon in the working population.

In comparison with another cohort of the working population, the study found a slightly increased lung cancer rate amongst asphalt worker populations in

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Asphalt road paving under way

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some countries. However, the report clearly stated that the results did not allow conclusions to be drawn on either the presence or absence of a causal link with exposure to bitumen fumes, because of insufficient information on exposure of the cohort members to other known lung cancer risk factors, in particular those related to the use of coal tar in asphalt mixes and tobacco smoking.

Importantly, the study recorded a decrease of exposure to bitumen fumes at an average rate of some 6% per year between 1970 and 1997, presumably as a result of improving working practices.

The study has been an example of successful collaboration between researchers and industry representatives, while preserving the scientific independence of the researchers. It has established an important database on asphalt paving workers which can be accessed by experienced epidemiologists and industrial hygienists in many countries.

IARC has proposed, in line with the original study plan, to carry out a 'nested case control' study of lung cancer risk. This detailed study will focus on a relatively small number of workers and will include a more detailed assessment of:

- their overall historical exposure to bitumen fumes within the asphalt industry also covering employment periods in companies not participating in the original cohort;



- their overall historical exposure to known lung cancer risk factors, in particular to coal tar; and
- exposure to non-occupational factors, in particular tobacco smoking.

Development of a detailed study protocol is in progress.

As part of its ongoing commitment to improving workplace practices and workers' health, our industry strongly supports the use of good working practices to minimise exposure to bitumen fumes, including control of the temperature in bitumen applications.