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Kjersti Steinsvåg, Magne Bråtveit and Bente Elisabeth Moen

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## **Exposure to carcinogens for defined job categories in Norway's offshore petroleum industry, 1970–2005**

**Kjersti Steinsvåg, Magne Bråtveit, Bente E. Moen**

University of Bergen, Department of Public Health and Primary Health Care, Section for Occupational Medicine, Kalfarveien 31, N-5018 Bergen, Norway

**Corresponding author:**

**Kjersti Steinsvåg**

**University of Bergen**

**Department of Public Health and Primary Health Care**

**Section for Occupational Medicine**

**Kalfarveien 31**

**N-5018 Bergen**

**Norway**

Tel. +47 55 58 61 57; fax +47 55 58 61 05

E-mail: [kjersti.steinsvag@isf.uib.no](mailto:kjersti.steinsvag@isf.uib.no)

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### **Main messages**

- The job categories with respective exposure to carcinogens are identified in Norway's offshore petroleum industry, 1970–2005
- Exposure data on benzene, mineral oil mist and oil vapour, respirable and total dust, asbestos fibres, refractory ceramic fibres, formaldehyde and tetrachloroethylene are presented
- Exposure sources and situations are described
- The lack of measured data for most of the described exposure sources and situations means that this industry needs to implement a more systematic strategy for exposure assessments, including quantitative measurements of carcinogens
- For a planned cohort study on cancer, quantitative estimation of exposure might be applied for benzene and mineral oil mist and vapour. For the other agents, the information in this study might be used for further exposure assessment for instance by expert judgement.

### **Policy implication**

- The scarce documentation on exposure to carcinogens in Norway's offshore petroleum industry means that more systematic surveillance of exposure to carcinogens is needed in order to comply with Norwegian regulations and to allow more rigorous future studies in this industry.

## ABSTRACT

**Objectives:** To identify and describe the exposure to selected known and suspected carcinogenic agents, mixtures and exposure circumstances for defined job categories in Norway's offshore petroleum industry from 1970 to 2005, in order to provide exposure information for a planned cohort study on cancer.

**Methods:** Background information on possible exposure was obtained through company visits, including interviewing key personnel ( $n = 83$ ) and collecting monitoring reports ( $n = 118$ ) and other relevant documents ( $n = 329$ ). Based on a previous questionnaire administered to present and former offshore employees in 1998, twenty-seven job categories were defined.

**Results:** This study indicated possible exposure to 18 known and suspected carcinogenic agents, mixtures or exposure circumstances. Monitoring reports were obtained on seven agents (benzene, mineral oil mist and vapour, respirable and total dust, asbestos fibres, refractory ceramic fibres, formaldehyde and tetrachloroethylene). The arithmetic mean of 367 personal samples of benzene was 0.037 ppm (range: less than the limit of detection – 2.6 ppm). Asbestos fibres were detected (0.03 fibres/cm<sup>3</sup>) when asbestos-containing brake bands were used in drilling draw work in 1988. Personal samples of formaldehyde in the process area ranged from 0.06 to 0.29 mg/m<sup>3</sup>. Descriptions of products containing known and suspected carcinogens, exposure sources and processes were extracted from the collected documentation and the interviews of key personnel.

**Conclusions:** This study described exposure to 18 known and suspected carcinogenic agents, mixtures and exposure circumstances for 27 job categories in Norway's offshore petroleum industry. For a planned cohort study on cancer quantitative estimates of exposure might be developed for benzene and mineral oil mist and vapour. For the other agents information in the present study can be used for further assessment of exposure for instance by expert judgement. More systematic exposure surveillance is needed in this industry. For future studies, new monitoring programmes need to be implemented.