Biological effects of inhaled crude oil vapor. III. Pulmonary effects

Introduction

Workers involved in oil exploration and production in the upstream petroleum industry are exposed to crude oil vapor (COV). COV levels in the proximity of workers during production tank gauging and opening of thief hatches can exceed regulatory standards, and several deaths have occurred after opening thief hatches. There is a paucity of information regarding the effects of COV inhalation in the lung. To address these knowledge gaps, the present hazard identification study was one of six undertaken to investigate the effects of inhaled COV in a rat animal model.

General description of data collection methods

This was a laboratory-based investigation that utilized a rat model to study the effects of inhaled COV. Control animals breathed filtered air and were otherwise treated identically. Measurements were made in vivo during anesthesia following suitable instrumentation of animals or following removal of tissues/organs from euthanized animals in in vitro studies.

In the in vivo experiments, data were collected from apparatus used to acquire electronic signals for the measures being taken; these included pulmonary function and reactivity to MCh. Responses were recorded in in vitro experiments via electronic data acquisition from apparatus used to measure responses in isolated, perfused trachea, electric field stimulation, and ion transport experiments. Vascular permeability changes were examined using a spectrophotometer to measure the amount of Evans blue dye released from blood into excised lung tissue.

Male rats were exposed by whole-body inhalation of 300 ppm of vapor from crude oil (Macondo well surrogate oil) for a single, acute exposure or for a sub-chronic exposure, and measurements were made 1, 28 and 90 days after conclusion of the exposure. A battery of in vivo and in vitro measurements was made: pulmonary mechanics in vivo, reactivity to inhaled MCh aerosol in vivo, in vitro reactivity of airway smooth muscle to MCh, smooth muscle responses to motor nerve stimulation in vitro, ion transport by airway epithelium in vitro, and vascular permeability of lung blood vessels.

Publication based on the data set

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