

## POTENTIAL HEALTH EFFECTS AFTER OIL SPILL

11 August 2020

Dr Harry Phoolchund, Consultant in Occupational Medicine

### Introduction

Crude oils contain over 1000 different hydrocarbons as well as trace metals and sulphur. Some crude oil components can cause respiratory, liver, kidney, hormonal, neurologic, haematologic and other systemic effects. Some of these effects may only occur at high doses, after a threshold is exceeded.

Crude oils also contain benzene (between 1 and 6% concentration), which is a volatile organic compound (VOC) and polycyclic aromatic hydrocarbons (PAHs) at lower doses, which are carcinogens. Benzene is known to be toxic to blood and the bone marrow, with a risk of blood cancers. It may also be harmful in pregnancy, with possible reproductive and developmental effects. However, Benzene is a risk to workers in a closed environment but tends to evaporate in an oil spill situation with community exposures being minimal. PAHs are more persistent, can bioaccumulate, potentially cause skin and lung cancers and have reproductive and developmental toxic effects.

Other VOCs of crude oil (e.g. toluene, ethylbenzene and xylene) may contribute to acute effects in oil-spill responders but are unlikely to stay in the environment at enough concentrations to cause long term effects. Atmospheric photochemical activation converts volatile hydrocarbons into reactive aldehydes and leads to ozone formation (causing respiratory irritation and possibly triggering asthma attacks).

### Routes of exposure

Inhalation

Skin contact (Dermal)

Ingestion of food and water

Contact with beach sand (e.g. local residents, children)

### Short term health effects:

Respiratory irritation, with asthma attacks triggered, wheezing

Skin irritation

Headaches

Sore throat

Eye irritation and sore eyes

Nausea & vomiting

Perception of unpleasant odour

Dizziness, Fatigue and exhaustion

Lower back pain and leg pain related to duration of clean-up activities

## Long term

Anxiety, depression and PTSD as part of mental health effects

Increased somatization and obsessive-compulsive disorder

Perceived health and financial risks associated with anxiety and depression

Persistent abnormalities of lung function reported

Possible long-term respiratory, endocrine, immunological and genotoxic effects persisting for years in highly exposed persons

## Oil-derived contaminants and exposure pathways

Inh – inhalation; Dml – dermal/skin, Ing - ingestion

| Compound           | Exposure      | Short-term effects   | Long-term effects  |
|--------------------|---------------|--|--|
| Particulate matter | inh           | Exacerbation of asthma, impaired lung function, inflammation                     | Respiratory and cardiovascular disease                     |
| VOC- benzene       | inh           | Blood, nervous + immune effects  | carcinogen   |
| VOC-Toluene        | inh           | Nervous effects, headaches, nausea, fatigue                                      | URT symptoms, nervous effects, developmental effects       |
| VOC- Ethyl benzene | inh           | Eye/throat irritation, dizziness   | ? carcinogen   |
| VOC- Xylene        | inh           | Nervous effects; ENT + skin irritation   |  |
| PAHs               | Inh, Dml, Ing | Headaches, nausea, vomiting, skin + eye irritation                               | Liver damage; haematological effects; suspected carcinogen |
| Hydrogen sulphide  | inh           | Respiratory: sore throat, cough, breathlessness, nervous effects, eye irritation | Central nervous effects                                    |
| cadmium            | inh           | Respiratory effects at very high exposures                                       | Kidney damage, lung disease, carcinogen                    |
| Mercury            | inh           | Nervous + respiratory effects  | Nervous + respiratory effects                              |
| Nickel             | Inh, Dml, Ing | Respiratory effects  | Chronic lung inflammation, carcinogen                      |

## **Precautions / Prevention**

Pregnant women should avoid skin contact with oil and avoid areas with visible oil contamination and odours

All workers and volunteers involved in clean up operations should use suitable personal protective equipment ( PPE) i.e. face masks, gloves, overalls (to avoid skin contamination).

### **Health surveillance programme:**

1. A database should be created of all workers and volunteers involved in the clean up operations, including name, gender, address and contact telephone number
2. A core team of volunteers (ideally including one or more with a health background) to maintain this database and also to record details for each individual: past medical history, any recent symptoms, exposures in relation to oil-spill, PPE used.
3. A separate database can be created for local residents to include name, gender, address, proximity to the coast/oil spill area, symptoms if any (including perception of any odours and eye irritation)

### **Next steps:**

The above suggestions for health surveillance and follow up can be elaborated after we review what has been done in oil spill scenarios e.g. Deep Water Horizon and Prestige. This will also depend upon on the strategy, moving forward.