



ECOTOX - BRASIL

*Ecotoxicol. Environ. Contam.*, v. 10, n. 1, 2015, 41-45  
doi: 10.5132/eec.2015.01.07

**EEC**

## Toxicity identification and evaluation of a refinery wastewater from Brazil (Phase I)

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(Received March 22, 2015; Accept July 07, 2015)

### Abstract

Petroleum refineries generate a large amount of effluents, which if released without appropriate treatment can cause chronic effects to organisms. Most studies show that many contaminants can be responsible for the toxicity, among them ammonia, sulfide, cyanide, phenol and hydrocarbons. The present study evaluated the cause of the chronic toxicity of a refinery wastewater from Brazil using the organism *Ceriodaphnia dubia* in short-term test. The results suggest that metals such as barium, manganese and strontium can be contributing for the toxicity of the wastewater. Besides this, conductivity could be contributing to the toxicity too, since the level is high for the test organism evaluated.

Keywords: *C. dubia*, chronic tests, refinery wastewater, toxicity identification.

### INTRODUCTION

Much attention has been given to the impact of oil refinery wastewaters. This industry discharges large volumes of wastewaters containing significant amounts of toxic substances and compounds, which need to be removed at the refinery (Avcı *et al.*, 2005).

Burks (1982) stated that chemicals in oil refinery wastewaters which cause acute short-term toxicity can be removed by good biological treatment systems. However, while some refinery treatment plants can eliminate the problem of acute toxicity, the contaminant levels still remain high enough to cause chronic toxicity (Dorris *et al.*, 1972).

Toxicity identification and evaluation (TIE) studies aim at identifying the agents responsible for wastewater toxicity, isolating the sources of this toxicity, evaluating and implementing actions to control and confirm the effectiveness of measures taken to reduce the toxic effects (USEPA, 1991).

Tischler (2013) applied TIE to refinery effluents in the USA and pointed out that the main toxicants contained in these effluents were total dissolved solids (TDS), fluoride, nitrite, ammonia, organic chemicals and metals such as copper, lead, zinc, and nickel. The author also stated that multiple waste constituents such as hardness and TDS can also reduce the bioavailability of other toxicants, e.g., metals.

Other studies suggest that compounds such as sulphides, phenol, cyanide, ammonia and hydrocarbons are responsible for refinery wastewater toxicity (Dorris *et al.*, 1974; Hall *et al.*, 1978; Westlake *et al.*, 1983; Hartmann, 2004; Wake, 2005). However, few works cite metals as responsible for toxicity (Dorris *et al.*, 1961; Pessah *et al.*, 1973; Badaró-Pedroso, 1999; Tischler, 2013).

The composition of refinery wastewater cannot be generalized because it depends on the refinery, the type of crude oil and the units that are in operation at any specific time (Wake, 2005). Therefore, it is difficult to predict what effects

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