

METHOD FOR THE DETECTION OF TRICHLOROACETIC ACID IN URINE USING UV-VIS SPECTROPHOTOMETER

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Abstract

Trichloroacetic acid (TCA) is excreted in urine as a metabolite of trichloroethylene (TCE) and perchloroethylene (PER). Both TCE and PER are volatile organic solvents widely applied as degreasers of fabricated metal parts, as lubricants, and in dry-cleaning. TCE is a well-known animal carcinogen, recognized for its many toxic effects in humans, such as cardiovascular effects, pulmonary toxicity, neurotoxicity and probably genotoxicity. Occupational exposure to TCE and PER occurs mainly through inhalation, while the less common routes are ingestion and skin contact.

TCA is one of the metabolite forms in TCE-exposed workers and is a specific index for TCE absorption in biological monitoring of exposure to TCE. Although TCA levels cannot represent the severity of a TCE-induced disorder, it is helpful for diagnosis of symptoms such as dermatitis induced by TCE. The half-life of TCA excretion in urine is about 2 to 5 days. A urinary TCA concentration of 100 mg/l at the end of the last work shift (8 h/day, 5 days/week) of the week has been established in workers as exposure equivalent for the carcinogenic substance TCE.

The aim of this study was to develop and validate a method to be used for the routine analysis of TCA in urine at NIOH-Analytical Services. Varying known concentrations of TCA were added to a urine of unexposed individual to prepare standards for the calibration curve. Calibration standards and certified reference materials (QCs) were prepared by adding pyridine and an alkaline solution of potassium hydroxide (KOH). The mixture was then heated at 65^o C for 30 min and produced a pink/purple colour, where the red reaction product was determined photometrically at 530 nm using Agilent carry 60 UV-VIS spectrophotometer.

The results obtained for this method showed: good linearity with R² values above 0.99; within-run precision and accuracy, as seen from % CV of 11.35 and SDI of 0.66, respectively; and a recovery of 92.86 %. Based on the acceptable R values, SDI, excellent precision and average recovery this method is deemed suitable for the routine analysis of TCA.