

# Urinary thioether output as an index of occupational chemical exposure in petroleum retailers

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Petroleum is a complex mixture of lipophilic chemicals, some of which are likely to be substrates for the microsomal mixed function oxygenases. Petroleum retailers, by virtue of their occupational exposure potential, are a group likely to receive relatively heavy exposure to petroleum products in comparison with the general public.

Urinary thioether output may provide a simple, non-invasive technique for identifying occupational chemical exposure.<sup>1,2</sup> The technique exploits the fact that conjugation with glutathione, followed by urinary elimination as mercapturates, is a significant metabolic clearance pathway for electrophilic chemicals and, in particular, for putatively toxic metabolites of the microsomal mixed function oxygenase system. Raised thioether output has been confirmed for several occupations associated with potential exposure to such chemicals.<sup>3-6</sup>

Induction of the microsomal oxygenases is a common response to the ingestion of lipophilic chemicals. Since hepatic microsomes from rats exposed to petroleum vapours were found to have induced activity towards a range of cytochrome p450 substrates,<sup>7</sup> it was reasonable to interpret the faster clearance of antipyrine in a cohort of petroleum retailers<sup>7</sup> to result from occupational exposure to petroleum, although it was not possible to confirm exposure more directly using indices based on petroleum components such as benzene or lead and shown by others<sup>8,9</sup> to be sensitive to petroleum exposure.

This study was undertaken to assess the utility of the urinary thioether technique to detect occupational chemical exposure in petroleum retailers. Since attendant operated pumps have been supplanted in many outlets by self-service pumps, it was of some interest to determine whether this difference in retailing practice was reflected in the occupational exposure patterns.

## Methods

Forty three male and five female employees (aged 16-53 (mean 29, SD 10)) at 25 Adelaide suburban petrol vending stations took part in the study. Thirteen were employed in self service stations. All had worked in the industry as petrol pump attendants or garage mechanics, or both, for more than a year. They were asked to collect two urine samples during a midweek working day—one prework sample between 0600 and 0700 and one postwork sample between 1900 and 2000. Samples were stored in the freezer until analysis. A short questionnaire giving details of diet, medications taken, cigarette consumption, and employment duties was completed by each subject at the time of sample collection. Urine samples were analysed for both thioether and creatinine concentration as follows.

## THIOETHER

Urinary thioether concentration was determined after acidification and ethylacetate extraction by colorimetric assay, as described by van Doorn *et al.*<sup>1-3</sup> Concentrations were expressed as  $\mu$ moles thioether relative to creatinine concentration (mmoles) to minimise any variation due to fluctuations in urine output.

## CREATININE

Creatinine concentration was determined by the method of Yatzidis.<sup>10</sup>

## STATISTICS

Work related changes (am to pm differences) in individuals were analysed by the Wilcoxon matched pairs, signed rank test, 2 tail. The rises in urinary thioether output in smokers versus non-smokers, in pump attendants versus self service outlets, and the influence of workshop duties were compared with the Mann-Whitney U test. The interaction between smoking and work related thioether output was assessed by a 2 way ANOVA.