

# Blood lead and carbon monoxide levels in Mersey Tunnel workers

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With a rail link between England and France forging ahead, and a possible road tunnel to follow, we examined the levels of lead and carbon monoxide in the workers of an existing motor tunnel.

## Methods and results

A single venous blood sample was taken from 12 non-smoking male Mersey Tunnel workers towards the end of an 8-hour shift. A similar sample was taken from 10 non-smoking policemen living in similar postal areas.

The blood was analysed for lead by the Delves Cup arrangement coupled with atomic absorption spectrophotography, and for carbon monoxide by a spectrophotometric carboxyhaemoglobin method. The results were compared using Student's t-test and are summarised in Table 1.

## Comment

All the results are within normal reference ranges (carboxyhaemoglobin <6%; blood lead <1.9  $\mu\text{mol/litre}$ ). Although the blood lead levels are statistically significantly higher in the tunnel workers, the total numbers are small and the confidence intervals wide. Thus, comparing the two groups of blood lead results, the difference shows a sample mean of 0.11 (95% confidence interval 0.03–0.19),  $t = 2.086$  (degrees of freedom 20),  $p < 0.05$ .

Although the mean age of the tunnel workers (47.2) was greater than that of the control groups (33.2), their higher blood lead levels are unlikely to be the result of accumulation with age, since Barry [1] has shown that, whilst the level of lead in bone rises steadily with age, there is no such accumulation in blood.

If the tunnel workers are accumulating lead as a result of occupational exposure, is it harmful at these levels? There is certainly little risk of acute lead poisoning, which does not normally become manifest at levels below 2  $\mu\text{mol/litre}$ . In recent years, greatest concern has centred round the possible link between lead exposure and intellectual impairment in children; the subject has been well reviewed by Rutter [2] and more recently by Cloag [3], and both agree there is no conclusive evidence of a harmful effect.

**Table 1.** Blood lead and carboxyhaemoglobin levels in Mersey Tunnel workers (means  $\pm$  1 SD).

	Mersey Tunnel workers	City policemen	
Blood lead ( $\mu\text{mol/litre}$ )	0.59 $\pm$ 0.13	0.48 $\pm$ 0.09	$p < 0.05$
Blood carboxyhaemoglobin (%)	4 $\pm$ 1.4	5 $\pm$ 1.2	$p$ NS

In adults, recent debate has focused on the association between lead and hypertension. Some studies, for example the second United States National Health and Nutrition Survey, show an association between systolic and diastolic blood pressure and blood lead level [4] whilst others, such as the British Regional Heart Study, suggest there is no such association [5].

From the available evidence there is little to suggest that there is accumulation of lead or carbon monoxide in Mersey Tunnel workers to a level that is likely to be injurious to their health. We believe this reflects well on the safety standards of existing underwater motor tunnels and should offer a note of encouragement for those embarking on more elaborate future projects.

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