

and PS. Further work will include a non-welding reference group, and will quantify exposure to manganese.

#### 20 INCREASED RISK OF PARKINSONISM ASSOCIATED WITH CUMULATIVE HOURS OF WELDING

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**Objectives** Manganese, an established neurotoxicant, is a common component of welding fumes. Symptoms of manganese poisoning include parkinsonism (PS). Prior epidemiologic evidence regarding occupational welding and PS is mixed, and remains highly controversial.

**Methods** This study investigated the prevalence of PS among 581 active male shipyard welders recruited from a trade union. Study subjects were examined by a movement disorders specialist using the Unified Parkinson's disease Rating Scale motor subsection 3 (UPDRS3) without knowledge of exposure. PS cases were defined as welders with UPDRS3 score  $\geq 15$ ; this threshold corresponds to the degree of motor impairment found in early, symptomatic Parkinson's disease. An intermediate group was defined as UPDRS3 score 6–15. Normal was defined as UPDRS3  $< 6$ . Exposure was classified as cumulative hours of welding ("welding hours"), based on validated questionnaire data. Prevalence ratios (PR) for PS, adjusted for age, race, smoking, and education, were calculated in relation to quartiles of welding hours.

**Results** The overall prevalence estimate of PS was 13.1%. We observed a monotonic exposure-response gradient comparing PS cases with normal subjects (UPDRS3 $<6$ ). PRs (95% CI) for increasing exposure quartiles were: 1.0 (reference), 1.2 (0.6–2.6), 1.4 (0.7–2.8), and 1.6 (0.8–3.1) (p-trend=0.28). There was a much weaker gradient comparing the intermediate UPDRS3 group and normal subjects: 1.0 (reference), 1.0 (0.7–1.3), 1.2 (0.9–1.6), and 1.2 (0.8–1.6) (p-trend=0.11), respectively.

**Conclusions** Results from our ongoing epidemiological study of welders support an etiologic relation of welding exposure