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### Occupation and Risk of Parkinson's Disease (PD): A Preliminary Investigation of Standard Occupational Codes (SOC) in Twins Discordant for Disease

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**OBJECTIVE:** To determine whether work as a teacher, healthcare worker, welder or agricultural worker is associated with an increased risk of PD.

**BACKGROUND:** Agricultural work, welding, teaching and healthcare have been proposed to increase the risk of PD, possibly reflecting occupational toxicant exposure, but results vary across studies. Proposed occupation-associated exposures are: welding/manganese, agriculture/pesticides, teaching/infection, health care/infection. Because twins share many environmental and genetic factors, investigations in twin pairs discordant for PD may be highly informative.

**DESIGN/METHODS:** Lifelong occupational histories were collected in male twin pairs discordant for PD from the NAS/NRC WWII Veteran Twin Cohort. Nondemented living twins were eligible. Job-task-based histories were obtained from age 10 until PD onset in the affected twin. Occupations of interest were identified a priori and assigned SOC codes. In this preliminary analysis, we determined the relationship between PD risk and ever working in the following occupations: agricultural work: SOC 55,56; welding: SOC 771; teaching: SOC 22-24; healthcare: SOC 26,28-30; teaching or health care: SOC 22-24, 26,28-30.

**RESULTS:** 96/142 discordant pairs were included (52 DZ, 44 MZ). Of 192 individual twins, 12 had been teachers, 10 health care workers, 8 welders and 74 agricultural workers. Overall, no occupation was significantly associated with an increased PD risk. Increased risk was suggested for teaching (OR 1.5, 95% CI 0.36, 7.2), health care (OR 3.0; 95% CI 0.54, 30) and teaching or health care (OR 2.2; 95% CI 0.7, 8.1), but in each case precision was poor and results were not statistically significant. However, in MZ pairs, working as either a teacher or healthcare worker was associated with a significantly increased risk of PD (OR 9; 95% CI 1.25, 394;  $p=0.027$ , continuity corrected). Welding (OR=1) and agricultural work were not associated with an increased PD risk.

**CONCLUSIONS:** The increased PD risk in MZ twins working as teachers or health care workers lends support to prior suggestions that some factor associated with these occupations may cause PD, such as an associated risk of exposure to infectious diseases (Tsui et al, 1999). Future investigations of this hypothesis may be informative.

Neither welding nor agricultural SOC codes were associated with an increased risk of PD. Because SOC codes may misclassify job task or specific exposure, a detailed job-task-specific analysis based on industrial hygienist review is currently underway.

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### Head Injury and Parkinson's Disease Risk in Twins

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**OBJECTIVE:** To determine whether a history of head injury with loss of consciousness is associated with subsequent development of Parkinson's disease.

**BACKGROUND:** Post-traumatic parkinsonism may occur following cumulative head trauma. However, the relationship be-

tween mild closed head injury and typical idiopathic PD is unclear. Several case-control studies found an increased frequency of prior head injury in PD patients, but others, including one nested prospective case-control study, found no significant association. Some have ascribed the association to general features of "male behavior" rather than head injury per se. Because twins share many behavioral traits and environmental experiences in addition to their similar or identical genotypes, they offer a powerful population in which to study putative risk factors for PD.

**DESIGN/METHODS:** Twin pairs with PD in at least one twin were identified from the NAS/NRC World War II Veteran Twin Cohort. Diagnosis was confirmed by direct examination. All members of affected pairs were asked to participate in a risk factor interview administered by telephone. Proxy respondents were queried on behalf of deceased and demented subjects. Subjects were asked if they had ever sustained a head injury that resulted in a loss of consciousness or amnesia, the length of unconsciousness, if they were hospitalized, and the date(s) of occurrence.

**RESULTS:** We identified 142 twin pairs discordant for PD (60 MZ, 80 DZ). 217 (76.4%) of these 284 individuals completed the interview. Response rates did not differ by zygosity, disease status, or respondent type. Excluding head injuries occurring after PD diagnosis, 32 (14.7%) subjects reported at least one prior head injury, for which 17 (7.8%) were hospitalized. Duration between head injury and PD onset ranged from 2 to 70 years (mean 37.4, SD 16.6). In 84 pairs with complete histories in both twins, the twin with PD was significantly more likely to have sustained a prior head injury ( $p=0.023$ ; OR 3.0, 95% CI 1.14 - 9.23). Similar non-significant trends were observed when stratifying by zygosity (MZ: OR 3.3, 95% CI 0.86 - 19; DZ: OR 2.7, 95% CI 0.64 - 16). This association persisted when restricted to head injuries occurring at least 10 years prior to PD. Neither duration of unconsciousness nor hospitalization were significantly associated with PD.

**CONCLUSIONS:** Head injury has been shown to impair BBB, increase free radicals and lipid peroxidation, increase catalase and glutathione peroxidase activity, and may enhance axonal accumulation of  $\alpha$ -synuclein. Using a discordant twin pair method, these results suggest that head injury increases the risk of developing typical PD. The persistence of the association when limited to head injuries at least 10 years prior to diagnosis reduces the likelihood that early "pre-clinical" PD might have caused the head injury. Although retrospective designs are susceptible to recall bias, this study further implicates the role of mild head injury in idiopathic PD.

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### Alcohol Consumption and the Incidence of PARKINSON'S Disease in Two Prospective Studies

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**OBJECTIVE:** To investigate whether moderate alcohol drinkers had a lower risk of idiopathic Parkinson's disease (PD) than abstainers in two large prospective cohorts.

**BACKGROUND:** Cigarette smoking and caffeine consumption are associated to a decreased incidence of PD. This inverse association may result from a neuroprotective effect of cigarette smoke and caffeine, or from a disinclination of future PD patients to engage in habituating behaviors. We investigated the association between alcohol consumption, another habituating behavior, and risk of PD in two large prospective studies.

**DESIGN/METHODS:** We identified new cases of PD in two large prospective cohorts of women (Nurses' Health Study) and men (Health Professionals' Follow-up Study). Overall, the diagnosis was confirmed by the treating neurologist in 85.2 percent of the cases, by review of the medical records in 4.1 percent of the cases, and by the treating internist without further support in the remaining 10.7 percent of the cases. Alcohol intake was measured using a semiquantitative food frequency questionnaire. We used

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