Does not appear to be published yet

Exposure Assessment in a Hospital-Based Case-Control Study of Acute Myeloid Leukemia and Lymphoma in Shanghai, China

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Background. This paper describes a retrospective exposure assessment (EA) in a hospital-based case-control study of acute myeloid leukemia and lymphomas. The epidemiologic study involved cases and individually matched controls drawn from patients at more than 30 hospitals in Shanghai, 2002-2007. Thus, the study subjects represent a diverse sample of the Shanghai regional population. The epidemiology study design, diagnostic procedures and quality assurance processes have been described elsewhere. This paper addresses the EA.

Methods. Interviews of patients based on structured questionnaires (in Chinese) by trained interviewers initiated the retrospective EA. The interviews focused on work history events (job one to job n as required) with review of hazards by stepwise detailed groups: 1. Petroleum products and solvents (16 subcategories) 2. Metals (21 subcategories), 3. Agricultural chemicals and products (12 subcategories), 4. Other substances (21 subcategories). Interviews were conducted in stages: a primary questionnaire for basic employment/occupational information and, if the jobs were of potential interest, with structured follow-up interviews if needed for more detailed data. Classifications included: potentially exposed to benzene, potentially exposed to other hazard, likely unexposed to any study hazard, or uncertain (requiring further investigation). Resources used in the exposure assessment included historical monitoring exposure data from the Shanghai Municipal Institute for Public Health Supervision, the Chinese medical/exposure literature, on-site workplace investigations, reports on technology changes for key industrial sectors, and opinions of a panel of local experts. The process for the benzene assessment involved a detailed job/task/industry/time exposure matrix that was applied to each work history event with possible occupational exposure. For the other hazards, qualitative scores were assigned also using a using a job/industry/task/time/exposure matrix.

Results . The total study database included over 21,000 work history events assessed for chemical exposures, and approximately 950 assessments specifically for benzene. The benzene results were categorical, with ranges of <1, 1 to <10, 10 to <100 and 100 and greater mg/m3. Based on a preliminary analysis, the work events rated in these categories were: 379, 190, 145, and 59 respectively. The data included frequency and duration of exposure for tasks associated with the job histories. The data for "other exposures" were diverse. Examples by broad category (with frequency of occurrence) included: fuels (434), pesticides (571), herbicides (100), fertilizers (548), metals and metal exposed operations (280), wood dust (70), solvents in general, excluding benzene (156), ionizing radiation (11).

Conclusions. The diversity and duration of work events encountered in this general population case-control study presented logistical and technical challenges (some unique to China). The extent of changes in industrial technologies in China's rapidly developing economy, regulatory changes and data quality issues were among the factors addressed via the study methods. For benzene, although the majority of the task intensity ratings are in the lower categories, the higher categories were populated by workers in industries known to have historically elevated benzene exposures in China. The exposure assessment is an integrated component of the epidemiologic study, and ultimately the strengths and limitations remain to be evaluated in the epidemiologic analyses yet to come.