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Project Title: Medical Surveillance for Former Workers
Institution: University of Washington
PI Name: Timothy Takaro, Jordan Firestone
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Medical Surveillance for Former Workers

Final Technical Report for the period October 1, 1996 – September 30, 2006

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ABSTRACT

The Former Hanford Worker Medical Monitoring Program, directed by the Occupational and Environmental Medicine Program at the University of Washington, served former production and other non-construction workers who were potentially exposed to workplace hazards while working for the USDOE or its contractors at Hanford. The USDOE Former Workers Program arose from Congressional action in the Defense Authorization of 1993 (Public Law 102). Section 3162 stated that, "The Secretary shall establish and carry out a program for the identification and ongoing medical evaluation of current and former Department of Energy employees who are subject to significant health risks as a result of exposure of such employees to hazardous or radioactive substances during such employment." (This also covers former employees of USDOE contractors and subcontractors.) The key objective has been to provide these former workers with medical evaluations in order to determine whether workers have experienced significant risk due to workplace exposure to hazards.

Exposures to asbestos, beryllium, and noise can produce specific medical conditions: asbestosis, berylliosis, and noise-induced hearing loss (NIHL). Each of these conditions can be identified by specific, non-invasive screening tests, which are widely available. Treatments are also available for individuals affected by these conditions.

This project involved two phases. Phase I involved a needs and risk assessment, characterizing the nature and extent of workplace health hazards which may have increased the risk for long-term health effects. We categorized jobs and tasks by likelihood of exposures to specific workplace health hazards; and located and established contact with former Hanford workers. Phase II involved implementation of medical monitoring programs for former workers whose individual work history indicated significant risk for adverse health effects.

We identified 118,000 former workers, employed from 1943 to 1997. After excluding current workers, construction workers, and deceased workers, the total estimated number of former workers eligible for screening was 72,611. By September, 2006, 53,010 workers had been contacted, 20,298 responded, 2,835 were eligible and authorized, and 2,773 workers were ultimately screened. The cohort was 80% male, 85% white, and had a mean age of 63 years (range 24-96 years) at the time of first exam.

Participants completed an occupational health history survey prior to the medical exam. Former Hanford workers were considered eligible for an exam if they reported exposure to asbestos, beryllium, or noise, or if a review of their Hanford work history indicated possible or probable exposure to one of these three hazards. We also invited any former Hanford worker who requested an exam to

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participate, regardless of documentation of exposure. The screening exam included a problem-focused physical exam, along with screening tests for one or more of three specific medical conditions: asbestosis (chest X-ray and spirometry), berylliosis (chest X-ray, spirometry, and beryllium-induced lymphocyte proliferation test), and NIHL (audiometry).

We assisted ill workers in filing appropriate workers' compensation claims, and facilitated appropriate follow-up medical care. This program has made an important contribution to the health of former DOE contractor workers at the Hanford defense nuclear site.

BACKGROUND

The U.S. Department of Energy (USDOE) Hanford Site was the nation's first plutonium-producing nuclear weapons facility, breaking ground in 1943.(1) An enormous amount of high-level radioactive and chemical waste was generated and continues to be stored at the Hanford Site, where occupational hazards include heavy metals, solvents, acids, asbestos, beryllium, ionizing radiation, and noise.(2, 3)

Congressional action in 1993 led USDOE to initiate thirteen pilot medical surveillance programs for former workers at various sites across the nation, including two at Hanford. These pilot programs used a variety of methods and approaches to medical surveillance. The programs identified hazardous exposures to asbestos, beryllium, and noise as warranting medical screening.(4,5)

Exposures to asbestos, beryllium, and noise can produce specific medical conditions: asbestosis, berylliosis, and noise-induced hearing loss (NIHL). Each of these conditions can be identified by specific, non-invasive screening tests, which are widely available. Treatments are also available for individuals affected by these conditions.

The Former Hanford Worker (FHW) Medical Monitoring Program, directed by the Occupational and Environmental Medicine Program at the University of Washington (UW), served former production and other non-construction workers who were potentially exposed to workplace hazards while working for the USDOE or its contractors at Hanford. In 1996, the FHW program conducted a needs assessment to estimate the size of the program's target population and to characterize the patterns of hazardous exposures at Hanford. We began to locate and recruit eligible workers, and began medical screening exams in 1998. This report represents the cumulative results of Project activities from October 1, 1996 to September 30, 2006.

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METHODS

Former Worker Cohort

Former Hanford production and non-construction workers were eligible to participate in the UW medical screening program, regardless of their current residence. (Construction workers were referred to the CPWR program, and current Hanford workers were referred to the Hanford on-site Occupational Medicine service.) Staff in the Richland field office, located near the Hanford site, provided a local presence and performed activities including locating and identifying participants and conducting outreach activities. We developed lists of eligible participants using administrative employment data from site records, unions, and employers. We confirmed vital status and contact information using local telephone books, internet resources, the Social Security Death Index, TransUnion Trace and Retrace services, and state driver's license databases. Recruitment activities included targeted mailings, flyers, video presentations, discussion seminars, and attendance at local events.

We identified 118,000 former workers, employed from 1943 to 1997. After excluding current workers, construction workers, and deceased workers, the total estimated number of former workers eligible for screening was 72,611.(6)

Participants completed an occupational health history survey prior to the medical exam. The survey contained questions regarding demographics (age, sex, race/ethnicity, and education), respiratory health history, smoking history ("Have you smoked at least 100 cigarettes in your entire life?"), and details about each job held at Hanford (job type, duration, location, toxicant exposures). The occupational health survey was completed by 80% of the workers screened.

Former Hanford workers were considered eligible for an exam if they reported exposure to asbestos, beryllium, or noise, or if a review of their Hanford work history indicated possible or probable exposure to one of these three hazards. We invited any former Hanford worker who requested an exam to participate, regardless of documentation of exposure.

Screening Protocol

The screening exam included a problem-focused physical exam, along with screening tests for one or more of three specific medical conditions: asbestosis (chest X-ray and spirometry), berylliosis (chest X-ray, spirometry, and beryllium-induced lymphocyte proliferation test or BeLPT) and NIHL (audiometry). We offered repeat screening at three year intervals to participants whose screening results for asbestosis or berylliosis were normal, as those two conditions have a long latency period. However, participation in these follow-up exams was limited for various reasons, including inconsistent program funding. We recommended

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that participants file workers' compensation claims when screening tests revealed abnormalities.

A single, experienced B-reader graded chest X-rays according to standard International Labor Organization criteria. Abnormalities were categorized as pleural or parenchymal, with parenchymal profusion ratings categorized as minimal (0/., 0/0, 0/1), mild (1/0, 1/1, 1/2), moderate (2/1, 2/2, 2/3), or severe (3/2, 3/3, 3/+).

We evaluated spirometry results according to American Thoracic Society criteria, with reference values determined according to the method of Crapo, adjusting for age, gender, race, height, and weight. Abnormalities were categorized as obstructive or restrictive. Obstructive lung disease was defined as FEV_1/FVC ($FEV_1\%$) < 70 , and was graded as mild ($FEV_1\% = 60-69$), moderate ($FEV_1\% = 50-59$), or severe ($FEV_1\% < 50$). Restrictive lung disease was defined as $FEV_1\% > 70$ and percent predicted FVC (ppFVC) < 80 , and was graded as mild (ppFVC = 70-79), moderate (ppFVC = 60-69), or severe (ppFVC < 60). We graded spirometry results for participants with multiple visits according to their lowest values.

We defined elevated blood pressure as any value above 140 mmHg systolic or 90 mmHg diastolic. We defined material hearing loss as average hearing threshold losses for both ears that exceed 25 dB at 1000, 2000, 3000, and 4000 Hz (7). BeLPT testing was done by laboratories at the National Jewish Hospital in Denver and the University of Pennsylvania in Philadelphia.

RESULTS

Many of the workers were found to have previously unrecognized medical conditions. For example, we found elevated blood pressure in roughly 40% of participants. Material hearing loss was found in 50% of participants screened with audiometry. The BeLPT was abnormal in 3.5% of participants screened. Respiratory health was assessed with chest exams, chest x-rays, and spirometry. Breath sounds were abnormal in 19% and chest x-rays were abnormal in 22% of participants, 83% of which showed pleural abnormalities, 32% showed parenchymal abnormalities, and 16% showed both. The majority of participants had normal lung function, though 17% showed mild, 5% moderate, and 3% severe obstructive lung disease, and 11% showed mild, 5% moderate, and 3% severe restrictive lung disease. Overall, 927 workers had evidence for NIHL, 561 for asbestosis, and 75 for berylliosis.

SIGNIFICANT ACCOMPLISHMENTS

Our program had distinctive strengths in two areas, multiple clinics and a local presence. All of the full-time clinics provided "one-stop shopping," so that workers received all necessary services at one site. We established locations based on

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demand and the number of former Hanford workers residing in a designated area. This local clinic approach allowed increased access to care, provided flexibility to the workers, and was an effective and efficient way to reach out to the former worker population. This delivery method contributed to high patient satisfaction. A local presence was maintained through our Richland office, where all staff members had experience with Hanford operations and therefore were instrumental in consulting on exposure history, assisting workers with providing accurate and complete work histories, and ensuring the Seattle program office remained aware of current Hanford activities.

PROJECT LIMITATIONS

Locating methods: Due to incomplete site rosters and databases we were unable to ascertain a complete list of all former Hanford workers.

Workers' compensation claims: The administration of Washington Department of Energy workers' compensation claims moved from the Washington State Department of Labor and Industries to a third-party administrator, CCSI, in February 2000. This change affected our claims information processing and handling practices, and increased administrative demands.

Geographic distance: Many former workers had left the Hanford area and could not access our clinics, which were located in the Northwest. We had some success utilizing other Former Worker Programs in areas where we did not have clinics in place. However, in some cases it was not possible to provide services in a manner convenient for the workers.

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