

**A Model Medical Surveillance Program
For Persons in Hazardous Waste Operations
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ABSTRACT

The paper describes a standardized medical surveillance program for a company engaged in hazardous waste operations at multiple locations in North America. The company implemented a program in 1986 to comply with the OSHA hazardous waste operations regulations. The initial program had deficiencies including: 1) lack of consistency in medical testing between different sites: 2) difficulty maintaining confidentiality: 3) differences in occupational medicine expertise among examiners which could affect occupational disease recognition and/or employee risk factor screening.

The program incorporated tools to assess individual employee exposures and applied multidisciplinary input from occupational health professionals (industrial hygienists and occupational medicine specialists) to job and site specific hazards to develop a comprehensive medical examination protocol. The Medical Surveillance Evaluation (MSE) form is completed annually by employees and categorizes chemical and physical hazard exposure potential. Program implementation resulted in 12% reduction of medical examinations and an improvement in the quality of both biological monitoring decisions/data and medical evaluations.

Approximately 2900 employees are currently enrolled. About 14,000 examinations were conducted in the past 14 years representing one of the largest studied industry populations. Initially, annual biological monitoring tests for lead, PCB's, arsenic and cholinesterase levels were conducted. This was

discontinued after tissue levels revealed concentrations in the general population range. Subsequent biological monitoring was targeted to hazards identified by EAS and site-specific activities with recognized exposure potential that could be effectively monitored. No unusual tissue levels have been measured indicating overall effectiveness of exposure control measures for this population. No previously unrecognized occupational disease cases from hazardous waste exposures were identified during a routine medical examination. Approximately 3% of employees had ergonomic related limitations and < 1% had respirator use restrictions. The study demonstrates how monitoring program weaknesses can be overcome by appropriate standardization of monitoring tools combined with centralized procedures.

PAPER

The passage of the Superfund Act of 1980 (officially known as the Comprehensive Environmental Response and Liability Act of CERCLA) resulted in the rapid growth of work in the Engineering and Construction industries. This was followed in 1986 by passage of the Superfund and Amendments Re-Authorization Act (also known as SARA) in which congress specifically required OSHA to develop protection for hazardous waste workers. OSHA promptly responded with the Hazardous Waste Operations and Emergency Response (HAZWOPER) standard, which included detailed requirements for training, safety planning, protective equipment, and medical surveillance.

The HAZWOPER Medical Surveillance requirements (29 CFR 1910.120(f)) covers employees working in hazardous waste operations that are exposed above published exposure limits (PELs, RELs, TLVs), wear a respirator over 30 days a year, those who develop symptoms, and or members of HAZMAT team. The exam frequency includes initial exams, annual exams, and exit exams with the allowance for biennial exams with the physician's approval. The medical examination content is determined by the physician. The employer must provide job activity information to the examining physician. The physician must issue a written opinion as to the clearance or limitations of the employee to work in hazardous waste operations.

The medical surveillance program for the company began informally in 1983 with examinations by local clinics near the 14 local offices that were involved in hazardous waste operations. Staff members assigned to field hazardous waste projects were typically well-educated geologists, environmental scientists, civil engineers, biologists, and other professionals. The staff (approximately 280) was seeing general practice physicians, typically selected due to a personal contact from the local office. There was no standard protocol or central record keeping system. Specific problems in the program included lack of consistency between different locations, lack of standardization regarding exams and lab test results, different criteria for work clearance, difficulty maintaining confidentiality, and lack of occupational disease expertise among examiners.

In 1986, the company determined the need for a nationwide management of the medical surveillance program with the goals including:

- Protection of employees
- Meeting regulatory (HAZWOPER) requirements
- Minimize company liability
- Comprehensive standardized exams protocol
- Computer tracking of exam frequency, medical conditions, and lab results
- Central oversight and record keeping

During this time, government, physicians, company management, and many employees believed that hazardous waste fieldwork was very high risk and the potential for occupational disease significant. The desire was clearly for a very detailed, and comprehensive medical surveillance program.

The implementation of a formal, corporate program in 1986 included a standard questionnaire for the employee, standard examination protocol, forms for the examining physicians, and a detailed group of tests, including:

- Pulmonary function tests
- Chest X-ray
- Audiometric exam
- Blood lead
- Serum and red blood cell cholinesterase
- Urinalysis and microscopic
- Blood Chemistry Panel
- Complete blood count

The local field offices paid for the exams, with costs ranging from \$500-\$800 per exam, and corporate paid the additional cost of medical review and database management to the medical management firm.

Since the initial implementation, the program has evolved based on changing needs and an ongoing review of the medical monitoring results and findings of industrial hygiene surveys. Numerous industrial hygiene surveys at a cross section of environmental clean up sites indicated that field exposures to staff are normally well below permissible exposure limits. In addition, the protection standards of personnel at these sites are exceedingly conservative, with both respiratory and dermal protection implemented at levels well below exposure limits.

In 1988, the results of the first years of the medical monitoring program were evaluated. Over 500 examinations had been performed and the findings indicate that there was no unusual tissue levels of contaminants or significant occurrence of occupational disease. Individuals in this program generally had an absence of significant health complaints and there was relative stability of complete blood counts, liver function and pulmonary function. Only one of over 500 blood lead measurements was outside the normal acceptable range for an industrial population of 15 micrograms per deciliter. This individual's result of 30 micrograms per deciliter was discovered on a baseline examination and reflected exposures from a previous employer. Similarly, there were no excursions above normal values for over 500 serum and red blood cell cholinesterase measurements. As a result of this, a policy was implemented to link biological monitoring to actual employee potential for exposure to various contaminants. This exposure driven model improved the effectiveness and efficiency of the biological monitoring aspect of the overall medical surveillance program.

In the mid-1980s, there was significant clean up of some of the most contaminated drum sites. Subsequently, the work since then has involved low-risk treatment of contaminated soil and ground water. Key changes in the medical protocols in the late 1980's involved the introduction of an employee exposure assessment form, called Medical Surveillance Evaluation (MSE). This instrument, shown in appendix a, documents employees' potential for exposure to a variety of physical, chemical and biological hazards. It also quantifies the amount of time an employee is engaged in hazardous waste activities. It is

a semi-quantitative instrument that is used as a surrogate for “exposure potential” and is reviewed yearly by an occupational physician. The employee is required to complete this form each year in conjunction with their supervisor at the time of their annual review. The peer review performed by the supervisor provides a limited form of quality review. Based on the occupational physician’s review, lower risk staff (currently 12%) was switched to biennial examination. In addition, the frequency of x-ray, EKG testing and biological monitoring may be altered. The information obtained from the MSE is periodically verified by formal industrial hygiene workplace surveys.

In the early 1990s, the consolidation of the hazardous waste/environmental business allowed the company to grow primarily through mergers and has resulted in current population of 2,900 staff enrolled in the medical surveillance program. The staff is spread throughout North America in 124 offices. The growing complexity of the program and the staff time involved and the management of this program prompted the company to seek additional efficiencies in the overall program management. The company elected in 1992 to use the medical oversight provider for full medical program management including:

- Selection and contracts with local clinics
- Quality assurance of medical providers
- Uniform nationwide pricing
- Selection of a single national laboratory to analyze blood and urine specimens
- Laboratory quality assurance
- Direct scheduling of exams with company staff
- Medical record keeping
- Physician written opinion (clearance)
- Quality review of exams, lab studies and outcome

The medical surveillance program involves the following process. Strict physician credentialing criteria are developed. Providers are selected based on a review of the credentialing information. A single national laboratory is selected to analyze biological

specimens. The vendor provides complete administrative service support, which uses a customer service team to coordinate scheduling of examinations and establish procedures to complete MSE forms and incident and accident illness reports. The vendor provides program compliance and a quality assurance plan that includes review of medical examinations, lab studies and outcomes. The contractor coordinates a clinical exam, lab testing and medical review as a single process. The lab collection kit is pre-positioned at the examining physician's office. Appointment protocols instruct the local provider staff on specimen collection and scope of exam. Exam results and lab testing are sent to the contractor in an overnight air envelope. Results are available for report on the third day after the examination. The employee is notified of the results. The physician provides a written opinion to the health and safety staff on individual employee clearance and ability to work with various physical and biological hazards. A database is maintained and updated with regards to tests, spirometry, audiometric lab results, chest x-ray, and EKG results and compared to baseline results for variability. Records are stored in compliance with 29 CFR 2910.1020, in strict confidentiality and locked in fireproof cabinets. Off-site storage of active records is maintained in climate-controlled conditions. There is a disaster recovery program to allow for back up of the database.

The most recent five-year comparison is attached in Table 1. In 1995, a total of 946 exams were performed. Of these, approximately 6 percent were cleared for work with restrictions. Three percent of these restrictions were ergonomic related; less than 1 percent were respirator use limitations. Two percent of the restrictions were of a temporary nature requiring further consultation with the employee's personal physician and were removed upon obtaining further information. A total of 10 people were deemed not qualified for hazardous waste work, approximately 1 percent of the total. This was mainly due to outdated examinations. In year 2000, 2,564 exams were done with 38 people being qualified with restrictions (less than 1 percent of the total). There was no individual not qualified for work. The average cost in year 2000 was \$295.00 per individual examined, including administrative costs. The company spent an average of \$260.00 per person enrolled in the program. The comparable figure for 1995 was

\$317.00 per individual examined and the estimated overall cost per participant in the program for 1995 was \$250.00.

The efficiencies created by migrating to a full service contract, including administrative aspects, are evident from these numbers. The company has begun to further enhance the efficiency by migrating to an Internet platform for certain administrative functions. The vendor has developed an Internet support site that allows health safety officials to access employee exam status information via the Internet. On-line service support capability enhances communication and access to data while reducing paperwork. A current initiative underway is to electronically transmit the MSE form and directly populate a database with this information. This will allow the exposure surrogate to be linked to employee medical information so that an exposure matrix can be maintained.

In summary, medical monitoring program deficiencies can be overcome by appropriate standardization of monitoring tools when combined with centralized procedure for exposure assessment, exam coordination and scheduling and protocol development. Use of the Internet will further enhance medical surveillance programs provided confidentiality issues are addressed.

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Table I

Most Recent 5-Year Comparison

	Year 1995	Year 2000
# Of Employees in Program	1,200	2,900
# Of Exams	946	2564
# Blood Lead/ZPP	68	219
Average Blood Lead	N/A	3.57 μ /deciliters
# Of People with Restrictions	54	38
%	6%	1%
Ergonomic Related Restrictions	37	0
%	3%	
# Not Qualified	10	0
%	1%	
Average Cost per Exam, Including Administrative Costs	\$317	\$295
Average Per Enrolled Employee	\$250	\$260