

**Summary Report of
BNL Occupational Medicine Clinic (OMC)
Medical Surveillance Examination Results
For
BNL Employees in
Fiscal Year 2008 (FY 2008)**

Jai Subramani, M.D., M.P.H
Moira Raynor, R.H.I.A, C.C.S-P
Joseph Falco, M.D., M.P.H

May 5, 2009

Executive Summary

This report summarizes OMC's findings from OSHA or DOE-mandated medical surveillance exams performed during Fiscal Year 2008 ("FY 2008") for BNL employees with potential occupational exposure to asbestos, beryllium, cadmium, lead and noise. Medical Surveillance examinations and clinical tests look for internal doses or early biological effects from these exposures. Results showed:

- **No detectable occupational overexposures or adverse health effects from current or recent exposure to asbestos, cadmium, beryllium or lead.**
- **There was 1 case OSHA-recordable occupational hearing loss (referred to as a "Standard Threshold Shift" or "STS").**

Taken together, these results show that efforts at protecting BNL employees from workplace health hazards have, to date, been highly successful and continue to improve.

OMC is highly supportive of:

- **The current initiative led by Industrial Hygiene to obtain adequate baseline, site-wide, operation-specific environmental monitoring data for noise, airborne contaminants and other hazards. This will help guide medical surveillance programs and assure worker protection from health hazards.**
- **Continued efforts at controlling noise in the workplace.**
- **The concept that working safely should be a "core value" for workers both when they are at work and away from BNL.**

PERIOD OF SURVEILLANCE: 10/01/2007-9/30/2008

SURVEILLANCE	EMPLOYEES ELIGIBLE	EMPLOYEES TESTED	COMPLIANCE	ABNORMAL RESULTS
ASBESTOS	6	6	100%	NONE
BERYLLIUM WORKER 11	11	9 Monitored 2 Declined	Voluntary Program	NONE
BERYLLIUM ASSOCIATED WORKER	0	0		
CADMIUM	9 (7 f/u & 2 Initial)	9	100%	NONE
LEAD GENERAL INDUSTRY	21	21	100%	NONE Median Value<3ug/
LEAD GENERAL INDUSTRY (FOLLOW-UP)	23	23	100%	
LEAD CONSRTUCTION	33	33	100%	NONE Median Value<3ug/
HEARING CONSERVATION	522	518	99.23%*	(1) STS FOR THIS PERIOD

* 4 individuals had their hearing tests just after 9/30/08

SPECIFIC SURVEILLANCE PROGRAMS AND RESULTS

Asbestos

Asbestos work at BNL has been determined to fall under the OSHA Asbestos Construction Standard (29CFR1962.1101). This standard requires medical surveillance exams for workers exposed at or above the OSHA time-weighted average (TWA) or excursion limits for airborne asbestos fibers. Clinical testing includes chest x-rays on a schedule recommended by the OSHA standards, and spirometry (pulmonary function testing) to detect any impairment of lung function.

ASBESTOS RESULTS:

6 BNL employees received asbestos medical surveillance because of potential asbestos exposure as a result of insulation work, asbestos abatement and monitoring of asbestos work. These included 3 MF and 3 SS employees

- **In all 6 employees there were no findings consistent with asbestos-related lung disease.(As evidenced by B readings of chest X-rays)**

Beryllium

At BNL, beryllium has had limited uses in reactors and accelerators. For this reason, handling and machining of beryllium metal and beryllium alloys has been very limited at BNL. In addition, in recent years, BNL has maintained very tight beryllium exposure controls, preventing significant worker exposure in tasks such as the installation of beryllium tubes in the RHIC detectors during construction in 1999-2000. In FY 2006, two current BNL employees have been identified by Industrial Hygiene as having had beryllium exposure in the past at BNL. These employees are classified as “Beryllium Associated Workers” according to the DOE Federal Regulation 10CFR850 *Chronic Beryllium Disease Prevention Program* (1999), and are offered beryllium medical surveillance every three years. This is directed at the detection of beryllium sensitization (through a special blood test called the BeLPT) and CBD through chest x-ray and spirometry.

BERYLLIUM MONITORING RESULTS

**11 Beryllium 2 Workers qualified for testing
2 declined & 9 were negative.**

**No Beryllium Associated Workers were on the protocol for the 2008 period.
At BNL, beryllium medical surveillance of beryllium associated workers is performed every 3 years in accordance with 10CFR850.**

Cadmium

At BNL, significant exposure to cadmium is rare. Certain types of shielding contain cadmium, so there is potential for cadmium exposure from cadmium-containing dusts from such shielding when it is stored or manipulated.

The OSHA Cadmium Construction Standard (29CFR1926.1127) requires initial cadmium medical surveillance, followed by a second round of cadmium surveillance one year after the initial round, even where exposure has ceased, because cadmium can have delayed biological effects.

Cadmium medical surveillance consists of obtaining blood and urine cadmium levels and comparing these results to OSHA biological exposure indices (BEI), which are threshold values for blood and urine tests. Exceedance of these thresholds indicates overexposure to cadmium. Urine beta-2 microglobulin is also checked; elevated levels suggest the possibility of kidney damage due to cadmium exposure, resulting in leakage of the small beta-2-microglobulin protein into the urine.

Prior cadmium medical surveillance at BNL has not, to date, shown any evidence of cadmium overexposure or toxicity.

CADMIUM MONITORING RESULTS:

- **All 9 employees in the Cadmium protocol underwent medical surveillance.**
- **7 employees had periodic testing (4 RP & 3CM) and 2 had initial screens.**
- **Blood and urine cadmium concentrations were well within the acceptable range and beta-2-microglobulin testing detected no evidence of kidney damage.**

Lead

Most lead-exposed BNL employees receive medical surveillance under the OSHA Lead Construction Standard, 29CFR1926.62. Some fall under the OSHA Lead General Industry Standard 1910.1025. At a minimum, OSHA mandates that lead medical surveillance include a blood lead level (BLL) and red blood cell zinc protoporphyrin (ZPP). Additional examinations and testing are performed as indicated or mandated by OSHA. The BLL reflects recent lead exposure.

- A BLL of 40ug/dL or higher is considered to indicate lead overexposure and the possibility of organ toxicity. Work removal is mandated under both OSHA standards for a BLL at or above 40 ug/dL.
- ZPP is a hemoglobin precursor which builds up in red blood cells when hemoglobin production is inhibited by the presence of lead. ZPP may give some indication of lead exposure during the prior 4 months, since the average red blood cell remains in circulation for 4 months.
- At BLLs typically observed in BNL workers, ZPP is a poor measure of prior lead exposure because the test is very non-specific, and can be elevated for other reasons, including inhibition of hemoglobin production due to iron-deficiency anemia. For this reason, ZPP results are not reported here beyond the general statement that nearly all BNL FY 2007 ZPP results fell within the normal range. In the few instances where ZPP was found to be elevated, alternate medical reasons were found.

In the past, occasional instances of elevated blood lead levels have been detected among BNL employees. Without exception, these have been traced to lead exposure in the course of hobbies, rather than to lead exposure during work at BNL. Bullet-making and extensive shooting at firing ranges have been significant non-occupational exposures.

SURVEILLANCE RESULTS

OSHA Lead Construction Standard;

A total of 33 blood lead tests were performed under the OSHA Lead Construction Standard.

The range of BLL's was from <3 ug/dL to 7.00 ug/Dl.

Median lead levels were <3 ug/dl.

OSHA Lead General Industry Standard

A total of 44 blood lead tests were performed under the OSHA Lead General Industry standard.

The range of BLL's was from <3ug/dL to 4 ug/dL.

Median blood lead level (BLL) was <3.0 ug/dL, with little variation among divisions/departments.

Noise

A worker with occupational noise exposure at or above the OSHA Action Level is required to undergo audiometric testing (hearing tests) on an annual basis, for the early detection of noise-induced hearing loss. The worker's initial test under the OSHA Occupational Noise Standard (29CFR1910.95) serves as a baseline. Occupational hearing loss detected in subsequent years and meeting or exceeding a threshold (≥ 10 decibels [dBA] averaged over 2, 3 and 4 kHz in either ear) is referred to as a "Standard Threshold Shift" ("STS") and must be recorded by the employer on the OSHA 300 Log.

Noise Medical Surveillance Results

OMC performed 518 OSHA hearing tests on employees in FY 2008. One OSHA recordable case of occupational hearing loss (or "STS") was detected. The employee with the STS in FY 2008, was a Building and Grounds Utility Worker in EP. Some non-occupational noise exposure and non-noise-associated underlying medical factors may have also contributed to the hearing loss. The same employee had a STS in the Right ear in 2007.

Summary and Discussion

- Medical surveillance results indicate that work planning and exposure control measures have been highly successful at protecting BNL workers from workplace health hazards and from adverse health effects from these hazards.
- No occupational overexposures or adverse health effects were found for asbestos, beryllium, cadmium or lead. Blood lead levels (BLL's) remain low, and are not significantly different from those recorded in FY 2007.
- Significant hearing loss from contemporary noise exposure remains rare in the BNL working population, with only 1 STS detected between 10/01/07-9/30/08

Temporal Trends (2004-2007)

OMC has written summary medical surveillance reports for CY 2004 and FY's 2005-2008. The following temporal trends can be summarized:

- Excellent control of exposure to workplace health hazards throughout that time interval, with no cases of asbestos-related disease, lead or cadmium overexposure or toxicity attributable to BNL exposures.
- The incidence of OSHA STS shifts have tended to decline slightly with only 1/521 (0.19%) case reported in FY 2007 & (1/522) in FY 2008 as opposed to 2/451 (0.44%) in FY2006 .

Recommendations

- OMC is highly supportive of the current initiative being led by Industrial Hygiene to get adequate baseline, site-wide, operation-specific workplace exposure monitoring for noise, airborne contaminants and other hazards. This will provide better guidance in determining who needs medical surveillance, and will provide further assurance that workers are being adequately protected from workplace health hazards.
- OMC supports continued efforts at controlling noise exposure at BNL. Great progress has been made in this area, as evidenced by the remarkable decline in the number of Standard Threshold Shifts (OSHA-recordable noise-induced hearing loss) between CY 2004 and FY 2005, with STS numbers remaining low in FY 2006 and declining further in FY 2007 & 2008.
- OMC encourages employees to bring their safe work practices with them when they work or engage in hobbies outside of BNL. As noted, the few employees who, in years past, had atypically high blood lead levels, invariably had lead exposures traceable to hobbies—shooting at a firing range or making homemade bullets. The highest blood lead recorded at BNL in FY 2008, 7.0 ug/dL, was <1/5th of the 40 ug/dL OSHA Biological Exposure Limit (BEL).

Acknowledgment: Medical surveillance examinations depend upon the hard, conscientious work of all OMC clinical, laboratory and administrative support staff. Special thanks to individuals involved in data entry and report-writing for this report: Robin Koebel, Mary Braunreuther, Linda Cavaliere, Denise Rodgers and Janet Sikora