Incidental Findings Detected Through Occupational Health Surveillance Program

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Background of DOE-FWP in Iowa

The FWP was established following the 1993 Defense Authorization Act (PL 102-484, Section 3162)[1], which called for the U.S. Department of Energy (DOE) to evaluate the long-range health effects of hazardous and radioactive exposures among its former employees. Since 2000, The University of Iowa College of Public Health has been involved in the national DOE Former Worker Medical Screening Program (FWP) to offer free medical screenings to former AEC/DOE workers from the Iowa Army Ammunition Plant (IAAP) and the Ames Laboratory. In addition to testing for occupational lung diseases and radiation-induced cancers, former workers are also evaluated for non-occupational chronic conditions such as anemia, diabetes, hypertension, hypercholesterolemia, and thyroid, liver and kidney disease.

Since the onset of the FWP screening program, over 2,500 former DOE workers from IAAP and Ames Laboratory have been screened occupational and for non-occupational-related conditions (incidental findings).

The screening tests performed are chest X-rays (CXR); Pulmonary Function Test (PFT); Beryllium Lymphocyte Proliferation Tests (BeLPT); and general blood work, which include complete blood count (CBC), comprehensive metabolic panel, TSH, total cholesterol and hemoglobin A1c. General vital signs such as blood pressure and pulse oximetry are also performed.

Aims of this study:

- To examine incidental findings of non-occupational conditions detected through FWP medical screening such as anemia, diabetes, hypertension, hypercholesterolemia, elevated ESR and non-malignant thyroid disease.
- To compare the occurrence of such conditions among the two study cohorts.

FWP Study Cohorts

IAAP is located in Middletown, near Burlington, Iowa. Built between 1941-1943 as conventional munitions Loading, Assembly and Packing (LAP) facility, from 1949-1975 one production line was responsible for manufacturing and assembling explosive lenses for nuclear bombs and assembling components from around the country into finished nuclear weapons.

Ames Laboratory is located on the campus of Iowa State University in Ames, Iowa and was historically a part of the Manhattan Project. In the 1940s and 1950s, they purified thousands of pounds of uranium and thorium. Since that era, the Laboratory has largely been a research & development facility for alkaline metals and materials science.

Primary exposures of the cohorts included ionizing radiation, beryllium, asbestos, solvents, isocyanates, epoxy adhesives, curing agents and high explosives.

Methods

Between 2001 and July 2011, over 2,500 former DOE workers from the IAAP (n=1,277) and Ames Laboratory (n=1,475) received general blood tests comprising of complete blood count (CBC), comprehensive metabolic panel, Thyroid Stimulating Hormone (TSH), total cholesterol and hemoglobin A1c. Blood pressures were also measured.

Prevalence of abnormal disease markers as well as correlations by age, gender, race, smoking and duration of employment are presented for both IAAP and Ames Laboratory participants.

Smoking history obtained from participants were categorized into never smoker, ex-smoker and current smoker.

Participants' age, ethnicity, duration of employment and smoking status were self-reported in the Health and Occupational History Questionnaire at time of screening.

Blood test results were categorized as normal or abnormal in detecting the following incidental findings:

- Hemoglobin for anemia
- Non-fasting glucose for possible diabetes
- Thyroid stimulating Hormone (TSH) for hypo/hyperthyroidism
- Erythrocyte Sedimentation Rate (ESR)
- Total cholesterol for possible hyperlipidemia
- Blood pressure for hypertension (HTN)

Cutoff levels are presented in Table 1.

Table 1. Interpretation Protocol for Incidental Findings[2,3,6]

	Normal	Abnormal
Hemoglobin (gm/dL)	>13.5 (male) >12.0 (female)	10.0-WNL: mild anemia 8-10: moderate anemia 6.5-8: severe anemia <6.5: life threatening
Non-fasting Glucose (mg/dL)	65-179	≤ 50: hypoglycemia ≥ 200: hyperglycemia
Thyroid Stimulating Hormone, TSH (µlU/mL)	0.5 - 5.0	<0.5: hyperthyroidism >5.0: hypothyroidism
Erythrocyte Sedimentation Rate, ESR (mm/hr)	0 - 30	>30 (>30-135)
Total Cholesterol (mg/dL)	≤ 200 (desirable)	201-239: borderline high >240: high
Blood Pressure (mmHg)	< 140/90	≥140/90: HTN >180/110: urgent/severe HTN >220/140: HTN emergency

Results

Table 2. Characteristics of Screened Population

Parameter	Ames Laboratory	IAAP
Date range of data (blood draw)	3/24/2003 - 6/23/2011	3/21/2001 - 7/21/2011
Age at blood draw, mean (SD), range	61.4 (12.8); 22-98	70.7 (9.2); 40-95
Age at blood draw, n (%)	n= 1,471 (53.5)	n=1,277 (46.5)
20-29	12 (0.8)	N/A
30-39	62 (4.2)	N/A
40-49	210 (14.3)	6 (0.5)
50-59	335 (22.8)	161 (12.6)
60-69	47 (28.3)	399 (31.2)
70-79	341 (23.2)	471 (36.9)
80-89	91 (6.2)	223 (17.5)
90-99	3 (0.2)	17 (1.3)
Gender, n (%)	n=1,473 (53.6)	n=1,277 (46.4)
Male	1,035 (70.3)	1,036 (81.1)
Female	438 (29.7)	241 (18.9)
Ethnicity, n (%)	n=1,441 (57.5)	n=1,066 (42.5)
White	1,363 (94.6)	1,014 (95.1)
African American	22 (1.5)	31 (2.9)
Hispanic	4 (0.3)	14 (1.3)
Asian	41 (2.8)	0
Native American	1 (0.1)	3 (0.3)
Mixed	8 (0.6)	3 (0.3)
Other	2 (0.1)	1 (0.1)
Smoking Status, n (%)	n=1,441 (53.3)	n=1,262 (46.7)
Current Smoker	40 (2.8)	151 (12.0)
Ex-Smoker	428 (29.7)	665 (52.7)
Never Smoker	973 (66.0)	446 (35.3)
Duration of Employment, mean, (SD), range	5.0 (8.8), <1 - 56	11.9 (12.5), <1 - 47
Duration of Employment, n (%)	n=1,444 (55.5)	n=1,156 (44.5)
<1-10	1,286 (89.1)	706 (61.1)
11-20	59 (4.1)	174 (15.1)
21-30	36 (2.5)	128 (11.1)
31-40	47 (3.3)	115 (9.9)
41-49	14 (1.0)	33 (2.9)
50-59	2 (0.1)	0 (0)

Table 4. Results by Study Cohort (Site)

Parameter, n (%)	Ames Laboratory		IAAP		Total		Fisher's Exact p-value Relative Risk (95% CI) Ames Lab:IAAP
	Abnormal	Normal	Abnormal	Normal	Abnormal	Normal	
Hemoglobin	50 (3.4)	1,402 (96.6)	117 (9.6)	1,105 (90.4)	167 (6.3)	2,507 (93.7)	<0.0001 0.36 (0.26-0.49)
Non-fasting Glucose	29 (2.0)	1,414 (98.0)	94 (7.7)	1,125 (92.3)	123 (4.6)	2,539 (95.4)	<0.0001 0.26 (0.17-0.39)
TSH	98 (6.9)	1,328 (93.1)	137(11.4)	1,066 (88.6)	235 (8.9)	2,394 (91.1)	< 0.0001 0.60 (0.47-0.77)
ESR	74 (11.3)	657 (88.7)	289 (25.4)	848 (74.6)	363 (20.2)	1,431 (79.8)	<0.0001 0.44 (0.35-0.56)
Total Cholesterol	221 (31.5)	480 (68.5)	151 (31.1)	335 (68.9)	372 (31.3)	815 (68.7)	0.8988 1.02 (0.85-1.21)
Blood Pressure	84 (12.6)	584 (87.4)	134 (30.0)	313 (70.0)	218 (19.5)	897 (80.5)	<0.0001 0.42 (0.33-0.54)

Table 5. Occupational Exposures Categories

Ames Laboratory*

No Exposure:	administrative, accounting, editor, graphic arts, draftsman, auditor
Low Exposure:	engineer, mathematician, geologist, bacteriology, computer science/programmer, medical, teaching assistant, imaging/ scanner, reactor & press operator, glass blower, glass washer, media/photographer, driver
High Exposure:	physicist, chemical engineer, professor, post doc, research asst., grad asst., lab tech, health & safety, guard, metallurgist, machinist, electrician, pipefitter, mechanic, mail, custodian, maintenance, construction

* Exposures to airborne dusts of asbestos, beryllium or other metals based on job location (as advised by the Ames Laboratory).

Line 1/IAAP*

No Exposure:	Administrative, Security, Medical, Power Plant, Cafeteria, Carpenter, Custodian, Auto/Equipment Mechanics
Rare/Low Exposure:	Production (assembly), Laundry, Millwright, Tool & Die, Machinist, Inspector, Storage
Occasional, Direct or Indirect Exposure:	Pipefitter, Plumber, Process Engineer, Firing Site
Frequent, Direct Exposure:	Production (fabrication) & Explosive Operator Melt, Scientist

*Job codes, job titles and work tasks were reviewed by industrial hygienists & a group of former workers to develop a qualitative exposure matrix for exposure to high explosives. The estimates for each job category were based on task frequency & proximity to the potential sources of airborne exposures and reflected the group's consensus.

Table 3. Results by Selected Characteristics of Screened Population

Parameter	Hemoglobin			Non-fasting Glucose			TSH			ESR			Total Cholesterol			Blood Pressure		
	Abnormal	Normal	Cochran-Armitage Trend p-value *Fisher's Exact p-value	Abnormal	Normal	Cochran-Armitage Trend p-value *Fisher's Exact p-value	Abnormal	Normal	Cochran-Armitage Trend p-value *Fisher's Exact p-value	Abnormal	Normal	Cochran-Armitage Trend p-value *Fisher's Exact p-value	Abnormal	Normal	Cochran-Armitage Trend p-value *Fisher's Exact p-value	Abnormal	Normal	Cochran-Armitage Trend p-value *Fisher's Exact p-value
Age at blood draw, mean (SD), range																		
Ames Laboratory	66.0 (13.1) 38-95	61.2 (12.7) 22-98		64.1 (11.8) 33-87	61.3 (12.8) 22-98		62.6 (13.1) 35-98	61.2 (12.8) 22-95		66.3(11.6) 39-95	59.2 (13.9) 22-98		58.2 (11.9) 22-84	60.9 (13.9) 22-98		67.0 (10.8) 43-98	58.6 (13.7) 22-88	
IAAP	74.6 (9.0) 54-94	70.3 (9.1) 40-94		70.1 (9.1) 49-87	70.8 (9.2) 40-94		72.5 (9.0) 53-94	70.4 (9.2) 40-94		73.6 (8.6) 52-94	69.2 (9.1) 40-94		67.4 (8.7) 48-86	70.4 (8.1) 53-90		69.2 (8.7) 52-86	69.9 (8.7 48-90	
Age at blood draw (by decade), n (%)																		
Ames Laboratory																		
20-29	0	12 (100.0)		0 (0.0)	12 (100.0)		0	12 (100.0)		0 (0.0)	7 (100.0)		1 (10.0)	9 (90.0)		0 (0.0)	10 (100.0)	
30-39	2 (3.3)	59 (96.7)		0 (100.0)	60 (100.0)		4 6.8)	55 (93.2)		1 (2.7)	37 (97.37)		12 (33.3)	24 (66.7)		0 (0.0)	41 (100.0)	
40-49	4 (1.9)	203 (98.1)		2 (1.0)	201 (99.0)		12 (5.9)	193 (94.1)		5 (5.1)	92 (94.9)		47 (35.6)	85 (64.4)		8 (6.3)	119 (93.7)	
50-59	9 (2.7)	323 (97.3)	***0.02***	6 (1.8))	325 (98.2)	***0.03***	26 (8.0)	300 (92.0)	*0.29*	13 (8.1)	147 (91.9)	***0.0004***	51 (36.7)	88 (63.31)	***0.03***	11 (8.3)	122 (91.7)	***< 0.0001***
60-69	13 (3.2)	399 (96.8)		6 (1.5)	400 (98.5)		21 (5.2)	380 (94.8)		25 (15.7)	134 (84.3)		66 (37.1)	112 (62.9)		28 (17.6)	131 (82.4)	
70-79	14 (4.2)	322 (95.2)		14 (4.2)	321 (95.8)		27 (8.2)	304 (91.8)		23 (16.0)	121 (84.0)		41 (23.3)	135 (76.7)		30 (17.7)	140 (82.3)	
80-89	6 (6.9)	81 (93.1)		1 (1.1)	88 (98.9)		7 (8.2)	78 (91.8)		6 (12.8)	41 (87.2)		3 (11.1)	24 (88.9)		6 (23.1)	20 (76.9)	
90-99	1 (33.3)	2 (66.7)		0 (0.0)	3 (100.0)		1 (33.3)	2 (66.7)		1 (33.3)	2 (66.7)		0 (0.0)	1 (10.0)		1 (100.0)	0 (0.0)	
Total	49 (3.4)	1,401 (96.6)		29 (2.0)	1,410 (98.0)		98 (6.9)	1,324 (93.1)		74 (11.3)	581 (88.7)		221 (31.6)	478 (68.9)		84 (12.6)	583 (87.4)	
IAAP																		
20-29	N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A	
30-39	N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A	
40-49	0 (0.0)	6 (100.0)		1 (16.7)	5 (83.3)		0 (0.0)	6 (100.0)		0 (0.0)	6 (100.0)		2 (100.0)	0 (0.0)		0 (0.0)	2 (100.0)	
50-59	8 (5.2)	145 (94.8)	***< 0.0001***	16 (10.5)	136 (89.5)	*0.24*	14 (9.2)	138 (90.8)	***0.03***	19 (12.7)	131 (87.3)	***< 0.0001***	26 (42.6)	35 (57.4)	***0.0006***	16 (29.6)	38 (70.4)	*0.77*
60-69	24 (6.3)	356 (93.7)		24 (6.3)	355 (93.7)		36 (9.3)	343 (90.7)		69 (19.4)	286 (80.6)		65 (35.7)	117 (64.3)		53 (31.7)	114 (68.3)	
70-79	51 (11.2)	403 (88.8)		40 (8.8)	414 (91.2)		57 (12.8)	388 (87.2)		127 (30.3)	292 (69.7)		42 (23.9)	134 (76.1)		47 (29.6)	112 (70.4)	
80-89	29 (13.7)	183 (86.3)		13 (6.1)	200 (93.9)		28 (13.5)	179 (86.5)		67 (34.9)	125 (65.1)		16 (25.0)	48 (75.0)		18 (28.1)	46 (71.9)	
90-99	5 (33.3)	10 (66.7)		0 (0.0)	15 (100.0)		3 (20.0)	12 (80.0)		7 (46.7)	8 (53.3)		0 (0.0)	1 (100.0)		0 (0.0)	1 (100.0)	
Total	117 (9.6)	1,103 (90.4)		94 (7.7)	1,125 (92.3)		137 (11.4)	1,066 (88.6)		289 (25.4)	848 (74.6)		151 (31.1)	335 (68.9)		134 (30.0)	313 (70.0)	
Gender, n (%)																		
Ames Laboratory																		
Male	25 (2.5)	994 (97.5)	***0.003****	19 (1.9)	993 (98.1)	*0.54**	58 (5.8)	935 (94.2)	***0.02****	36 (9.1)	329 (90.9)	**0.03***	133 (27.0)	359 (73.0)	***<0.0001****	63 (13.4)	409 (86.6)	*0.37**
Female	25 (5.8)	408 (94.23)		10 (2.3)	419 (97.7)		40 (9.3)	391 (90.7)		38 (14.6)	171 (85.4)		88 (42.3)	120 (57.7)		21 (10.7)	175 (89.3)	
Total	50 (3.4)	1,402 (96.6)		29 (2.0)	1,412 (98.0)		98 (6.9)	1,326 (93.1)		74 (11.3)	581 (88.7)		221 (31.6)	479 (68.4)		84 (12.6)	584 (87.4)	
IAAP																		
Male	81 (8.2)	911 (91.8)	***0.001****	74 (7.5)	918 (92.5)	*0.50**	101 (10.3)	882 (89.7)	***0.01****	201 (21.8)	721 (78.2)	**<0.0001***	98 (25.1)	293 (74.9)	***<0.0001****	102 (28.8)	252 (71.2)	*0.30**
Female	36 (15.8)	192 (84.2)		20 (8.8)	207 (91.2)		36 (16.7)	184 (83.6)		88 (40.9)	127 (59.1)		53 (55.8)	42 (44.2)		32 (34.4)	61 (65.6)	
Total	117 (9.6)	1,103 (90.4)		94 (7.7)	1,125 (92.3)		137 (11.4)	1,066 (88.6)		289 (25.4)	848 (74.6)		151 (31.1)	335 (68.9)		134 (30.0)	313 (70.0)	
Potential Occupational Exposure, n(%) *See Table 5*																		
Ames Laboratory																		
No Exposure	10 (5.8)	164 (94.2		3 (1.7)	171 (98.3)		16 (9.1)	159 (90.9)		21 (15.6)	114 (84.4)		41 (50.0)	41 (50.0)		9 (13.4)	58 (86.6)	
Low Exposure	4 (1.9)	202 (98.1)	*0.16*	5 (2.5)	198 (97.5)	*0.56*	20 (10.1)	179 (89.9)	***0.03***	13 (12.6)	90 (87.4)	*0.12*	32 (32.7)	66 (67.3)	***0.0004***	12 (13.5)	77 (86.5)	*0.82*
High Exposure	25 (3.0)	816 (97.0)		12 (1.40	822 (98.6)		46 (5.6)	774 (94.4)		33 (10.4)	283 (89.6)		116 (28.6)	289 (71.4)		50 (12.6)	345 (87.3)	
Total	39 (3.2)	1,182 (96.8)		20 (1.7)	1,191 (98.3)		82 (6.9)	1,112 (94.4)		67 (12.1)	487 (87.9)		189 (32.3)	396 (67.7)		71 (12.9)	480 (87.1)	
IAAP																		
No Exposure	40 (8.9)	412 (91.1)		31 (6.8)	423 (93.2)		47 (10.4)	405 (89.6)		99 (23.7)	318 (76.3)		57 (31.3)	125 (68.9)		51 (31.1)	113 (68.9)	
Rare/low indirect/bystander	22 (9.1)	220 (90.9)	*0.22*	18 (7.4)	224 (92.6)	*0.15*	27 (11.3)	212 (88.7)	*0.23*	56 (24.9)	169 (75.1)	0.21	24 (26.4)	67(73.6)	*0.64*	19 (22.9)	64 (77.1)	*0.74*
Occasional, direct or indirect	6 (6.7)	83 (93.3)		5 (5.7)	83 (94.3)		7 (7.87)	82 (92.1)		17 (21.3)	63 (78.7)		15 (36.6)	26 (63.4)		10 (25.6)	29 (74.4)	
Frequent, direct	47 (11.5)	362 (88.5)		39 (9.6)	367 (90.4)		53 (13.4)	344 (86.6)		109 (27.9)	282 (72.1)		52 (32.5)	108 (67.5)		48 (32.2)	101 (67.8)	
Total	115 (9.7)	1,077 (90.3)		93 (7.8)	1,097 (92.2)		134 (11.4)	1,043 (88.6)		281 (25.3)	832 (74.7)		148 (31.2)	326 (68.8)		128 (29.4)	307 (70.6)	
Smoking Status, n (%)																		
Ames Laboratory																		
Current Smoker	1 (2.6)	38 (97.4)		3 (7.5)	37 (92.5)		3 (7.5)	37 (92.5)		6 (23.1)	20 (76.9)		9 (42.9)	12 (47.1)		5 (26.3)	14 (73.7)	
Ex-Smoker	17 (4.0)	407 (96.0)	*0.64*	9 (2.2)	409 (97.2)	*0.09*	23 (5.5)	393 (94.5)	*0.25*	28 (14.1)	170 (85.9)	***0.01***	42 (23.5)	137 (76.5)	*0.12*	32 (19.2)	135 (80.8)	***0.0003***
Never Smoker	31 (3.2)	929 (96.8)		17 (1.8)	935 (98.2)		72 (7.7)	866 (92.3)		40 (9.4)	387 (90.6)		167 (34.3)	320 (65.7)		46 (9.8)	424 (90.2)	
Total	49 (3.4)	1,374 (96.6)		29 (2.1)	1,381 (97.9)		98 (7.0)	1,296 (93.0)		74 (11.4)	577 (88.6)		218 (31.7)	469 (68.3)		83 (12.7)	573 (87.3)	
IAAP																		
Current Smoker	6 (4.1)	141 (95.9)		8 (5.5)	138 (94.5)		12 (8.2)	134 (91.8)		29 (20.6)	112 (79.4)		16 (42.1)	22 (57.9)		12 (38.7)	19 (61.3)	
Ex-Smoker	70 (10.7)	582 (89.3)	*0.16*	57 (8.8)	593 (91.2)	*1.00*	76 (11.9)	564 (88.1)	*0.40*	160 (26.2)	451 (73.8)	*0.29*	79 (28.2)	201 (71.8)	*0.96*	72 (27.5)	190 (72.5)	*0.85*
Never Smoker	41 (9.9)	373 (90.1)		48 (11.7)	363 (88.3)		48 (11.7)	363 (88.3)		100 (26.3)	280 (73.7)		56 (33.9)	109 (66.1)		49 (32.5)	102 (67.5)	
Total	117 (9.7)	1,096 (90.3)		94 (7.8)	1,118 (92.2)		136 (11.4)	1,061 (88.6)		289 (25.5)	843 (74.5)		151 (31.3)	332 (68.7)		133 (30.0)	311 (70.0)	

Summary of Findings

➢The medical screening study for incidental findings detected the following:

•6.3% overall prevalence of anemia, and a 2.8 fold statistically significant increase in rate of anemia among IAAP as compared to Ames Laboratory workers.

•4.6% overall prevalence of abnormal non-fasting glucose, and a 3.9 fold statistically significance increase in rate of abnormal non-fasting glucose among IAAP as compared to Ames Laboratory workers.

• 8.9% for thyroid disease (hypothyroid/hyperthyroid), and a 1.7 fold increase in rate of thyroid disease among IAAP as compared to Ames Laboratory workers. The Cochran-Armitage Trend Test indicates significant linear trend in percentages of IAAP workers with abnormal thyroidism with increasing decade age class. Percentage increases with age decade (Table 3).

•20.2% overall prevalence of elevated ESR,(>30 mm/hr), and a 2.2 fold increase in rate of elevated ESR among IAAP as compared to Ames Laboratory workers (Fisher's exact p <0.0001).

•31.3% with elevated total cholesterol statically not significance and no differences between the cohorts (Fisher's exact p=0.8988)

•19.5% elevated blood pressure (hypertension), and a 2.4 fold increase in rate of elevated blood pressure among IAAP as compared to Ames Laboratory workers.

➢Age was relatively uniformly associated with detection of abnormal results, with age being associated with anemia, elevated cholesterol, elevated blood pressure and elevated ESR at both facilities and abnormal thyroid stimulation hormone being associated with age among IAAP but not Ames lab workers (Table 3).

➢Gender (female) was associated with higher rates of anemia for both Ames Laboratory and IAAP (RR = 2.4 for Ames, 1.9 for IAAP); higher rates of thyroid disease (RR = 6.3 for both sites); higher rates of elevated ESR (RR = 1.6 for Ames, 1.9 for IAAP); and higher rates of hypercholesterolemia, (RR = 1.6 for Ames, 2.2 for IAAP).

Conclusions

➢Detection of chronic conditions such as diabetes, abnormal thyroidism and hypertension through health surveillance/screening programs leads to improved knowledge of health status and may lead participants to seek or receive evaluations and care from personal health care providers. Usually these health conditions are detected incidentally. Half of diabetics discovered through a medical screening program among construction workers did not know they had diabetes.[4] Early detection of many of these conditions can result in significant improvement in longevity and quality of life among these workers. Early detection of subclinical incidental findings such as minimally elevated total cholesterol and pre-diabetes may initiate early preventive measures.

➢There are multiple possible explanations and implications for the differences noted within and between the cohorts studied. These facilities differ in several ways. The Ames Laboratory is situated on a University campus and the majority of the employees and those with the most exposure to substrates used on site are largely scientific and technical staff. The IAAP in contrast is a more conventional blue collar production facility.

➢Stratifying the screening results by Industrial Hygienists determined differences in degree of exposure to metals dusts and fumes for the Ames Laboratory workforce and high explosives for the IAAP did not reveal any consistent trends across exposure strata. There was a statistically significant inverse association between degrees of metals dust exposure among Ames laboratory workers and prevalence of both hyperlipidemia and abnormal thyroid stimulating hormone (TSH). A recent study of a facility similar to the IAAP indicated positive associations between thyroid abnormalities and weapons assembly in general, however our study did not find such an association.[5]

➢Overall, IAAP workers had a greater prevalence of abnormal incidental findings except for cholesterolemia compared to Ames Laboratory workers. We suggest that differences noted between and within the cohorts are largely due to differences in socio-economic status and access to health care.

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