

# NIOSH Investigation into INL Site Profile Review

## Issue 24

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**ISSUE 24**

Issue 24 states the following actions for NIOSH/SC&A: Look at interviews appearing in SC&A’s site profile review for relevant anecdotal discussions on extremity exposures. NIOSH will report how many INL/ANL-W claimants have extremity cancers.

The table below illustrates the extremity cancers for claimants at INL/ANL-W. Fifty three claimants were diagnosed with a total of 62 cancers. The total number of claims for the INL and ANL-W is 1736. Three percent of INL and ANL-W claims involve extremity cancers.

<b>NIOSH Claim ID</b>	<b>Facility</b>	<b>ICD-9 Code</b>	<b>Illness Description</b>	<b>Diagnosis Date</b>	<b>Job Title</b>	<b>Extremity Dosimetry</b>
[Redacted]	Idaho National Laboratory	172.7	Malignant Melanoma of the left Foot, Clark's Level IV	1998	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Cancer in situ, right leg	1993	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Squamous cell carcinoma, in situ, right arm lesion	2002	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	SCC, in situ, left wrist	2002	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	SCC, in-situ, right posterior forearm	2000	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	SCC in situ-3rd digit on left hand	2001	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	SCC in-situ, left hand	2004	[Redacted]	Y 1988, 1989
[Redacted]	Idaho National Laboratory	232.6	SCC in-situ, left hand	2005	[Redacted]	Y 1988, 1989
[Redacted]	Idaho National Laboratory	232.6	Squamous cell carcinoma in situ left elbow	2003	[Redacted]	N

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[Redacted]	Idaho National Laboratory	232.7	Squamous cell carcinoma in situ, left leg	2003	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	SCC in-situ, left arm	2001	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.7	Squamous cell carcinoma, in-situ, right posterior ankle	2008	[Redacted]	N
[Redacted]	Idaho National Laboratory	172.6	Malignant melanoma, left forearm	2005	[Redacted]	N
[Redacted]	Argonne National Laboratory-West	232.6	SCC, in-situ, left forearm	2011	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Melanoma, lower left arm in situ	2002	[Redacted]	N
[Redacted]	Argonne National Laboratory-West	232.7	Malignant melanoma in situ; right calf	1998	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Squamous cell carcinoma in situ, lower right arm	2004	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	SCC, right index finger (in-situ)	2004	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	SCC, Bowen type, right forearm	2009	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	SCC, skin left lower arm, in-situ	2005	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Lentigo malignant melanoma, in-situ, left forearm	2007	[Redacted]	Y 1955-1992
[Redacted]	Idaho National Laboratory	172.6	Malignant melanoma-left dorsal arm	1991	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	SCC in situ; skin, R hand	2003	[Redacted]	N

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[Redacted]	Idaho National Laboratory	232.6	Carcinoma in situ, Skin of left arm	1989	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	SCC, in-situ, Bowen's type right middle finger	2005	[Redacted]	N
[Redacted]	Idaho National Laboratory	172.7	Melanoma of the right leg	1951	[Redacted]	N
[Redacted]	Argonne National Laboratory-West	232.6	Squamous cell carcinoma in situ; right arm	2002	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Squamous cell carcinoma in situ; right arm	2002	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Skin; SCC in situ, right forearm	2004	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Melanoma in situ, left wrist	2005	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Malignant melanoma in situ, right dorsal hand	2005	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	SCC, left wrist	2004	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Squamous cell carcinoma in situ; left dorsal hand	1997	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Melanoma in situ - left arm	1990	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.7	Squamous cell carcinoma in-situ, right anterior tibia	1996	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Skin cancer R middle finger Bowen's SCC	1989	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Squamous cell carcinoma in-situ of the right wrist	2006	[Redacted]	N

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NIOSH Claim ID	Facility	ICD-9 Code	Illness Description	Diagnosis Date	Job Title	Extremity Dosimetry
[Redacted]	Idaho National Laboratory	172.7	Acral melanoma, right foot	2003	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	SCC, in situ, right dorsal hand	2012	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.7	Squamous cell carcinoma in-situ on the left lateral foot	2008	[Redacted]	N
[Redacted]	Idaho National Laboratory	172.6	Malignant Melanoma, Skin, Left Arm	2003	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	SCC, Bowen's in situ, left forearm	2001	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Squamous cell carcinoma in situ of the left hand	2002	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	In Situ Malignant Melanoma	2002	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Squamous cell carcinoma in-situ/right hand	2009	[Redacted]	N
[Redacted]	Idaho National Laboratory	173.7	Intraepithelial squamous cell carcinoma of the left ankle	2009	[Redacted]	N
55[Redacted]	Idaho National Laboratory	232.6	SCC, in situ, left forearm (Bowen's disease)	2011	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Squamous Cell Carcinoma (SCC), in situ of the right forearm	2005	No data entered	N
[Redacted]	Idaho National Laboratory	232.6	SCC, in situ, of the skin of the left hand (thenar eminence)	1998	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	SCC, in situ, (Bowen's Disease) of the skin of the left thenar eminence	2002	[Redacted]	N

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[Redacted]	Idaho National Laboratory	232.6	SCC, in situ, right dorsum hand	2008	No data entered	N
[Redacted]	Idaho National Laboratory	172.6	Melanoma in-situ of right elbow skin	2011	[Redacted]	N
[Redacted]	Argonne National Laboratory-West	172.6	Melanoma, in situ, right elbow	2000	[Redacted]	N
[Redacted]	Idaho National Laboratory	172.7	Melanoma of the right shin	2008	[Redacted]	Y 1986-1988
[Redacted]	Idaho National Laboratory	232.6	Squamous cell carcinoma (SCC), in situ, right dorsal wrist	2006	[Redacted]	N
[Redacted]	Idaho National Laboratory	173.71	BCC, right lower leg	2005	[Redacted]	Y 2006-2011
[Redacted]	Idaho National Laboratory	232.6	Squamous cell carcinoma (SCC) in-situ right dorsal hand	2007	[Redacted]	N
[Redacted]	Idaho National Laboratory	172.6	Malignant melanoma right lateral arm	2012	[Redacted]	N
[Redacted]	Idaho National Laboratory	173.71	BCC right shin	2011	[Redacted]	N
[Redacted]	Idaho National Laboratory	232.6	Squamous cell carcinoma (SCC) in situ right elbow	2006	[Redacted]	N
[Redacted]	Idaho National Laboratory	172.7	Melanoma left lateral calf	2008	No data entered	N
[Redacted]	Idaho National Laboratory	232.7	Squamous cell carcinoma in situ medial left lower leg	2009	[Redacted]	N

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The following ICD-9 codes were used in the database query:

<b>ICD-9 Code</b>	<b>Description</b>
172.6	Malig melanoma arm
172.7	Malig melanoma leg
173.70	Unspecified malig neo skin lower limb, incl hip
173.71	BCC skin lower limb, incl hip
173.72	SCC skin lower limb, incl hip
173.79	Other specified malig neo skin lower limb, incl hip
232.6	Ca in situ skin arm
232.7	Ca in situ skin leg

For codes 172.6, 172.7, 232.6 and 232.7, cancers with specified locations that did not meet the definition of extremity (arm below the elbow and leg below the knee) were excluded.

The following comments regarding extremity exposures are from interviews appearing in SC&A's site profile review:

Multiple badges and extremity dosimetry have been in use since 1953. Multiple badges included dosimetry for extremities (e.g., finger rings), the upper trunk, the lower trunk, and any other location deemed necessary by RadCon personnel. "Routine" badges were worn in addition to the multiple dosimeters provided for a job. Workers wore their primary dosimeters customarily on their chest or at their belt level. In the case of multiple dosimeters, the highest dosimeter value was recorded as the dose of record. The results from all badges of a multiple pack were maintained in the individual's dosimetry file. The use of multiple badging was based on multiple high-level sources being present simultaneously in the work area, high-level point source with multiple workers, or other arrangements reflecting non-uniform fields.

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Formal procedures are now in place for extremity and multiple badging, including when and how to use multi-badging. The multi-badging records were kept in the regular worker files. The highest dose recorded was assigned as the dose of record up until 1995. At that time, INL implemented weighting factors to calculate dose from multiple dosimetry systems.

There were situations, especially during maintenance activities, where there was partial-body exposure to workers. Many site experts were concerned about the potential in their jobs for extremity or nonuniform exposure. Multi-badging was used only in unusual conditions. For example, it was used during the SL-1 incident to monitor for high beta exposures. It was also sometimes used at the NWCF.

Multi-badging was rarely used among maintenance and operations workers. While typically there was some shielding afforded to the whole body during maintenance jobs, workers were often required to reach inside an area or around a pipe or valve where dose rates were much higher. In some cases, work was performed in tight spaces in close proximity to high-radiation sources. In the past, management required workers to perform some high radiation jobs without multi-badging. The multi-badging is very important in assessing external dose, as some jobs involved different dose rates at different body levels in a high radiation area.

Prior to the 1980 time period, extremity and multi-badging were rare. Laboratory personnel often wore extremity monitoring. The jobs which typically required extremity dosimetry included the following:

- Bottling of Krypton gas
- Maintenance at the NWCF
- Replacement of valve boxes in tank storage
- Entry into hot cells (starting in the 1990s)

Extremity dosimetry was implemented in the 1980s for crafts personnel. Not all operators were provided with extremity dosimetry in the earlier years.

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