RI-46 PERSONAL EXPOSURE INVESTIGATIONS AND REPORTING

PURPOSE

This procedure specifies the requirements and responsibilities for conducting, documenting and reporting investigations of actual or suspected radiation exposures to individuals that exceed specific investigation levels, and for timely reporting of any doses that exceed regulatory limits.

RULES AND REGULATIONS

The University is committed to maintaining all radiation doses to levels that are as low as reasonably achievable (ALARA). One method for accomplishing the ALARA goal is to investigate situations and incidents that lead to unusual exposures, even if no regulatory limit is exceeded. To assure that unexpected radiation exposures are evaluated, investigation levels are established well below the dose limits.

For all exposures, there are two investigation levels (ILs). The levels are based on the expected (normal) exposure for a category or specific group of radiation users. A higher level or Level II is established as an ALARA limit that requires a formal documented investigation. Values of the IL for doses to the body or to the extremities for the various groups are listed in the table on page 3.

For internal exposures, Level I IL is set to 0.025 ALI per single intake or per calendar quarter. Specific ILs may be dictated by CSU's broad-scope license conditions, or detection sensitivity for a given radionuclide. In those instances, different ILs will be assigned. Level II ILs are typically set at 0.05 the ALI unless otherwise noted. Annual intakes exceeding 0.1 the ALI for all nuclides combined shall be included in the calculation of total effective dose equivalent for purposes of determining compliance with annual dose limits and reporting requirements.

Potential intakes due to personal contamination or injury involving radioactive materials shall be investigated regardless of the actual radiation dose.

Any radiation dose to an individual that exceeds the annual dose limit shall be investigated and reported to the regulatory agency. If the dose is received as the result of a single event, it shall be reported either immediately or within 24 hours, depending on the magnitude of the dose. The RSO directs the investigation, evaluates the results and submits the report to the regulatory agency. The exposed individual shall provide information regarding the circumstances of the exposure.

The principal user must be informed of the exposure and of any subsequent restrictions that may need to be imposed on the individual.

PROCEDURES

The RCO shall ensure that the monthly dosimetry reports are reviewed to determine whether any reported doses exceed an investigation level. The RCO shall also ensure that any reported overexposure is investigated promptly and reported, if necessary.

For doses below the reportable level (Level I), no action is necessary. Doses that exceed the reportable Level 1 limit require the RCO to contact the individual by phone or email and make that person aware of the dose report. The phone call or email is to be considered for informational purposes only and no investigation is required. For doses above the reportable level (Level II) the RCO must obtain the relevant information by a face-to-face interview. Investigations of external exposures exceeding the LEVEL II value shall be recorded on the "EXTERNAL EXPOSURE (ALARA) INVESTIGATION REPORT" (RF-46A). The questionnaire on the back of RF-46A must be used as a guide for Level II investigations to ensure that all necessary information is obtained. Investigations of internal exposures shall be recorded on the "INTERNAL EXPOSURE (ALARA) INVESTIGATION REPORT" (RF-46B).

For each overexposure requiring a report to the regulatory agency, a signed, written statement shall be submitted by the exposed individual describing the circumstances that led to the exposure and the measures that will be taken to prevent recurrence. An accurate and complete response is important, since all or part of this statement may be sent to the regulatory agency.

Dosimeter readings shall be accepted as valid and shall not be changed on the permanent record unless there is a complete, written description of the circumstances that produced an invalid dosimeter exposure, and the report is signed by the exposed individual, the principal user and the RSO.

The original Investigation Report and all attachments shall be filed in the personal dosimetry record for the individual. A copy of the report shall be provided to the exposed individual.

All ALARA investigations are required to be reported to the Radiation Safety Committee.

The loss of a radiation dosimetry badge should be investigated and the RF-46C form is required to be completed. The loss of the badge requires an estimation of dose by the Radiation Control Office that must be documented. A charge for the loss may be

incurred by the participant as outlined in the University's Radiation Control Manual.

REPORTING LEVELS and DEADLINES

(Effective dose equivalent in rem)
Regulatory Limit Reporting Requirements for the University to the State of Colorado

	Immediately	24 Hours	30 Davs
Total Body:	25 rem/event	5 rem/event	5 rem/year
Eye:	75 rem/event	15 rem/event	15 rem/year
Skin or Extremities:	250 rem/event	50 rem/event	50 rem/year
Any Other Single Organ:	Not applicable	Not applicable	50 rem/year

ALARA INVESTIGATION LEVELS – (LevelI)

(Effective dose equivalent in mrem/month)

	External Dose to Body (Body Badges)	**External Dose to Extremities (Ring Badges)**	**Intake by Any Route (Bioassay)**
Cardiac Catheterization:	150	1500	N/A
Other Special Procedures:	150	1500	N/A
Diagnostic Radiology:	150	500	N/A
Nuclear Medicine:	150	750	7.5E-4 ALI (^{125}I)
(Radio Iodines)			2.5E-5 ALI (^{131}I)
			0.025 ALI (^{123}I)
All Others:	150	500	0.025 ALI/event

ALARA INVESTIGATION LEVELS – (LevelII)

10% of ALI

(Effective dose equivalent in mrem/month)

	External Dose to Body (Body Badges)	**External Dose to Extremities (Ring Badges)**	**Intake by Any Route (Bioassay)**
Cardiac Catheterization	500	5000	N/A
Other Special Procedures:	500	5000	N/A
Diagnostic Radiology:	500	5000	N/A
Nuclear Medicine	500	5000	0.05 ALI (^{125}I)
(Radio Iodines)			0.05 ALI (^{131}I)
			0.05 ALI (^{123}I)
All Others:	500	5000	0.05 ALI/event

RF-46A. EXTERNAL EXPOSURE (ALARA) INVESTIGATION REPORT

Name: _____ CSU ID No.: _____

Work Location: _____ Phone: _____

Principal User: _____ Department: _____

REASON FOR INVESTIGATION: _____ ☐ Dosimeter reading for the period: _____

Badge #:_____ Series: _____ Collar Badge Body Badge Finger (Ring)

Reported dose - Shallow: _____ mrem _____ mrem _____ mrem

Reported dose - Deep: C: _____ mrem B: _____ mrem

Effective dose (if leaded apron was worn) = 0.04C + 1.5B = _____ mrem

Report received by: _____ Date:_____ Time: _____

Additional information dated _____ ☐ attached

NOTIFY CDPHE-RCD (and NRC if Reactor involved); check category:

☐ IMMEDIATE NOTIFICATION IF REPORTED OR POTENTIAL DOSE EXCEEDS 5 x ANNUAL LIMIT

☐ NOTIFICATION WITHIN 24 HOURS IF REPORTED OR POTENTIAL DOSE EXCEEDS ANNUAL LIMIT

Initial Notification by: _____ Date:_____ Time: _____

☐ WRITTEN REPORT REQUIRED WITHIN 30 DAYS FOR ANY DOSE THAT EXCEEDS ANY LIMIT.

RESULTS OF INVESTIGATION: (see Questionnaire on next page)

Employee interviewed by: _____ Date:_____

Employee statement attached? ☐ Yes ☐ No Date: _____

Invalid dosimeter reading(s) verified by: _____ Date: _____

Valid dosimeter reading(s) verified by: _____ Date: _____

Additional information dated _____ ☐ attached

RECOMMENDATIONS TO PREVENT RECURRENCE: _____

_____

_____

_____

Additional information dated _____ ☐ attached

Reported by: _____ Date: _____

EXTERNAL EXPOSURE INVESTIGATION QUESTIONNAIRE (Level II)

For all investigations of external exposures:

1. Where did you work during the exposure period? Building, room, hood/bench, etc., or any other information which would help to determine the source of exposure, and whether it is valid.

2. What type and number of procedures did you perform during the monitoring period? How much time was spent on these procedures?

3. Where is your dosimeter kept when not being worn? Was it ever taken out of the lab area by you or anyone else? Could anyone else have used it or exposed it to a radiation source? For Dispersible Users: was the badge surveyed for contamination upon completion of the procedure?

4. Incident Specific Questions

Question #1

Question #2

For Nuclear Medicine:

5. What is the specific caseload for the monitoring period (animal species, etc.)

For radioisotope users:

6. Did you use shielding? Which type? Could another individual have caused the exposure, e.g. someone working near you, a sample placed near you or in a drawer?

For Cardiologists:

7. What position were you located at during the fluoroscopy procedure? (diagram 46.1)

8. Do you use the X-ray equipment in such a way that the angle of the primary beam is not perpendicular to the patient? If so how do you ensure that your distance from the primary beam is maintained?

RF-46B. INTERNAL EXPOSURE INVESTIGATION REPORT

Name: _____ CSU ID No.: _____

Work Location: _____ Phone: _____

Principal User: _____ Department: _____

REASON FOR INVESTIGATION:

☐ Personal contamination or injury Date: _____

☐ Abnormal Urinalysis ☐ Abnormal Thyroid Count Date: _____

Additional information dated _____ ☐ attached

Investigation initiated by: _____ Date: _____ Time: _____

NOTIFY CDPHE-RCD (and NRC if Reactor involved); check category:

☐ IMMEDIATE NOTIFICATION IF REPORTED OR POTENTIAL DOSE EXCEEDS 5 x ANNUAL LIMIT

☐ NOTIFICATION WITHIN 24 HOURS IF REPORTED OR POTENTIAL DOSE EXCEEDS ANNUAL LIMIT

Initial notification by: _____ Date: _____ Time: _____

☐ WRITTEN REPORT REQUIRED WITHIN 30 DAYS FOR ANY DOSE THAT EXCEEDS ANY LIMIT

RESULTS OF INVESTIGATION: (description of event, cause, etc.)

_____

_____

_____

_____

Employee interviewed by: _____ Date: _____

Employee statement attached? ☐ Yes ☐ No Date: _____

Intake of radioactive material - Estimated: _____ ALI; Verified: _____ ALI

Intake verified by: _____ Date: _____

Additional information dated _____ ☐ attached

RECOMMENDATIONS TO PREVENT RECURRENCE: _____

_____

_____

_____

Additional information dated _____ ☐ attached

WRITTEN REPORT, if required, within 30 days:

Reported by: _____ Date: _____

INTERNAL EXPOSURE INVESTIGATION QUESTIONNAIRE

1. Where did you work during the contamination event? Building, room, hood/bench, etc., or any other information which would help to determine the source of exposure, and whether it is valid.

2. What type of procedures did you perform during the exposure event? What is the estimated activity that was taken internally (The details of the procedures are not so important as a reliable estimate of your potential intake.)

3. What is the likely cause of the internal exposure?

4. What type of personal protective apparel did you wear, i.e. lab coat, lead apron, thyroid collar, goggles, gloves?

5. Who else may have been exposed to the contamination? _____

RF-46C. LOSS OF RADIATION BADGE INVESTIGATION REPORT

Name: _____ CSU ID No.: _____

Work Location: _____ Dept.: _____

Principal User : _____ Phone: _____

Month/ Year of Loss: _____ Badge Wear Date: _____

Notified RCO on (date):_____ Interview Conducted By : _____

Interview Date: _____ Over the Phone: ☐ Face to Face: ☐ e-mail ☐

1. Where did you work during the exposure period? (Building, Rm, and Dept.)

_____

2. What type of procedures/ research did you perform during the monitoring period?

_____

_____

3. Are these procedures routine procedures that you have performed in previous months?

_____

4. Where on your person is your badge worn? i.e. waist, collar etc._____

5. Explain how you might have lost your badge? _____

_____

6. Notes:_____

_____

Estimated Dose Equivalent by RCO: _____ for (month/yr or quarter/yr): _____
Estimates taken from prior Dose reports dated (m/y) _____ to _____
Means of dose estimate (Calculation, P.U. estimate) : _____

_____

Reported By (RCO): _____ Date: _____

Radiation Worker (signature): _____ Date: _____

RCO use only:

Location:_____ Wearer #:_____ Badge Type:_____

Contact Dosimetry Vendor Yes ☐ No ☐ Initials:_____ Date:_____

Attach Dose History from Vendor ☐ Spare badge assigned ☐ Yes ☐ No

Entered into Access data base ☐ Spare Badge #_____Series #_____

46.1 Fluoroscopy Procedure Positioning