University of Maryland Baltimore

Radiation Safety Procedure

Procedure Number: 3.1

Title: Individual Monitoring Program

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Technical Review and Approval:

_____ **Date:**_____
Radiation Safety Officer

Radiation Safety Committee Approval:

_____ **Date:**_____
Chair, Radiation Safety Committee

PROCEDURE 3.1 – INDIVIDUAL MONITORING PROGRAM

1.0 Purpose:

This procedure provides instructions for:

- Enrolling individuals in UMB's Individual Radiation Monitoring Program;
- Issuing, wearing, and retrieving individual dosimeters;
- Determining individual radiation doses resulting from external and internal occupational radiation exposure; and
- Creating individual monitoring program records.

2.0 Scope:

This procedure applies to all individual radiation exposure monitoring activities at UMB.

3.0 Procedure:

3.1. Identification of Individuals Requiring Individual Monitoring

3.1.1. The designated representative in each work group shall coordinate with EHS to ensure assigned individuals are enrolled in the individual external dose monitoring program. EHS shall develop and implement appropriate forms and processes to facilitate the required notifications.

3.1.2. EHS shall enroll individuals in the individual internal dose monitoring program based on an assessment of the radiological hazards of the work to be performed. Typically, this shall include individuals in the radioactive waste management program and those working with significant (millicurie) quantities of tritium or volatile iodine for iodination experiments.

3.1.3. EHS shall enroll in the individual monitoring program (external and/or internal, as appropriate) all individuals:

- Who potentially may receive, in a year, a dose equivalent exceeding 10 percent of the applicable dose limit set forth in COMAR Part D [D.502(a)(i) & (ii) & (c)(i) & (ii)]; or
- Who enter a high or very high radiation area [D.502(a)(iii)]; or
- Who are involved in operations that use more than 100 mCi of tritium in an uncontained form other than metallic foil [MD-07-014-01.18A].
- EHS may also enroll other individual's in the individual monitoring program, such as individuals who are concerned about their radiation exposure, at the discretion of the RSO.

3.2. Determination of Prior and Allowable Individual Doses

3.2.1. Prior to allowing an individual to receive an occupational dose that requires individual monitoring under COMAR D.502, EHS must determine the individual's prior occupational dose. EHS shall:

- Determine the individual's occupational dose received during the current year [D.205(a)(i)]; and
- Attempt to obtain records of the individual's lifetime cumulative occupational radiation dose [D.205(a)(ii)].

3.2.2. When determining the individual's prior occupational dose during the current year, EHS may accept a written, signed statement from either the individual or the individual's most recent employer, that discloses the nature and amount of any occupational dose received during the current year [D.205(c)(i)].

3.2.3. When determining the individual's lifetime occupational cumulative radiation dose, EHS may accept a current MDE Form ND 216 or equivalent, signed by the individual and countersigned by an appropriate official of the individual's most recent employer (for work involving occupational radiation exposure). If the individual is not a UMB employee, EHS may accept a form countersigned by the individual's current employer [D.205(c)(ii)].

3.2.4. EHS may accept reports of individual dose transmitted by telephone, telegram, letter, or facsimile, as long as these submittals are deemed to be verifiable [D.205(c)(iii)].

3.2.5. EHS shall maintain records of individual dose history on MDE Form ND216 or equivalent forms that contain all of the information required on that form. EHS shall include on the form:

- Each period during which the individual received occupational exposure to radiation or radioactive material [D.205(d)(i)];
- For each period for which EHS receives a report of prior occupational dose, the dose shown in the report [D.205(d)(i)];
- For each period for which EHS does not receive a report of prior occupational dose, a notation indicating the time periods for which reports are not available [D.205(d)(i)]; and
- The signature of the affected individual [D.205(d)(i)].

3.3. Determination of Individual Allowable Dose

3.3.1. EHS shall reduce the individual's allowable dose in the current year by the amount of any prior occupational dose received during the year [D.205(f)].

3.3.2. If EHS is unable to obtain a complete record of the individual's current and previously accumulated occupational dose, EHS shall:

- Assume the individual was pursuing activities involving occupational radiation exposure during each quarter of the current year for which records are unavailable [D.205(e)(i)]; and
- Reduce the individual's allowable occupational dose by 1.25 rem for each quarter of the current year that records are unavailable [D.205(e)(i)].

3.4. Issuance of Personnel Dosimeters

3.4.1. Following notification that a new employee requires or desires enrollment in the individual monitoring program, EHS shall:

- Determine the individual's prior occupational dose (see above);
- Assign the individual to the proper monitoring group (types of dosimeters, wear location(s), account and series numbers, dosimeter exchange/bioassay frequency, etc.); and
- Provide the required dosimeters to the individual or his work group coordinator.

3.4.2. EHS shall enter the required tracking information into the tracking software and transmit the information to the dosimetry processor.

3.5. Use of Personnel Dosimeters

3.5.1. Monitored individuals should wear whole body dosimeters on the front of the body, between the waist and neck, unless otherwise directed by EHS. Monitored individuals should wear other dosimeters (e.g. extremity dosimeters) on the maximally exposed portion of the body, as directed by EHS.

3.5.2. Individuals shall not wear or position their dosimeters in a manner that falsely or deceptively indicates a radiation dose not actually received by the individual [D.501(d)].

3.6. Return of Personnel Dosimeters

3.6.1. With the assistance of the work group dosimetry program coordinator, EHS shall collect issued dosimeters at the end of the established monitoring period.

3.6.2. Should any individual fail to return his or her dosimeter in accordance with the established schedule, EHS shall initiate action to obtain the dosimeter, up to and including revocation of the individual's authorized user status and privileges to enter areas where individual monitoring is required. EHS may also institute a replacement fee for lost or non-returned dosimeters.

3.6.3. EHS shall sort the dosimeters as required by the dosimetry processor, identifying unused dosimeters as necessary, and transfer the dosimeter to the dosimetry processor.

3.7. Collection of Bioassay Samples/Analyses

3.7.1. EHS shall establish an appropriate schedule for collecting bioassay samples/performing required in vivo analyses based on the activities undertaken by the affected individuals. Typical bioassay schedules are:

- Thyroid bioassay within 6-72 hours after performing iodination;
- Thyroid bioassay weekly for other iodine exposures (e.g., routine exposure of Waste Management personnel);
- Urinalysis within one week following a single operation involving more than 100 mCi of tritium and at weekly intervals for continuing operations [MD-07-014-01.18.A];
- Urinalysis weekly for tritium for all individuals who work in restricted areas in which tritium is used. This may be changed to

and maintained at a monthly frequency if the average tritium concentration for any individual is less than 10 μCi per liter; such samples shall be collected on the same day of the week to the extent practicable [MD-07-014-01.18.B(2)];

- Urinalysis monthly for other exposures (e.g., P-32 exposures of Waste Management personnel).

3.7.2. Bioassays may also be required by EHS following unusual occurrences, such as major spills or other uncontrolled releases of radioactive material.

3.7.3. Individuals who are enrolled in the bioassay program shall submit required samples or allow required in vivo analyses, as appropriate, on the schedule established by EHS.

3.7.4. Should any individual fail to comply with the established schedule, EHS shall initiate action obtain the required analyses, up to and including revocation of the individual's authorized user status and privileges to enter areas where individual monitoring is required.

3.8. Processing of Personnel Dosimeters

Note: The NVLAP accreditation requirements do not apply to processing of extremity dosimeters.

3.8.1. EHS shall retain the services of a vendor who is accredited under the National Voluntary Laboratory Accreditation Program to process all personnel dosimeters issued to ensure compliance with COMAR Part D individual monitoring requirements [D.501(c)(i)]. The vendor's NVLAP accreditation shall address include those NVLAP categories that most closely approximate the types of radiation present at UMB [D.501(c)(ii)].

3.9. Processing of Bioassay Samples

EHS shall analyze submitted bioassay samples using appropriate counting instruments (typically liquid scintillation counting for tritium analyses).

3.10. Determination of Individual Dose Equivalents

3.10.1. External Dose Determination

EHS shall assign the deep dose equivalent and shallow dose equivalent based on the exposure to the applicable portion of the body

receiving the highest dose [D.201(c)]. If the applicable portion of the body receiving the highest dose was not specifically monitored or results of individual monitoring are not available, EHS shall determine the dose equivalents based on the results of other measurements, such as:

- Area monitoring results;
- Results of monitoring other portions of the body; or
- Results of monitoring of other individuals undertaking similar activities [D.201(c)].

EHS shall submit the completed analyses to the dosimetry processor for inclusion in the individual's dose record.

3.10.2. Internal Dose Determination

EHS shall assign the committed dose equivalent and committed effective dose equivalent based on, as appropriate:

- The results of individual bioassays and accepted dose conversion factors; or
- The Derived Air Concentration and Annual Limit on Intake values provided in COMAR Part D, Appendix B, Table 1 [D.201(d)].

Internal dose determination based on individual bioassay results is the preferred alternative.

3.10.3. Summation of Internal and External Dose Equivalents

- If EHS has determined that both internal and external individual monitoring are required for any individual, then EHS shall sum the internal and external dose equivalents to determine the total effective dose equivalent [D.202(a)].

- If only internal or external dose monitoring is required, then it is not necessary to sum the internal and external dose equivalents [D.202(a)].

3.10.4. Dose to the Embryo/Fetus

In the case of monitoring of the declared pregnant woman, the dose to the embryo/fetus shall be determined as the sum of the following, as applicable:

- The deep dose equivalent to the declared pregnant woman [D.208(c)(i)];
- The dose to the embryo/fetus from radionuclides deposited in the fetus [D.208(c)(ii)]; and
- The dose to the embryo/fetus from radionuclides deposited in the declared pregnant woman [D.208(c)(ii)].

4.0 Records and Reports

4.1. Records

4.1.1. EHS shall maintain required records in accordance with the requirements of Procedure UMB-RSP-A-003, *Radiation Safety Records*.

4.1.2. Records of individual monitoring results shall include the following, as applicable:

- The deep dose equivalent to the whole body, eye dose equivalent, and shallow dose equivalent to the skin and extremities [D.1107(a)(i)];
- The estimated intake or body burden of radionuclides [D.1107(a)(ii)];
- The committed effective dose equivalent assigned to the intake or body burden of radionuclides [D.1107(a)(iii)];
- The specific information used to calculate the committed effective dose equivalent [D.1107(a)(iv)];
- The total effective dose equivalent, when required [D.1107(a)(v)];
- The sum of the deep dose equivalent and the committed dose to the organ receiving the highest total dose (D.1107(a)(vi)].

4.1.3. Records of individual prior occupational dose history shall be maintained on MDE Form ND216 or equivalent [D.205(d)(i)].

4.1.4. Records of individual monitoring results shall be maintained on MDE Form 217 or equivalent forms containing all of the information required by MDE Form 217 [D.1107(c)].

4.1.5. Records of dose to the embryo/fetus shall be maintained with the records of the dose to the declared pregnant woman [D.1107(d)].

4.1.6. Records of the declaration of pregnancy shall be maintained and should be maintained with the declared pregnant woman's individual monitoring record [D.1107(d)].

4.2. Reports

UMB is required to provide reports to monitored individuals regarding their personal radiation exposure. UMB is also required to report to MDE incidents involving exposures of individuals exceeding the regulatory dose equivalent limits. See Procedure 1.3, *Radiation Safety Reports*, for details on these reporting requirements.

5.0 References:

Code of Maryland Regulations 26.12.01.01
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