

CHAPTER 3 RADIATION EXPOSURE LIMITS

1.0 RESPONSIBILITY AND AUTHORITY OF THE RADIATION SAFETY COMMITTEE

1.0. ALARA POLICY

It is the policy of the University of Georgia that exposure to ionizing radiation will be **As Low As Reasonably Achievable (ALARA)**, consistent with the teaching, research, and service missions of the institution.

2.0 MONITORING OF EXTERNAL RADIATION EXPOSURE

Each radiation worker at the University of Georgia with the potential to exceed 10% of any annual exposure limit due to external radiation detectable by industry standard dosimetry will have that exposure monitored by the use of personnel dosimetry.

3.0 RADIATION EXPOSURE ALARA ACTION LEVELS

3.1 The radiation exposure ALARA Action Level 1, as described in Table 3.0, will apply to all UGA radiation workers, except as specified in section 3.2 (below).

3.2 Personnel in the Department of Anatomy and Radiology at the College of Veterinary Medicine and the Veterinary Teaching Hospital, and any other exposure groups approved by the RSC, will use the ALARA Action Level 2 as described in Table 3.0.

**Table 3.0
Radiation Exposure ALARA Action Levels**

Exposure Measurement	ALARA Action Level 1 mrem/calendar quarter	ALARA Action Level 2 mrem/calendar quarter
Total Effective Dose Equivalent (TEDE)	125	375
The sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye	1875	5625
Shallow Dose Equivalent (SDE) to the skin or any Monitored Extremity (SDEME)	1875	5625
Lens of the eye Dose Equivalent (LDE)	750	2250

3.3 If any individual exceeds an ALARA action level, Radiation Safety will report the exposure to the appropriate Authorized User and the Radiation Safety Committee.

1) The Authorized User, with assistance from Radiation Safety, will be responsible for performing an investigation of the radiation exposure.

- 2) A written summary of the investigation results, including potential corrective actions, should be provided to the Radiation Safety Committee.
- 3) Persons who turn in two consecutive monitoring badges that are over the ALARA action level will be individually counseled by a member of the Radiation Safety staff.
 - The person will be informed of the risk from radiation exposure.
 - The reason for the exposure will be determined, if possible.
 - Changes in work habits, procedures, and equipment will be recommended as appropriate.

4.0 INTERNAL EXPOSURE MONITORING AND ACTION LEVELS

4.1 Radioactive Iodine Monitoring and Action Levels

- 1) Individuals should receive a thyroid bioassay after completion of operations involving, at any one time, direct handling or use of unsealed radioiodine in individual quantities in excess of the quantities specified in Table 4.1 below.
- 2) Persons routinely working with individual quantities of radioiodine in excess of these amounts should have monthly bioassays.
- 3) Scheduling of routine bioassays is the responsibility of the individual radiation worker.

Table 4.1
Radioiodine Bioassay Requirements

Type of Operation or Procedure Conducted	Quantity Requiring a Bioassay	
	volatile form*	bound to non-volatile agent*
Operations performed in an open room or bench.	>0.1 mCi	>1 mCi
Operations performed in a fume hood.	>1 mCi	>10 mCi

*Volatile forms include, but are not limited to, unlabeled sodium iodide (NaI) or operations involving acids or chlorine. Non-volatile forms are those that are chemically bound and used in such a manner that the radioiodine will remain nonvolatile and are diluted to concentrations less than 0.1 mCi/mg of non-volatile agent. Radioimmunoassay (RIA) kits are considered non-volatile.

- 4) If historical data indicates that exposures are consistently minimal and personnel/procedures are uniform in nature, the RSO may reduce the frequency of routine thyroid bioassays to a quarterly, bi-annual, or annual schedule.
- 5) The optimum schedule for a thyroid bioassay is within the time period of 8 to 72 hours of exposure. No more than a two-week delay is considered acceptable.
- 6) Persons with internal radioiodine exposures in excess of 10% of the applicable limit will be counseled by a Radiation Safety staff member.
- 7) The Authorized User and Radiation Safety will evaluate the probable causes of the exposure and changes in procedures, work habits, or equipment will be recommended as appropriate.
- 8) A written summary of the investigation results, including potential corrective actions, should be provided to the Radiation Safety Committee.

4.2 Tritium Monitoring and Action Levels

- 1) Individuals involved in operations which utilize, at any one time, more than 100 millicuries of tritium in a non-contained form, other than metallic foil, shall have a bioassay performed within one week following a single operation, and at weekly intervals for continuing operations.
 - Tritium shall not be used in such a manner as to cause any individual to receive a radiation exposure such that urinary excretion rates exceed 28 microcuries of tritium per liter when averaged over a calendar quarter.
 - If the average concentration of tritium in urine for an individual during a calendar quarter is less than 10 microcuries per liter, urinalysis may be performed on that individual at monthly intervals for the following calendar quarter and may continue at monthly intervals so long as the average concentration in a calendar quarter remains below 10 microcuries per liter.
 - The urine specimen should be collected on the same day of the week, whenever practical.
 - Scheduling of routine bioassays is the responsibility of the individual radiation worker.
- 2) Persons with more than 10% of the applicable limit for internal exposure of tritium will be counseled by a Radiation Safety staff member.
- 3) The Authorized User and Radiation Safety will evaluate the probable causes of the exposure and changes in procedures, work habits, or equipment will be recommended as appropriate.
- 4) A written summary of the investigation results, including potential corrective actions, should be provided to the Radiation Safety Committee.

4.3 Non-routine Bioassay Requirements

- 1) If ingestion, inhalation, or absorption of any radioactive material is suspected, a bioassay or dose calculation will be performed by the RSO or designee.
- 2) Any individual, whose internal exposure exceeds 10% of the applicable limit for the radioisotope, or sum of the radioisotopes, will be counseled by a Radiation Safety staff member.
- 3) The Authorized User and Radiation Safety will evaluate the probable causes of the exposure and changes in procedures, work habits or equipment will be recommended as appropriate.
- 4) A written summary of the investigation results, including potential corrective actions, should be provided to the Radiation Safety Committee.

4.4 Airborne Radioactivity Exposure

Any intentional exposure of individuals to airborne radioactive materials or conduct of a project which will require the use of radiological respiratory protective equipment is highly restricted. Such actions will require the development of procedures, plans, and/or protocols for the proposed activity by the Authorized User and Radiation Safety. A complete review and approval of the proposed project and associated documentation by the Radiation Safety Committee will be required prior to the initiation of any such activity.

5.0 PERSONNEL EXPOSURE LIMITS

5.1 Occupationally Exposed Adults

The occupational dose to individual adults (radiation workers) shall not exceed the following annual dose limits:

- 1) A total effective dose equivalent (TEDE) of 5 rem; or,
- 2) The sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue, other than the lens of the eye, being equal to 50 rem.
- 3) A dose equivalent of 15 rem to the lens of the eye.
- 4) A shallow-dose equivalent of 50 rem to the skin or any extremity.

5.2 Planned Special Exposures

In keeping with the research and teaching missions of the University of Georgia, use of the Planned Special Exposure as defined in Rule .03(5)(e)6.(i) of Chapter 391-3-17 *Rules and Regulations for Radioactive Materials* shall not be authorized.

5.3 Occupationally Exposed Minors

The annual dose limits for occupationally exposed minors (any individual less than 18 years of age) shall not exceed 10 percent of the annual dose limits specified above for adult workers.

5.4 Occupational Exposure to Pregnant Women

The U.S. Nuclear Regulatory Commission's Regulatory Guide 8.13 and its Appendix are required reading for all UGA radiation workers, including all Authorized Users. Obviously, not all radiation workers may become pregnant. However, any radiation worker may have the opportunity to work with a radiation worker who is, or has the potential to, become pregnant. Authorized Users or Advanced Radworker personnel may be required to supervise the activities of occupationally exposed pregnant women. Therefore, all radiation workers should be instructed in regard to the hazards of radiation exposure to unborn children. Regulatory Guide 8.13 is provided in its entirety as an appendix to this chapter. In addition, the following UGA policies apply:

- 1) A pregnant radiation worker must make her own decision regarding whether or not to declare her pregnancy in accordance with Regulatory Guide 8.13.
- 2) The declaration of pregnancy must be submitted in writing to the appropriate Authorized User (or work group supervisor) and to Radiation Safety. An example declaration form is provided in the appendix to this chapter.
- 3) Once pregnancy is declared in writing, the declaration will remain in effect for a period of one year from the date of submission, unless it is revoked in writing.
- 4) The radiation exposure to the embryo/fetus of a declared pregnant woman shall not exceed 500 mrem during the entire term of the pregnancy.
- 5) The radiation exposure to the embryo/fetus of a declared pregnant woman should not exceed an ALARA action level of 50 mrem per month. Any monthly exposure in excess of this value will be evaluated by Radiation Safety and the responsible Authorized User (or supervisor). When appropriate, corrective actions will be taken to prevent future monthly exposures from exceeding this ALARA action level.
- 6) If a pregnant woman has already received ≥ 450 mrem during the term of pregnancy by the time she declares, the limit for the remainder of the entire term of declared pregnancy shall be 50 mrem.

- 7) If a declared pregnant woman has already received a radiation exposure of < 450 mrem by the time she declares, the monthly ALARA action level may be reduced by the RSO to a level that will ensure that the dose to the embryo/fetus will not exceed 500 mrem for the term of the pregnancy.
- 8) Exposure to the embryo/fetus of a declared pregnant woman shall be maintained as low as reasonably achievable, consistent with the right-to-work prerogative of the employee and/or student.

5.5 Exposure to Members of the Public

The total effective dose equivalent to individual members of the public due to UGA licensed radioactive material or radiation producing devices, will not exceed 100 mrem in a year exclusive of the dose contribution from background, medical treatments, or radioactive material disposed of via sanitary sewerage performed in accordance with state and federal regulations.