

## **Radiation Protection During Pregnancy**

The objective of radiation protection during pregnancy is to limit the dose to the developing embryo/fetus to as low as reasonably achievable. Restricting dose to the fetus does not necessarily mean that it is necessary for pregnant women to avoid work with radiation or radioactive materials completely or that they must be prevented from entering or working in areas where radiation is present. It does however imply the employer and employee should carefully review the exposure conditions of the pregnant women. In particular their working conditions should be such that the probability of high accidental doses and radionuclide intakes is insignificant.

The University has in place a policy titled: Radiation Protection during Pregnancy, Date: 08/01/05, Policy ID: SEC-010. The following information was developed to provide additional guidance for the pregnant worker. The Environmental Health & Safety Office/Radiation Safety is available for consultation on these matters at 2-4911.

### **Guidance - General**

1. A declared\* pregnant technologist's dose shall be limited to 500 mrem over the course of the entire pregnancy.
2. Make efforts to avoid substantial variation above a uniform monthly exposure rate. The National Council on Radiation Protection and Measurements (NCRP) recommends a monthly equivalent dose limit of 50 mrem to the embryo/fetus once the pregnancy is known. Any monthly dose of greater than 100 mrem will be considered a substantial variation and will require justification.
3. Upon declaration of pregnancy a review of the technologist's specific exposure history and work environment should be performed.
4. The pregnant technologist may receive additional counseling by the Chief Technologist and be advised on specific safety measures that must be followed.
5. An additional dosimeter ("baby badge") may be issued to the employee to wear in the abdominal region. An additional self-reading dosimeter can be issued upon request. The supervisor will assure that dosimetry is returned to EHS on a monthly basis.
6. The pregnant worker may inspect her dosimetry records at any time. These records are kept at EHS. The records show monthly and yearly totals of radiation dose to the worker. By inspecting her own dosimetry records a worker can determine exactly how much dose she is receiving during the course of her pregnancy and she may gauge how effective her dose reduction methods are.
7. It is especially important to reduce radiation dose during the first 2 to 3 months of pregnancy. If the options for rescheduling of job duties are limited then these efforts should be concentrated in the first trimester (exception, iodine uptake maximum after 90 days).
8. In keeping with the ALARA philosophy, efforts will be made to keep the individual away from areas of radiation exposure that are considered significantly higher; however, due to work demands and staffing, complete removal from these areas cannot be guaranteed.

9. Practices to maintain doses ALARA should be employed at all times. Minimize time, maximize distance and use shielding whenever possible.
10. Pregnant workers should never be placed in situations where they may have to make a decision to enter a high radiation area under emergency conditions.

#### **Additional Guidance - Nuclear Medicine and Nuclear Cardiology Personnel**

11. A nuclear medicine technologist can continue to work during pregnancy. By limiting close patient contact, the radiation doses received by nuclear medicine technologist can be kept low.
12. Considerations should be made for possibly limiting certain types of work or the amount of time spent in particular activities, including the administration of therapeutic radioiodine, daily work in the nuclear pharmacy and work with PET radiopharmaceuticals.
13. Pregnant workers should not allow themselves to be exposed to radionuclides that are in volatile form and easily absorbed through the skin or otherwise yield a dose equivalent of more than 50 mrem per month. This includes work in areas using radioiodine in unsealed volatile form, except for exempt quantities.
14. The preparation and administration of any radionuclide therapy doses and the subsequent care/management of the patient should be limited as much as possible. Administering radionuclide capsules or diagnostic doses (less than one mCi) is permitted and all precautions to minimize dose should be employed.
15. Pregnant workers must wear appropriate protective clothing when handling radioactive material.
16. Injecting doses is permitted. Assignment to administer unshielded, high dose rate injections should be avoided.
17. Practices to maintain doses ALARA should be employed at all times. Minimize time, maximize distance and use shielding (syringe and vial shields) whenever possible. The majority of the pregnant technologist's dose may come from radiation exposure from the patients who have been dosed. By maintaining maximum distance and minimum time with patients, doses can be kept low.
18. Potential doses from daily flood performance should be evaluated by the Environmental Health & Safety Office.
19. The employee must have a monthly thyroid bioassay performed. The supervisor will assure that bioassay counts are completed on the required monthly schedule.
20. Notify EHS in the event of any radioactive spill, and arrange for appropriate bioassay monitoring for the pregnant person. Intakes by a declared pregnant worker of inhaled or ingested or absorbed radionuclides must be evaluated and subsequent effective committed dose equivalent to the embryo/fetus determined.
21. Pregnant workers should not be involved in clean-up of radioactive spills, but should report them immediately to their supervisor.

22. Pregnant workers should monitor their hands for radioactive contamination after handling unsealed forms of radioactive material.
23. Pregnant workers should ensure that they wash hands after working around radioactive material.

#### **Additional Guidance – Therapy Patient Caregivers**

24. Iodine therapy patients - Fluids from the patient's body will contaminate linen, bed clothes, and much of what the patient touches. The major routes of potential intake are passage through skin and ingestion. For example, if you were to touch a surface contaminated with radioactivity, your fingers could transfer radioactivity to your mouth.
25. Because of the potential for contamination Universal Precautions are required and effective for attending personnel (for example, a gown, shoe covers, and gloves must be worn).

Any vomitus, gastric contents collected during the first 24 hours by nasogastric aspiration, or excessive sputum should be collected in a waterproof container and held for disposal by EHS if disposal down the sanitary sewer is not possible. If there has been a large spill of urine, EHS (2-4911) or Nuclear Medicine staff shall be notified immediately.

Do not spend any more time in patient's room than is necessary to care for patient. In particular, time at patient's bedside should be kept to a minimum. Specific "stay times" will be provided on the patient's door. Consult with EHS/Radiation Safety regarding concerns or modification of allowed stay time.

26. A lead apron does not provide much shielding for Cesium-137 or Iodine-131. In the case of therapy patients administered these nuclides, heavy portable shields are provided. Radiation Oncology provides shields for brachytherapy patients.
27. Workers in Nuclear Medicine and Radiation Therapy usually do not wear lead aprons and are exposed to higher photon energies. In spite of this, fetal doses are not likely to exceed 25% of the personal dosimeter measurement. (ICRP Report 84)

#### **Additional Guidance for Personnel Involved in the Use of X-ray Producing Equipment**

28. Practices to maintain doses ALARA should be employed at all times. Minimize time, maximize distance and use shielding whenever possible. The majority of the pregnant technologist's dose may come from radiation scattered by the patient who is being X-rayed. By maintaining maximum distance and minimum time near patients, doses can be kept low.
29. The use of pregnancy lead is advised. This two piece type is best and has additional shielding in the abdominal region of skirt. This lead should be made available by your department.

30. If requested, you will be provided with an additional dosimeter (“baby badge”) to be worn at the waist **UNDER** your lead. Contact EHS/Radiation Safety to declare your pregnancy or request a “baby badge”.
31. Pregnant technologists should never be asked to hold a patient during an X-ray procedure.
32. There is no need for a pregnant radiographer or other staff (for example, nurses, radiologists, etc.) to stand outside of the room during a fluoroscopic procedure or any diagnostic radiology procedure as long as she is wearing a lead apron. It would be prudent for pregnant staff to wear a personal radiation monitor (TLD or similar device) under the apron at abdominal level to monitor any radiation received under the apron.
33. Use of an additional dosimeter has consistently shown that exposures to the fetus are insignificant. Suppose, for instance, that the declared pregnant worker wearing a single radiation dosimeter at collar level outside of the lead apron receives 1000 millirem during the nine month pregnancy. The dose at waist level under a protective apron would be approximately 5% of the collar radiation dose, or 50 millirem. Because of attenuation by the maternal tissues overlying the fetus, the dose to the fetus would be approximately 30% of the abdominal skin dose, or 15 millirem. Consequently, when adequate protective measures are taken, it is nearly impossible for the declared pregnant worker to even approach the fetal exposure limit of 500 millirem.

If you have additional questions please contact any of the following: Environmental Health & Safety Office (Radiation Safety) at 2-4911 or Radiological Physics group at 4-2163.

\* **Declared Pregnant Woman:** A woman who has voluntarily informed the licensee, in writing, of her pregnancy and the estimated date of conception. The declaration remains in effect until the declared pregnant woman withdraws the declaration in writing or is no longer pregnant.