FACT SHEET

Berkeley UNIVERSITY OF CALIFORNIA EH&S OFFICE OF ENVIRONMENT, HEALTH AND SAFETY

Pregnancy and Radiation

Overview

There are things in our surroundings and in our lifestyles that can affect an embryo/fetus. It is especially important that individuals who work with sources of radiation understand the risks of radiation to the embryo/fetus. Everyone is exposed daily to various kinds of radiation: heat, light, ultraviolet, microwave, ionizing, etc. People are exposed to different amounts of ionizing background radiation depending on how and where they live. This document explains the risks associated with radiation and pregnancy and compares these risks with other risks to the embryo/fetus. This will assist the *Expecting parent* in assessing the potential risk to the embryo/fetus during the course of employment and their rights on the decision whether or not to declare their pregnancy. Also discussed are methods of minimizing the radiation dose and the risk to the embryo/fetus and maintaining radiation dose as low as reasonably achievable.

The state of California and Federal regulations require institutions holding radioactive material licenses to instruct individuals working with radioactive material or radiation producing machines with regard to pregnancy as appropriate. *Expecting parents* are workers who are pregnant or actively trying to become pregnant, whether or not they become *declared pregnant workers*. It is UC Berkeley's policy to inform radiation workers (employees and students) of the risks to the developing embryo/fetus from exposures to ionizing radiation and the options available to maintain such external and internal exposures as low as reasonably achievable (ALARA) below the legal limit of 500 mrem for *declared pregnant workers*.

Who Can I Talk To At EH&S?

Any radiation worker is strongly encouraged to contact the EH&S Radiation Safety Office if they have any questions regarding radiation exposures and pregnancy. These calls, and the medical status of all individuals, are kept strictly confidential. If you are pregnant and would like to declare your pregnancy, you may submit a **Declaration of Pregnancy**. If you are considering pregnancy and would like to talk to someone, please contact the Dosimetry Coordinator or Radiation Safety Officer, send an e-mail to **radsafety@berkeley.edu**, or call (510) 642-3073.

You may submit another **Declaration of Pregnancy** to revoke your pregnancy declaration at any time for any reason. The reason does not need to be disclosed.

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Making the Decision to Declare Your Pregnancy

The decision to declare your pregnancy is completely yours. The State of California and the NRC have set a limit of 500 mrem for fetal exposure. This is 1/10 of the normal yearly exposure limit for radiation workers (see table below). This limit is set to protect the embryo/fetus from unnecessary radiation levels that may cause developmental risk.

The radiation exposure limit for the embryo/fetus can only be enforced if the pregnancy is declared in writing by the expecting parent. A declared pregnancy is one in which a person voluntarily informs their employer, in writing, of their pregnancy and gives the estimated date of conception by filling out a **Declaration of Pregnancy**.

Dose Limits

Organ	Occupational Worker Dose Limit (mrem/year)	Comments
Whole Body	5,000	Includes dose from both internal and external emitters
Lens of the Eye	15,000	
Extremities	50,000	Extremities include the arm or leg above the knee or elbow
Skin	50,000	
Embryo/Fetus	**500**	**This limit applies only when a Declaration of Pregnancy has been submitted**
Occupational Exposure of a Minor	500	Applies to anyone under 18 years of age
General Public	100	

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What Happens Once Pregnancy is Declared?

When you have made the decision to declare your pregnancy, you may submit a **Declaration of Pregnancy** via our secure online form. On the form, we will need your name, RUA number(s), supervisor's name, and your estimated date of conception. The dosimetry coordinator will follow up with you within 48 hours of your declaration to collect additional information related to your pregnancy, including a description of the isotope(s) and amounts you will be using or the type of radiation producing machine that you plan to work with during your pregnancy and if you are planning to breastfeed after the birth.

You are considered a *declared pregnant worker* until you withdraw your **Declaration of Pregnancy** by submitting the online form, you inform Radiation Safety of your child's birth, or at least 40 weeks have elapsed since your estimated date of conception.

A member from the Radiation Safety Team will review the risks and possible effects to the embryo/fetus due to ionizing radiation exposure as compared to other hazards (see the links at the bottom of the page for additional references). You will be issued a monthly dosimeter after you submit the **Declaration of Pregnancy**. If you are already issued a dosimeter under an active RUA, you will continue to wear the dosimeter and the exchange frequency will be increased to monthly. You may be required to participate in the internal dosimetry program if you are working with low-energy beta-emitters (e.g. ^{3}H) that cannot be measured using external dosimeters.

Radiation Safety will evaluate your dose from the time of conception to the time of your declaration. We will notify you of any positive doses and if you are approaching the maximum dose limit during your pregnancy. If you accumulate the maximum dose of 500 mrem, you may not be allowed to continue working with radioactive material or around radiation producing machines. The Dosimetry Coordinator will contact you to set up an appointment for an additional review of your work practices. The Radiation Safety Officer may need to work with your supervisor regarding any additional work activities.

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Frequently Asked Questions:

Q: Can I tell my supervisor or EH&S verbally, rather than in writing, that I am pregnant?

A: No, the declaration must be in writing for legal documentation reasons to monitor your dose.

Q: If I have not declared my pregnancy in writing, but my supervisor notices that I am pregnant, do the lower dose limits apply?

A: No. The lower dose limits can apply only if you have declared your pregnancy in writing.

Q: If I have declared my pregnancy in writing, can I revoke my declaration of pregnancy even if I am still pregnant?

A: Yes, it is your right to declare or revoke your pregnancy at any time without an explanation.

Q: What effect will formally declaring my pregnancy have on my job duties?

A: You and your supervisor must make this decision. Very few people at UCB receive an annual dose of 500 mrem under normal working conditions. You and your supervisor should discuss ways that your dose may be limited. The Radiation Safety Officer or a member of the Radiation Safety Team will work with you and your supervisor to come up with the best solution.

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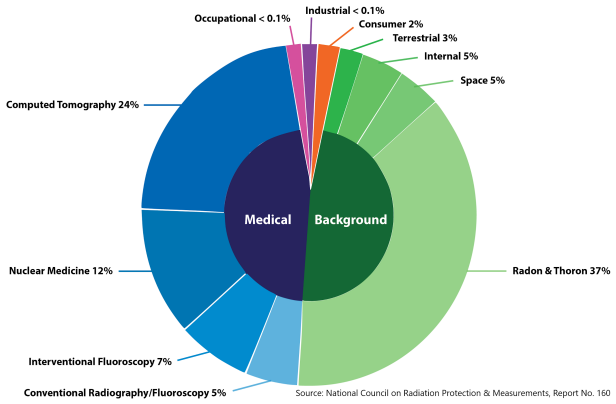
Radiation Biology & Allowed Radiation Doses

1. **Natural Background and man-made Radiation Doses** - Each of us receives approx. 300-620 mrem/year from naturally occurring radioactive material. These include solar cosmic radiation, radon (gases) from soils, and internal dose from ^{40}K. We also receive approx. 70-310 mrem from man-made sources, primarily from medical applications. Your altitude above sea level and the location and construction materials in your home also can influence your background dose (e.g. in Denver [the *Mile High City*], the background dose is about twice the dose as in Berkeley.)



2. **Internal versus External Exposure** - External exposure is the passage of radiation into or through the body tissue from radiation sources that are located outside of the body. Internal exposure results from isotopes that have been deposited inside the body from one of the four entry pathways: ingestion, inhalation, absorption through the skin, and skin punctures. You should be aware that radiation exposure to the fetus could be from internal sources as well as from external sources. In workplaces where unsealed radioactive material is routinely used, there is a greater risk of radioactive material entering the body.
3. **Acute versus Chronic Doses and Effects** - Chronic radiation doses are received over many years. The biological effects of chronic whole-body doses up to regulatory limits have proven undetectable and may not exist. Acute radiation doses are received in a very short duration (e.g. a few minutes or hours). The biological effects of acute whole-body doses under 10 rem have been proven to be almost undetectable.
4. **Somatic versus Genetic Effects** - Somatic effects occur in the person (or fetus) receiving the radiation dose. Somatic effects can be caused by acute or chronic exposure. Cataracts and cancer are somatic effects identified with radiation exposure. Genetic effects of radiation have been observed in animals. These are effects to the offspring of male or female animals that were exposed before conception occurred and are due to damage to the egg or sperm. Genetic effects have not been observed in humans, but are believed to occur based on animal studies.
5. **Effects on the Embryo/Fetus of Exposure to Radiation** - An embryo/fetus may be exposed to radiation during the course of a pregnancy (e.g. during a diagnostic medical exam or an occupational exposure). Regulations limit these exposures, and if followed, are unlikely to cause adverse health effects for the embryo/fetus. Accidental or intentional exposure above regulatory limits may cause issues during and post-pregnancy, such as failure to implant or miscarriage, growth restrictions, or malformations. Radiation dose below regulatory levels has not resulted in detectable issues in current studies, however, the recommendation to keep doses as low as reasonably achievable (ALARA) is a best practice.

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Special Precautions for Expecting Parents

UC Berkeley recommends certain precautions for expecting parents (whether or not they are *declared pregnant workers*) that choose to continue working with or around radioactive materials and/or radiation producing equipment. The expecting parent who uses or works around radioactive material or radiation producing machines should:

- Consult with the EH&S Radiation Safety Team regarding any radiation safety questions and concerns.
- Avoid situations in which the abdomen may be exposed to penetrating radiation (gamma, X-ray, neutron) levels greater than two (2) mrem per hour or 10 mrem per week.
- Wear a radiation dosimeter as a *fetal dose monitor*. This monitor assesses penetrating radiation exposures from external sources (gamma, X-ray, neutron) to the abdomen.
- Contact EH&S about working with volatile or reactive radiochemicals that could result in the inhalation, ingestion, or absorption of radioactive materials through the skin.
- Follow standard lab procedures as follows:
    - No smoking, eating, drinking, or applying cosmetics where radioactive materials are used.
    - No pipetting by mouth.
    - Use disposable gloves while handling radioactive materials.
    - Wash hands and monitor for radioactive contamination frequently.
    - Wear lab coats or other protective clothing around radioactive material.
    - Use certified ventilation hoods when handling volatile or potentially volatile radionuclides.
- Immediately contact the Radiation Safety Officer or EH&S (510-642-3073) in any case of suspected accidental exposure to radiation sources or uptake of radioactive materials. After hours, Campus police (510-642-3333) can contact EH&S.

EH&S RST is here to assist you.

Remember, the decision to declare your pregnancy is completely yours.

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Resources:

- **Pregnancy and Radiation Exposure** - Health Physics Society Publication
- **NRC Regulatory Guide 8.13 Instruction Concerning Prenatal Radiation Exposure**
- **NRC Regulatory Guide 8.29 Instruction Concerning Risks from Occupational Radiation Exposure** - Part 11 has a section on health risks from radiation exposure to the embryo/fetus
- **Doses in Our Daily Lives** - NRC general radiation information
- **Prenatal Radiation Exposure Policy** - UC Berkeley's Radiation Safety Manual
- **Radiation: Facts, Risks and Realities** - EPA general radiation information
- **Radiation Sources and Doses** - EPA summary website for relative doses