



Health Physics Society  
Specialists in Radiation Safety

## Radiation Exposure and Pregnancy

Everyone is exposed to radiation every day. People are continuously exposed to low-level radiation found in food, soils, building materials, and the air and from outer space. All of this radiation originates from naturally occurring sources. For example, bananas contain naturally occurring radioactive potassium-40 and air contains radon, a radioactive gas. Your average natural background radiation *dose*\* is about 3.0 *mSv* (300 mrem) each year (millisieverts and millirem are units of radiation dose, much like a gram or an ounce is a unit of weight).

In addition to natural background radiation, you may be exposed to radiation from medical x rays and medical radiation tests or treatments. If you think, or there is a possibility, that you may be pregnant and need a medical x-ray or radiation procedure, the information below will help answer your question "Does a medical procedure involving radiation increase my baby's health risks?"

### *What are the health risks from medical x rays or radionuclide medical tests performed during pregnancy?*

There is a lot of reliable information about the effects of radiation exposure during pregnancy. Potential radiation effects vary depending on the fetal stage of development and the magnitude of the doses. Our best knowledge indicates that there is a threshold below which negative effects are not observed.

According to the American College of Radiology, routine x rays of a mother's abdomen, back, hips, and pelvis are not likely to pose a serious risk to the child (ACR/RSNA 2010). However, certain procedures (such as a computerized tomography [CT scan] or a lower GI fluoroscope exam) to the mother's stomach or hips may give higher doses. If you are administered a radioactive drug (nuclear medicine), radioactivity in your urine or intestines could give a moderate dose to the fetus, and some compounds can cross the placenta



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as well. If you are a candidate for a therapeutic use of radiation from either machine-produced radiation or a nuclear medicine treatment, this may be delayed until after pregnancy, or if urgent, special precautions should be taken to protect the fetus.

Very high radiation doses (for example, in survivors of the Japanese atomic bombings who were pregnant) resulted in some fetal abnormalities and neurological effects, but in diagnostic uses of radiation the doses are below these thresholds. Some have discussed possible risks of cancer appearing later from children irradiated in utero, but the chance of these effects occurring are

very small and, if they exist at all, they are well below the natural occurrence rates for these cancers and even farther below the other normal risks of all pregnancies. Every pregnancy carries about a 3 percent risk for birth defects (ACOG 2009) and a 15 percent risk of miscarriage (ACOG 2002).

\*Words in italics are defined in the Glossary on page 3.

Most diagnostic x-ray or radionuclide medical procedures do not result in a radiation dose that can be associated with any significant increase in risk. If you have a test or treatment that might give your fetus a higher dose, a medical physicist or health physicist in consultation with your doctor can evaluate the possible radiation dose and risk. A medical physicist or health physicist may be contacted through your hospital's Radiology or Radiation Safety Department.

***What if I find out I'm pregnant after being exposed to radiation?***

If you discover you are pregnant after you have had a test or treatment that causes you concern, you should consult with the doctor who ordered the test. You and your doctor should contact a medical physicist or health physicist, who will estimate the radiation dose to your fetus. The calculated radiation dose and developmental stage of your fetus will help the medical physicist or health physicist determine the potential health risks. This information should be shared with your doctor.

Most standard radiological tests and treatments produce radiation doses below 50 mSv (5,000 millirem). The National Council on Radiation Protection and Measurements and the American College of Obstetricians and Gynecologists both agree that the potential health risks to your fetus are not increased from most standard medical tests with a radiation dose below 50 mSv. Potential health risks, however, may increase for a few medical tests or combinations of tests that result in radiation doses that exceed 50 mSv, depending on the dose and on the stage of pregnancy.

***Does it matter how far along in the pregnancy I am?***

The sensitivity of a developing fetus to radiation can vary with the stage of development, the magnitude of the dose, and the length of time of the total exposure (minutes, hours, days, or weeks). The most radiosensitive period appears to be between 8 and 15 weeks after conception. The medical physicist or health physicist will consider all these factors in determining the risks to your fetus.

***I am not pregnant now, but will an x ray or a radionuclide medical test cause my future children to have birth defects?***

There is no evidence that your future children will be at a greater risk for birth defects from x rays or radionuclide medical tests that you receive before becoming pregnant. This conclusion is based on extensive studies of women exposed to atomic-bomb radiation at Hiroshima and Nagasaki and those pregnant women who received x-ray studies, radionuclide medical tests, and other medical radiation procedures. Since the discovery of x rays over a century ago, the number of women exposed to medical radiation has increased dramatically while the rate of birth defects and miscarriages has not changed.

More questions and answers about radiation and pregnancy can be found on the Health Physics Society "[Ask the Experts](#)" Web site.

***What else do I need to know?***

As a precaution, if during your pregnancy you are considering having an abdominal/pelvic x ray or a radionuclide medical test, consult your doctor. The doctor, in consultation with the medical physicist or health physicist, will help you determine if any increased risk is significant. If there is a considerable risk, your doctor can determine if the procedures can be delayed until after birth or whether another medical procedure, such as an ultrasound or MRI, could be used instead.

If you are pregnant and abdominal x rays or radionuclide medical procedures are scheduled without consultation with your doctor, inform the person performing the exam that you are pregnant. As a precaution, you should inform a person performing any type of x-ray or radiation procedure that you are pregnant.

***What if I am breast-feeding and I need a nuclear medicine exam?***

A woman who is a breast-feeding mother may have to stop breast-feeding for a period of time after receiving a radiopharmaceutical for a nuclear medicine exam. The nuclear medicine staff will provide information to women regarding cessation. In the case of x rays and CT scans, the breast milk is not affected by the exam so the woman can continue to breast-feed.

## *Glossary*

### *Dose*

A general term used to refer either to the amount of energy absorbed by a material exposed to radiation (absorbed dose) or to the potential biological effect in tissue exposed to radiation (equivalent dose).

### *Sv or Sievert*

The International System of Units (SI) unit for dose equivalent equal to 1 joule/kilogram. The sievert has replaced the rem; one sievert is equal to 100 rem. One millisievert is equal to 100 millirem.

## *References*

American College of Obstetricians and Gynecologists. Reducing your risk of birth defects. August 2009. Available at: [http://www.acog.org/publications/patient\\_education/bp146.cfm](http://www.acog.org/publications/patient_education/bp146.cfm). Accessed 24 June 2010.

American College of Radiology/Radiological Society of North America. Pregnancy and x-rays. RadiologyInfo.org. March 2010. Available at: [http://www.radiologyinfo.org/en/safety/index.cfm?pg=sfty\\_xray#part6](http://www.radiologyinfo.org/en/safety/index.cfm?pg=sfty_xray#part6). Accessed 6 May 2010.

American College of Obstetricians and Gynecologists. Early pregnancy loss: Miscarriage and molar pregnancy. May 2002. Available at: [http://www.acog.org/publications/patient\\_education/bp090.cfm](http://www.acog.org/publications/patient_education/bp090.cfm). Accessed 24 June 2010.

## *Resources for more information*

Brent RL. Saving lives and changing family histories: Appropriate counseling of pregnant women and men and women of reproductive age, concerning the risk of diagnostic radiation exposures during and before pregnancy. *Am J Obstet Gynecol* 200(1):4-24; 2009.

International Atomic Energy Agency. Pregnancy and radiation protection in diagnostic radiology, radiotherapy and nuclear medicine. 2010. Available at: [http://rpop.iaea.org/RPOP/RPoP/Content/SpecialGroups/1\\_PregnantWomen/index.htm](http://rpop.iaea.org/RPOP/RPoP/Content/SpecialGroups/1_PregnantWomen/index.htm). Accessed 24 June 2010.

National Council on Radiation Protection and Measurements. Radionuclide exposure of the embryo/fetus. Bethesda, MD: National Council on Radiation Protection and Measurements; NCRP Report No. 128; 1998. Available at: <http://www.ncrppublications.org/Reports/128>. Accessed 24 June 2010.

Radiation Answers, [www.radiationanswers.org](http://www.radiationanswers.org) is a Web site that answers questions about radiation and was developed by the Health Physics Society.

Stabin M, Breitz H. Breast milk excretion of radiopharmaceuticals: Mechanisms, findings, and radiation dosimetry. *Continuing Medical Education Article, Journal of Nuclear Medicine* 41(5):863-873; 2000.

U.S. Nuclear Regulatory Commission. Instruction concerning prenatal radiation exposure. Washington, DC: U.S. Nuclear Regulatory Commission; NUREG 8.13, Revision 3; June 1999.

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The Health Physics Society is a nonprofit scientific professional organization whose mission is excellence in the science and practice of radiation safety. Formed in 1956, the Society has approximately 5,500 scientists, physicians, engineers, lawyers, and other professionals. Activities include encouraging research in radiation science, developing standards, and disseminating radiation safety information. The Society may be contacted at 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101; phone: 703-790-1745; fax: 703-790-2672; email: [HPS@BurkInc.com](mailto:HPS@BurkInc.com).