

# Pregnant Employee's Guide to Radiation

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Environmental Health and Safety Department

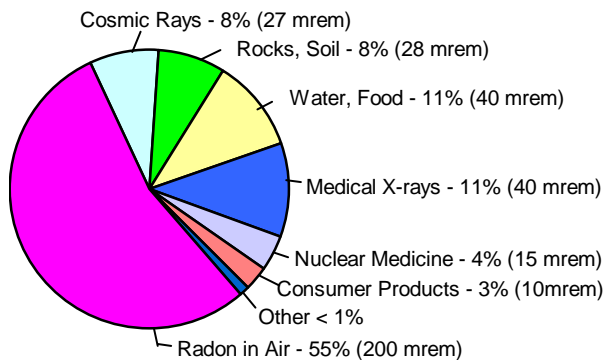
## Pregnant Employee's Guide to Radiation

This document attempts to explain the risk associated with radiation and pregnancy and compares it with other risks to the unborn child. This will assist the pregnant, occupationally exposed employee in assessing the potential risk to the unborn child during the course of employment. Also, discussed are methods of minimizing the radiation dose, and therefore, the risk to the unborn child and maintaining the radiation dose as low as reasonably achievable.

There are things in our surroundings and in our life-styles that can affect the unborn child. For those who work with sources of radiation, it is desirable that the biological risks of radiation to the unborn child be understood.

Everyone is exposed daily to various kinds of radiation: heat, light, ultraviolet, microwave, ionizing, and so on. All human activities involve exposure to radiation. People are exposed to different amounts of background ionizing radiation depending on where they live, what they eat and drink, and how they live. Background radiation comes from many sources: radon, soil, rocks, cosmic rays, food, water, air, consumer products, etc. The average person is exposed to approximately 360 mrem per year from background radiation.

### Sources of Radiation Exposures



### Effects on the Embryo/Fetus of Exposures to Radiation and Other Environmental Hazards

To understand the potential effects of different levels of radiation on an embryo/fetus, it is helpful to compare them to the naturally occurring effects and the environmentally produced risks such as smoking and drinking. This will allow someone to contrast these risks with those produced by exposure to ionizing radiation.

The natural risks for birth defects are as follows: 3-5% of all births have some type of abnormality detectable at birth and 3-5% of all births have some type of condition or disease that develops later in life (not detectable at birth). The risk of a known pregnancy ending in a miscarriage or stillbirth is 20-30%.

The following table compares the radiation risks (childhood cancer, abnormalities) and non-radiation risks (stillbirth or spontaneous abortion due to high-risk occupations such as the lead industry, fetal alcohol syndrome and perinatal death due to alcohol or smoking) with their natural occurrence as birth defects.

## Natural Occurrence of Birth Defects vs. Excess Defects Due to Types of Risk

Effect	# Occurring from natural causes per 1000	Type of Risk	Excess Occurrence Due to Risk per 1000
Childhood Cancer Death	1.4	Radiation dose of 1 rem received before birth	0.6
Abnormalities Small Head Size	40	Radiation dose of 1 rem received 4-7 weeks after conception	5
		Radiation dose of 1 rem received 8-11 weeks after conception	9
Mental Retardation	4	Radiation dose of 1 rem received 8-15 weeks after conception	4
Occupational - NON RADIATION RISK			
Stillbirth or Spontaneous Abortion	200	Work in high-risk occupations	90
Alcohol - NON RADIATION RISK			
Fetal Alcohol Syndrome	1 to 2	2-4 drinks/day	100
		More than 4 drinks/day	200
		Chronic alcoholic (more than 10 drinks/day)	350
Perinatal Infant Death (around time of death)	23	Chronic alcoholic (more than 10 drinks/day)	170
Smoking - NON RADIATION RISK			
Perinatal Infant Death	23	Less than 1 pack/day	5
		One pack or more/day	10

## Nuclear Regulatory Commission and the Texas Bureau of Radiation Control Position

Regulations and guidance are based on the conservative assumption that any amount of radiation, no matter how small, can have a harmful effect on an adult, child, or unborn child. Because it is known that the unborn child is more sensitive to radiation than adults, particularly during certain stages of development, a special dose limit for protection of the unborn child has been established.

Since such a limit could result in job discrimination for women of child-bearing age and perhaps an invasion of privacy (if pregnancy tests were required), the regulatory agencies have taken the position that special protection of the unborn child should be voluntary and should be based on decisions made by workers and employers who are well informed about the risks involved. It is important that the employee understand the risk to the unborn child from radiation received as a result of the occupational exposure of the mother.

## **Radiation Dose Limits**

Because of the sensitivity of the unborn child, the Texas Regulations for Control of Radiation and the Code of Federal Regulations Part 20 has recommended that the dose equivalent to the unborn child from occupational exposure of the expectant mother be limited to 500 mrem for the entire pregnancy.

This radiation exposure limit can only be enforced if the mother declares the pregnancy. A declared pregnancy is one in which a woman voluntarily informs her employer, in writing, of her pregnancy and gives the estimated date of conception. An employee can declare her pregnancy by filling out a Pregnancy Declaration Form available in the Radiation Safety Office.

## **Advice for Employee and Employer**

Although the risks to the unborn child are small under normal working conditions, it is a regulatory requirement to limit the radiation dose from occupational exposure to not more than 500 mrem for the total pregnancy and to not more than 50 mrem in any month. Employee and employer should work together to decide the best method for accomplishing this goal. Some methods that might be used include reducing the time spent in radiation areas, wearing some shielding over the abdominal area, and keeping an extra distance from radiation sources when possible. The Radiation Safety Officer will be able to estimate the probable dose to the unborn child during the normal nine-month pregnancy period based on the exposure history. If the predicted dose approaches the limit, the employee and employer should work out schedules or procedures to confine the dose to less than the 500 mrem required limit.

## **Internal Hazards**

Workers should be aware that radiation exposure to the fetus could be from internal sources as well as from external sources. In workplaces such as nuclear medicine clinics and research laboratories where unsealed radioactive materials are routinely used, there is a greater risk of radioactive material entering the body. Pertinent standard radiation precautions include the following:

- Never smoke, eat, drink, or apply cosmetics where radioactive materials are used.
- Never pipette radioactive solutions 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 loose radioactive material.
- Use certified ventilation hoods when handling volatile or potentially volatile radionuclides.

### References:

Cunningham, Gary. William's Obstetrics, 19th Ed (1993).  
NCRP Report No. 94 (1987)  
NCRP Report No. 95 (1987)  
U.S. Nuclear Regulatory Commission. Reg. Guide 8.13 (1987).

If you have any questions or would like some counseling on pregnancy and radiation, please call 648-2250 or come by the Radiation Safety Office, WT1.134.