



DIAGNOSTIC X-RAYS AND PREGNANCY

The Issue

Diagnostic x-rays are sometimes needed during pregnancy to provide a doctor with important information about a woman's medical condition. However, x-rays may involve risks to an unborn child.

Background

X-rays are electromagnetic radiation, just like visible light. Ultra-violet radiation and microwaves have varying degrees of energy, however, x-rays have the most energy. X-rays can cause the material through which it is passing to become charged (ionization), resulting in damage of cells or DNA in living matter.

Like many medical tests, x-rays have risks as well as benefits. Your doctor is trained to determine whether the benefits of an x-ray outweigh the risks to you or your unborn child. The risk of not having a needed x-ray can be much greater than the risk from any exposure to the radiation.

Fetuses can be unintentionally exposed to x-rays when a woman does not know she is pregnant, or does not inform the doctor or technician of her pregnancy before an x-ray. Whether planned or unintentional, exposure of an unborn child to x-rays can cause anxiety to the mother, which may be more harmful than the x-rays themselves. Therefore, it is important to understand the issues around x-rays during pregnancy.

The Effects of Diagnostic X-rays

Radiation is not directed towards the fetus during an x-ray of the mother's upper body (chest, teeth, neck and limbs). An x-ray of the mother's lower body (abdomen, lower back, pelvis, kidneys) may direct radiation near, or through, the fetus. Generally these types of x-rays only involve small amounts of radiation.

The two types of x-rays involving higher amounts of radiation are the abdominal or pelvic CT (computerized tomography) and fluoroscopy. If an x-ray cannot be delayed until after pregnancy, special techniques are used to minimize the radiation exposure on the fetus. The x-ray beam can be narrowed to expose only a small area, and in fluoroscopy the exposure time can be minimized as well.

This table shows the standard amount of radiation to a fetus from common diagnostic x-rays. The amount is given in a unit called a “milligray” or mGy. However, the actual amount of radiation may vary.

Average Radiation Dose to an Unborn Child from X-ray Procedures

| Radiation source | Average dose (mGy) |
|---|--------------------|
| Dental | <0.01* |
| Barium meal (upper GI) (Fluoroscopy) | 1.1 |
| Chest | <0.01 |
| Barium enema (Fluoroscopy) | 6.8 |
| Mammography | <0.05* |
| Head (Computed tomography) | <0.005 |
| Pelvis | 1.1 |
| Chest (Computed Tomography) | 0.06 |
| Abdomen Lumbar Spine (Computed Tomography) | 2.4 |
| Lumbar spine | 1.7 |
| Abdomen (Computed Tomography) | 8.0 |
| Natural background radiation (entire pregnancy) | 0.5* |
| Pelvis (Computed Tomography) | 25 |

*Estimates made by Health Canada

To understand these figures, you must compare them to the amount of natural background radiation you get every day from the ground, building materials, air, food, even from space (cosmic rays). In Canada, a fetus encounters about 0.5 mGy during pregnancy. This amount could be higher depending on where you live. Natural background radiation increases when you fly because cosmic radiation levels are higher than those at ground level. For

example, a round-trip flight between Toronto and Vancouver might expose the fetus to 0.05 mGy.

The Risks to a Fetus from X-rays

Fetuses are more susceptible than adults to the damaging effects of x-rays, partly because their cells are rapidly dividing and growing into specialized cells and tissues. If x-rays cause changes in these cells, there is a slightly increased chance of birth defects or certain illnesses, such as leukemia, later in life. However, most birth defects and childhood diseases are not attributed to exposure to any known harmful agent during pregnancy.

Damage to fetal cells may result in miscarriage, birth defects, or mental impairment, depending on the amount of radiation and the stage of pregnancy. The risks are higher during the first three months of pregnancy (first trimester). It is important to note that most of these effects do not usually occur below 100 mGy – more radiation than three pelvic CT scans or 20 abdominal x-rays.

There is an increased risk of childhood cancer from DNA damage regardless of when in pregnancy the radiation occurred. The risk is believed to be proportional to the amount of radiation, i.e. the smaller the amount of radiation, the smaller the risk of cancer. Most studies show no increase in childhood cancer from small amounts of radiation. However, one study identifies the chance of a childhood cancer from abdominal x-rays (in the 10 mGy range) at about one in 1,000 births. In comparison, the

chance of a childhood cancer in the general population is about two to three in 1,000 births.

Minimize Your Risk

- If you have received more than the usual amount of radiation from diagnostic x-rays, such as abdominal or pelvic, CT or fluoroscopy, discuss the possible risks with your doctor
- If you are pregnant, or think you may be, tell your doctor before having an x-ray, it may be possible to delay it, or to substitute other tests such as ultrasound or MRI
- If you must have an x-ray, tell your doctor about any similar x-rays you have had recently, you may not need to repeat them
- If you think you may be pregnant, have a pregnancy test before undergoing an x-ray
- If you are pregnant, inform the x-ray technician so that protective measures, such as using a lead apron, can be taken. If you must hold a child needing an x-ray, ask to wear a lead apron

Need More Info?

Health Canada
 Healthy Environments and Consumer Safety Branch
 Consumer and Clinical Radiation Protection Bureau
 775 Brookfield Road
 Ottawa, Ontario K1A 1C1.
 (613) 954-6699
<http://www.hc-sc.gc.ca/ehp/ehd/rpb/index.htm>