Using Radiopharmaceutical Products in Breastfeeding Mothers

The use of radioactive products in breastfeeding mothers must be approached with great care. Invariably, the administration of a radiopharmaceutical to a lactating mother will result in some transfer of radioactivity into her milk. The relative dose received by the infant is dependent on a number of factors, but most importantly by the radioactive dose administered, the absorption and distribution of the radioisotope, the biological and radioactive half-life of the product, and the amount that enters milk. The following table presents data from some of the best sources in the world and provides their recommendations on interrupting breastfeeding to allow for the decay and/or clearance of the radiopharmaceutical. Most of their decisions were based on the probable radioactive ‘dose’ transferred to the infant, and whether or not it was considered hazardous. Please note that some of their recommendations conflict. Ultimately the mother and her radiologist will have to assess the relevance of this data in their specific situation.

When evaluating radiopharmaceuticals, it is important to understand that all of these products have “two” half-lives. One is the radioactive half-life of the isotope. This half-life is set and invariable. While we prefer shorter half-life products like $^{99m}$Technetium (6.02 h), many other isotopes have important uses in medicine. The second half-life is the ‘biological’ or ‘effective’ half-life of the specific product. Many of these products are rapidly eliminated from the body via the kidney, some within minutes to hours. Thus the ‘biological or effective’ half-life is critical and sometimes is so fast that the radiopharmaceutical is gone from body long before its isotope is decayed (see $^{111}$In-Octreotide). However, some isotopes such as the radioactive iodides ($^{131}$I, $^{125}$I) may be retained in the body for long periods and present extraordinary hazards to the breastfeeding infant.

Lastly, two units of radioactivity are commonly used by differing sources. Just remember that one mCi (millicurie) is equal to 37 MBq (megabecquerel). Regardless of the unit you are given, you can now convert them easily.
Some important points to remember about evaluating these products in breastfeeding mothers:

- Use the shortest half-life product permitted such as $^{99m}$Technetium. It’s half-life is so short, and its radioactive emissions are so weak, that it poses little risk (but this depends on dose). While the table that follows often does not even require interrupting breastfeeding, we still suggest that waiting even 12-24 hours before breastfeeding would virtually eliminate all possible risks associated with this isotope.

- Regardless of the isotope used, if the dose is extremely high, then withholding breastfeeding for a minimum of five to as many as ten radioactive half-lives is probably advisable.

- Measuring the radioactivity present in milk is the most accurate way to determine risk. This often requires sophisticated equipment not available in most hospitals, but it is the “final” determinant of risk to the infant. If the isotope present in milk approaches ‘background’ levels, there is no risk to the infant.

- Use great caution before returning to breastfeeding if the radioactive iodides are used. Iodine is selectively concentrated in the thyroid gland, the lactating breast (27% of dose), and breastmilk, and high doses could potentially lead to thyroid cancer in the infant. $^{131}$I and $^{125}$I are potentially of high risk due to their long radioactive half-lives and their affinity for thyroid tissues. $^{123}$I has a much shorter half-life, and brief interruptions may eliminate most risks. In mothers who have had their thyroid removed, the return to breastfeeding will be much quicker. Further even close contact can produce high radiation exposure to an individual in close contact with the individual. Thus we have added comments regarding close contact restrictions under the breastfeeding interruption section in the Radioisotope table.

- Because radioactivity decays at a set rate, milk can be stored in the freezer for at least eight to ten half-lives and then fed to the infant without problem. All of the radioactivity will be gone.