# Radioactive Iodine

## WHAT IS THE THYROID GLAND?

The thyroid gland is a butterfly-shaped endocrine gland that is normally located in the lower front of the neck. The thyroid's job is to make thyroid hormones, which are secreted into the blood and then carried to every tissue in the body. Thyroid hormone helps the body use energy, stay warm and keep the brain, heart, muscles, and other organs working as they should.

## THE THYROID GLAND AND IODINE

Iodine is essential for proper function of the thyroid gland, which uses it to make the thyroid hormones. The thyroid is equipped with an active system or "pump" for moving iodine into its cells, where it is concentrated as iodide. The thyroid gland is the only tissue in the body that takes up and holds onto iodine.

## WHAT IS RADIOACTIVE IODINE (RAI)?

Iodine, in the form of iodide, is made into two radioactive isotopes that are commonly used in patients with thyroid diseases: I-123 (*harmless to thyroid cells*) and I-131 (*destroys thyroid cells*). The radiation emitted by each these isotopes can be detected from outside the patient to gain information about thyroid function and take pictures of the size and location of thyroid tissues. RAI is safe to use in individuals who have had allergic reactions to seafood or X-ray contrast agents, since the reaction is to the compound containing iodine, not the iodine itself. RAI is given by mouth in pill or liquid form.

## RAI FOR THYROID IMAGING

I-123 is the usual isotope used to take pictures and determine the activity of the intact thyroid gland (*Thyroid Scan and Radioactive Iodine Uptake, RAIU*), since it is harmless to thyroid cells. No special radiation precautions are necessary after a thyroid scan or RAIU. I-131 can also be used to take pictures of the thyroid gland, although it is rarely used due to the harmful effects it has on thyroid cells.

## RAI FOR TREATMENT OF THYROID DISORDERS

Normal Thyroid Tissue - I-131 is given to destroy overactive thyroid tissue (see *Hyperthyroidism brochure*) or to shrink thyroid glands that are functioning normally but are causing problems because of their size (see *Goiter brochure*). Patients are asked to follow some radiation precautions after treatment in order to limit radiation exposure to others (*see chart*). I-131 may occasionally cause mild pain in the neck that can be treated with aspirin, ibuprofen or acetaminophen. The RAI treatment may take up to several months to have its effect. Frequently, the end result of RAI treatment of hyperthyroidism is hypothyroidism, which is treated by thyroid hormone replacement (see *Hypothyroidism brochure*).

THYROID CANCER - Large doses of I-131 are used to destroy thyroid cancer cells (see *Thyroid Cancer brochure*). This is performed after the remaining thyroid cells (*including any cancer cells*) are stimulated by raising TSH levels by either withdrawing the thyroid hormone pills or by treating with recombinant human TSH. Patients are asked to follow some radiation precautions after treatment in order to limit radiation exposure to others (*see below*). Depending on state regulations, patients may have to stay isolated in the hospital for about 24 hours to avoid exposing other people to radiation, especially if there are young children living in the same home.

## RADIATION SAFETY PRECAUTIONS AFTER TREATMENT WITH I-131 RAI

Although the treatments with 131-I are generally safe, RAI produces radiation so patients must do their best to avoid radiation exposure to others, particularly to pregnant women and young children. The amount of radiation exposure markedly decreases as the distance from the patient increases. Patients who need to travel in the days after I-131 RAI treatment are advised to carry a letter of explanation from their physician. This is because radiation detection devices used at airports or in federal buildings may pick up even very small radiation levels. Details should be discussed with a physician prior to, and at the time of, the RAI treatment.

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## LONG TERM RISKS OF I-131 RAI

In general, RAI is a safe and effective treatment for the thyroid disorders mentioned above. Hypothyroidism is a common side effect of RAI for hyperthyroidism and always seen after RAI for thyroid cancer. This is usually easily treated with thyroid hormone replacement (see *Hypothyroidism brochure*). Some studies suggest a slight increase in thyroid cancers may be seen after RAI treatment for hyperthyroidism. Loss of taste and dry mouth due to salivary gland damage may be seen. The use of lemon drops, vitamin C or sour stimulation to potentially decrease the exposure of the salivary glands to RAI is controversial and should be discussed with your physician. Importantly, once you have been treated with RAI, regular medical follow-up is lifelong.

### INSTRUCTIONS TO REDUCE EXPOSURE TO OTHERS AFTER I-131 RAI TREATMENT

| ACTION | DURATION (DAYS) |
|---|---|
| Sleep in a separate bed (~6 feet of separation) from another adult | 1-11* |
| Delay return to work | 1-5* |
| Maximize distance from children and pregnant women (6 feet) | 1-5* |
| Limit time in public places | 1-3* |
| Do not travel by airplane or public transportation | 1-3* |
| Do not travel on a prolonged automobile trip with others | 2-3 |
| Maintain prudent distances from others (~6 feet) | 2-3 |
| Drink plenty of fluids | 2-3 |
| Do not prepare food for others | 2-3 |
| Do not share utensils with others | 2-3 |
| Sit to urinate and flush the toilet 2-3 times after use | 2-3 |
| Sleep in a separate bed (~6 feet of separation) from pregnant partner, child or infant | 6-23* |

*duration depends on dose of I-131 given

## SPECIAL CONCERNS FOR WOMEN

RAI, whether I-123 or I-131, should never be used in a patient who is pregnant or nursing. This protects the baby who would otherwise receive radioactive milk and the mother's breasts which concentrate RAI. Breastfeeding must be stopped at least 6 weeks before administration of I-131 treatment and should not be restarted after administration of RAI, but can be safely done after future pregnancies. Also, pregnancy should be put off until at least 6 - 12 months after I-131 RAI treatment since the ovaries are exposed to radiation after the treatment and to ensure that thyroid hormone levels are normal and stable prior to pregnancy. There is no clear evidence that RAI leads to infertility.

## SPECIAL CONCERNS FOR MEN

Men who receive RAI treatment for thyroid cancer may have decreased sperm counts and temporary infertility for periods of roughly two years. Sperm banking is an option in a patient who is expected to need several doses of RAI for thyroid cancer.

## FURTHER INFORMATION

Further details on this and other thyroid-related topics are available in the patient information section on the American Thyroid Association® website at *www.thyroid.org*.