

# **PNNL and IsoRay Develop Cesium-131 Seed to Treat Prostate Cancer**

*Innovative prostate cancer treatment developed thanks to collaborative research between the Pacific Northwest National Laboratory and IsoRay Medical Inc.*

Over 90 men with prostate cancer have received an innovative radioisotope treatment thanks to collaborative research between the Pacific Northwest National Laboratory and IsoRay Medical Inc. The two organizations developed a brachytherapy seed using cesium-131. The first cesium-131 seed implant was performed in October 2004 at the University of Washington Medical Center.

“PNNL is very excited to be part of this effort. It is extremely satisfying to staff to realize that their work may provide a life-saving cancer treatment to patients with prostate cancer,” said PNNL Project Manager Lawrence Greenwood.

Prostate cancer is one of the leading causes of death among men. Around 230,000 men will be diagnosed with prostate cancer this year in the United States, and nearly 30,000 die of the disease annually.

IsoRay received U.S. Food and Drug Administration approval to market cesium-131 for treatment of prostate cancer and other malignancies in March 2003.

“Prostate cancer is usually a slow growing cancer,” said Greenwood. “Doctors have time to inject the seeds and then closely monitor the patient.”

Although IsoRay is marketing the cesium-filled seeds for prostate cancer therapy, the FDA has approved cesium-131 for the treatment of other forms of cancer, including breast, brain, liver, head and neck cancers, and other malignant disease.

PNNL began working with IsoRay in 2000. IsoRay had a process that efficiently produced ultra pure cesium-131. PNNL and IsoRay developed and refined the manufacturing process which deposits the cesium-131 onto a ceramic core, inserts the core into titanium capsules, and seals the capsule with laser welding.

“IsoRay selected PNNL because of our experience and expertise in working with radioisotopes,” said Process and Measurement Technology Product Line Manager Wally Weimer.

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## Brachytherapy seeds kill cancerous tumors without causing serious side-effects

The brachytherapy procedure involves the use of special needles to implant seeds, which are smaller than a grain of rice, using ultrasound guidance. The seeds are implanted near or in the cancerous tumor. Using the cesium-131 seeds, approximately 30 kiloelectronvolt (keV) x-rays are emitted by each capsule. The x-rays damage the genetic material of the cancer cells, making it impossible for these cells to continue to grow and divide.

Doctors typically deposit 75 to 100 seeds into each tumor. Computer models are used to measure the size of the tumor and determine the number and placement of seeds necessary to destroy the cancer.

“Cesium-131 has a faster delivery of the total radiation dose than the other types of seeds currently on the market,” said Greenwood. “It has a significantly higher dose rate than iodine-125, allowing for the delivery of more radiation in a shorter period of time.”

Cesium-131 seeds decay with a 10 day half-life, which means the seeds implanted in the prostate stop emitting radiation in about 100 days. The commonly used iodine-125 has a half-life of 60 days and emits radiation for 600 days.

Due to the shorter duration of treatment with cesium-131, side effects such as incontinence, urinary urgency and pain are usually minimal compared to side effects from alternative treatments.

The procedure is completed in 45 to 60 minutes. This is typically a day-surgery procedure, as no incision or suturing is required. Most patients are back to their normal daily activities within two to three days. Patients that have been treated with cesium-131 start to feel symptoms of the radiation two to three weeks after the implant, but most report a resolution of these symptoms seven to nine weeks after the implant.

## Future research of IsoRay and PNNL

IsoRay is now investigating new isotope delivery systems that could be used in addition to the titanium capsule. IsoRay signed a contract with PNNL in February 2005 to develop and test methods for producing high-purity yttrium-90, which already has FDA approval to market for treatment of bone and other cancers.



**To treat cancer, IsoRay, Inc. and Pacific Northwest National Laboratory have developed an advanced form of radiation-emitting seeds that are implanted in confined tumors.**

### **For more information, contact:**

**Walter Weimer**

Process and Measurement  
Technology Product Line Manager  
Pacific Northwest National Laboratory  
PO Box 999, MSIN: K9-09  
Richland, WA 99352  
E-mail: [walter.weimer@pnl.gov](mailto:walter.weimer@pnl.gov)  
509/375-6922

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