

BRAZIL RADIOACTIVE SOURCES PRODUCTION FOR CANCER TREATMENT

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Purpose

The modality, known as brachytherapy, was performed in Brazil by only a handful of hospitals at an extremely high cost. For producing new sources, five major areas must be considered: 1) source production: nuclear activation and/or radiochemical reaction; 2) welding; 3) Quality control: leakage tests; 4) Dosimetry and metrology; 5) Operational procedures; 6) validation studies. To perform all steps, a multidisciplinary team works together to overcome difficulties. - Iridium-192 pellets: In Brazil there are 140 machines with pellets that replacement every 5 years. Our new production line has assembly, welding and quality control hot cells. - Iridium-192 wires: Produced since 1999. The wire is activated at IPEN's IEA-R1 reactor for 30 hours with 5×10^{13} n/cm².s⁻¹ neutron flux resulting in 192 mCi maximum activity. - Iridium-192 seed: New seed for ophthalmic cancer treatment. The irradiation device presented 90% activity homogeneity. We are still testing in-vivo. - Iodine-125 seeds: Largely used in low dose brachytherapy. I-125 binding yield achieved with our new reaction was 80%; Laser welding presented 70% efficiency. Approved in all leakage tests. - Other ongoing projects: Veterinary brachytherapy, Waste management, Radionecrosis healing with laser, calibrations sources production, linear accelerator calculations for hospitals, sources with polymeric matrix. Our Iodine-125 seeds will be available in 2018. All other projects are advancing. We will continue to develop new products hoping to help the Brazilian population fight against cancer. For producing new sources, five major areas must be considered: 1) source production: nuclear activation and/or radiochemical reaction; 2) welding; 3) Quality control: leakage tests; 4) Dosimetry and metrology; 5) Operational procedures; 6) validation studies. To perform all steps, a multidisciplinary team works together to overcome difficulties.

Methods

For producing new sources, five major areas must be considered: 1) source production: nuclear activation and/or radiochemical reaction; 2) welding; 3) Quality control: leakage tests; 4) Dosimetry and metrology; 5) Operational procedures; 6) validation studies. To perform all steps, a multidisciplinary team works together to overcome difficulties.

Results

- Iridium-192 pellets: In Brazil there are 140 machines with pellets that replacement every 5 years. Our new production line has assembly, welding and quality control hot cells.
- Iridium-192 wires: Produced since 1999. The wire is activated at IPEN's IEA-R1 reactor for 30 hours with 5×10^{13} n/cm².s⁻¹ neutron flux resulting in 192 mCi maximum activity.
- Iridium-192 seed: New seed for ophthalmic cancer treatment. The irradiation device presented 90% activity homogeneity. We are still testing in-vivo.
- Iodine-125 seeds: Largely used in low dose brachytherapy. I-125 binding yield achieved with our new reaction was 80%; Laser welding presented 70% efficiency. Approved in all leakage tests.
- Other ongoing projects: Veterinary brachytherapy, Waste management, Radionecrosis healing with laser, calibrations sources production, linear accelerator calculations for hospitals, sources with polymeric matrix.

Conclusions

Our Iodine-125 seeds will be available in 2018. All other projects are advancing. We will continue to develop new products hoping to help the Brazilian population fight against cancer.