Pacific Northwest NATIONAL LABORATORY

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Battelle Number(s):

13962-E

Patent(s) Issued

Available for licensing in all fields

Available Technologies

Method and Apparatus for Production of 213Bi from a High Activity 225Ac Source

SUMMARY

The use of radiation to kill or neutralize unwanted cell growth such as cancer has led to increasing interest in the usage of various radioactive isotopes. Of particular interest are radioactive isotopes, such as 213Bi, which emit alpha radiation. Alpha particles deposit their full energy across a microscopic distance in the body. Therefore, an alpha emitting radionuclide (such as 213Bi) delivered to a cancerous cell in the body is capable of damaging or killing the cell while the surrounding healthy tissue remains virtually unaffected.

A method and apparatus for isolating and purifying a 213Bi radioactive isotope from an 225Ac source has been developed at PNNL. The chemical separation process utilizes tandem columns. The primary column contains a sorbent which preferentially retains 225Ac over 213Bi when exposed to a compatible solvent. The 225Ac on the column is allowed to decay for a short period of time, after which the in-grown 213Bi is eluted from the primary column and is retained on a secondary column. Once the 213Bi is adsorbed onto the secondary column, the secondary column is washed to remove any trace chemical or radiochemical impurities. Next, the purified 213Bi is eluted using a small volume of eluent solution. The chemical matrix of the 213Bi eluent solution was demonstrated to be directly compatible with an existing method of labeling the 213Bi isotope to a monoclonal antibody used in the treatment of leukemia.

Because of its short half-life of 45.6 minutes, it is highly advantageous to generate 213Bi at the point of use, typically in a clinical setting. Due to the radiological hazards associated with working with highly radioactive substances, the automated production of 213Bi would provide important benefits to clinical staff. Specifically, an automated generator system would substantially reduce radiological dose to staff, as compared to manual separation and purification steps, and such a system would enable highly reproducible and error-free production of the 213Bi isotope. Scientists at PNNL developed and demonstrated 225Ac/213Bi separation chemistry utilizing an automated fluid handling system. With further development, a prototype instrument could be constructed and tested for clinical use.

ADVANTAGES

* short half-life allows for the generation of 213Bi at the point of use in a clinical setting
* automated generator system would substantially reduce radiological dose to staff
* automated generator system would enable highly reproducible and error-free production of 213Bi isotope

U.S. DEPARTMENT OF ENERGY

RELATED LINKS

» **PNNL Radioisotopes Program**

Information about Pacific Northwest National Laboratory's Radioisotope Program

http://radioisotopes.pnl.gov/

Patents & Intellectual Property

» Patent #: 6,972,414

Technology Portfolio(s)

» Radiochemical Processing

» Chemical Processing and Catalysis

» Biomedical

Potential Industry Applications

» Chemicals

» Healthcare, Pharma, Biotech & Medical

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