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Targeted alpha therapy for cancer

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1. Targeted Alpha Therapy (TAT)

New approaches in the treatment of cancer are necessary to overcome the limited therapeutic efficacy and high costs of currently available therapeutics. Conventional therapies often have negative side effects such as nausea, vomiting, hair loss, general malaise and depression. This seriously affects the patient's overall health and quality of life. Moreover, the disease will most likely recur in time due to the survival and spreading of cancerous cells, or micro-metastases, from the original tumour to other areas in the body. Targeted Radionuclide Therapy is a new kind of cancer treatment. It combines new developments in molecular biology and in radionuclides for medical applications. Alpha-emitting radionuclides seem particularly promising to destroy cancer cells.

2. Production of Actinium-225 for TAT

Radium needles that were once implanted into tumours as a cancer treatment are now obsolete and constitute a radioactive waste problem, as their half-life is 1600 years. The reduction of radium by photonuclear transmutation by bombarding Ra-226 with high-energy photons from a medical linac has been investigated. A linac dose of 2800 Gy produced about 50 mCi of Ra-225, which decays to Ac-225, and can then be used for 'Targeted Alpha Therapy' (TAT) of cancer. This result, while consistent with theoretical calculations, is far too low to be of practical use. The increasing application of Ac-225 for cancer therapy indicates the potential need for its increased production and availability.

This presentation investigates the production of Ac-225 in commercial quantities, which could potentially reduce obsolete radioactive material, and displace the need for expensive importation of Ac-225 from the USA in the years ahead. Scaled up production of Ac-225 could be achieved by the use of a high current cyclotron or high-power linac. Production specifications are determined for a linac in terms of current, pulse length and frequency. Yields are compared with those calculated for the Australian National Cyclotron in Sydney.

Biography

Graeme Melville is a nuclear physics/medical researcher at St George Hospital in Sydney, Australia. Previously he was an astrophysics researcher at the University of Wollongong and lecturer at the University of Western Sydney. He was also science policy advisor to the Australian Labor Party in 1998 and a consultant for NASA in their planetary exploration program. He received a commendation from NASA for his planetary astronomy work, which involved the Magellan Venus Project in 1994. Dr Melville has published a many papers and presented at conferences on nuclear medicine and other areas of physics. He has also been Editor-in-Chief of international journals as well as reviewer.

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