

Astatine-211: The Chemistry Infrastructure

Introduction

There is a consensus around the clinical potential of astatine-211 (^{211}At), but only a limited number of research facilities work with the nuclide. There are three main reasons for this which all are related to the chemistry infrastructure:

- Despite the fairly straight way of producing the rare alpha emitting element ^{211}At , the production is scarce. There are a number of existing cyclotrons that have the capacity of producing ^{211}At but only a few do.
- After cyclotron production there are no systems available for converting astatine into a chemical useful form and this is likely the biggest hurdle for widespread ^{211}At research. Currently the research groups that do work with ^{211}At depend on custom systems for recovering ^{211}At from the irradiated targets. Setting up and implementing such custom units require long lead times to provide a proper working system. This means that even though there are cyclotrons capable of producing ^{211}At , there is lack of research infrastructure that prohibits interested parties to scale up or even start ^{211}At research.
- Another hurdle to overcome is the ^{211}At chemistry. Appropriate chemical synthesis methods for stable bonds between ^{211}At and the tumor specific vector has to be established.

Herein we like to present chemical strategies for overcoming these hurdles in research and clinical trials with ^{211}At . It includes automation of isolation and work up of ^{211}At and chemical synthesis of ^{211}At radiopharmaceuticals.

Method

To increase the chemical infrastructure for ^{211}At research and clinical trials an automatic system for work up of ^{211}At and synthesis of ^{211}At labelled compounds has been developed. To simplify the synthesis of ^{211}At -radiopharmaceuticals prefabricated conjugated molecules has been synthesized. This strategy reduce reaction times, increase radiochemical yields and can effortlessly be adopted for automatic radiochemical synthesis.

Conclusion

By providing a chemistry infrastructure for work up and chemical synthesis ^{211}At and ^{211}At -radiopharmaceuticals, the main obstacles concerning research and clinical trials of this element could be met and research significantly enhanced.

Funding Agency

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Presentation Type

Contributed Oral

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