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Astatine-211: The Chemistry Infrastructure

Introduction

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

• Despite the fairly straight way of producing the rare alpha emitting element 211At, the production is scarce. There are a number of existing cyclotrons that have the capacity of producing 211At 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 211At research. Currently the research groups that do work with 211At depend on custom systems for recovering 211At 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 211At, there is lack of research infrastructure that prohibits interested parties to scale up or even start 211At research.

• Another hurdle to overcome is the 211At chemistry. Appropriate chemical synthesis methods for stable bonds between 211At 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 211At. It includes automation of isolation and work up of 211At and chemical synthesis of 211At radiopharmaceuticals.

Method

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

Conclusion

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

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