NON-CONFIDENTIAL SUMMARY

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BUSINESS OPPORTUNITY

The Centre for Addiction and Mental Health is seeking partners to either license this technology. CAMH is open to various forms of collaboration.

# Novel Method for Fluorination of Radioligands

## Market Need

In the life sciences, such as pharmaceuticals and medical imaging, polyfluorinated molecules are used in $^{19}F$ magnetic resonance imaging and $^{18}F$-labelled molecules are essential radiotracers for positron emission tomography (PET), a diagnostic tool for cancers and other diseases, and molecular imaging in drug development. The success of molecular imaging with PET depends on the availability of selective molecular probes labelled with positron-emitters, such as fluorine-18 ($^{18}F$, $t_{1/2}$ = 109.7 min) or carbon-11 ($^{11}C$, $t_{1/2}$ = 20.3 min). The captive solvent ("in-loop") methodologies have become widely adopted for routine $^{11}C$-radiotracer syntheses because of the simplicity, high radiochemical yields, speed, versatility and ease of automation. While this process has advantages for $^{11}C$ radiopharmaceutical production, isotopic labelling using the most common PET radionuclide, $^{18}F$, has not yet been achieved with this in-loop technology. Current methods of synthesizing $^{18}F$-labelled radiotracers typically require an "in-vial" process: introducing an $^{18}F$-labelling agent into a vial containing solvent, precursor and optionally a catalyst, heating the components to allow them to react, quenching the reaction, then transfer of the materials to a solid phase extract, ion cartridge and/or HPLC for purification. This vial method has multiple steps and is time consuming, which reduces the overall radiochemical yield. With the increasing demand for new $^{18}F$-labelled PET radiotracers and their application in drug development involving multi-center clinical trials, there is a pressing need for new and practical methods for the introduction of $^{18}F$-labels into bioactive molecules and for more cost efficient and robust manufacturing processes for $^{18}F$-labelled compounds and radiopharmaceuticals.

## Technology Description

Our scientists have developed a new method to introduce an $^{18}F$-label onto compounds of interest using an "in-loop" protocol. This discovery solves the problems of the current in vial process, and results in streamlined manufacture of $^{18}F$-labelled compounds and radiopharmaceuticals. Our "in-loop" $^{18}F$-fluorination method consists of the initial trapping of gaseous [$^{18}F$], followed by "in-loop" radiofluorination to form $^{18}F$-labelled products. Importantly, these steps are performed directly in a stainless steel HPLC loop. For easy adoption of this method for routine radiopharmaceutical production, we integrated the "in-loop" method to a commercial radiosynthesis module to carry out automated HPLC purification and formulation of the labelled compounds. The method also has applications in $^{19}F$-fluorination reactions. For example, fluoridated pharmaceuticals could be synthesized using this protocol.

## Stage of Development

- A fully-automated "in-loop" [$^{18}F$]fluorination procedure has been developed.
- Three different $^{18}F$-labelled compounds were produced in high radiochemical yield and molar activity.

## Advantages

- This novel method is simple, efficient and allows for a reliable production of radiofluorinated compounds and radiopharmaceuticals.

## Notable Publication(s)

Kenneth Dahl, Neil Vasdev et al. "In-loop" $^{18}F$-fluorination: A proof-of-concept study. J Label Compd Radiopharm, 2019: doi.org/10.1002/jlcr.3751

## Intellectual Property

This invention is protected by a US provisional patent application.

FOR MORE INFORMATION CONTACT

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