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Nucleophilic labeling reactions on a multipurpose synthesis platform.

Alexander Schmitz[1], Richard Freifelder[1]

[1]University of Pennsylvania, Dept. of Radiology, 3400 Spruce St., Philadelphia, PA 19128, USA

Objectives: Our synthesis unit was originally designed for the cGMP compliant manufacture of FDG. It uses pre-sterilized kits and reagent components and is designed for a single synthesis per kit. The goal was to adapt our manual synthesis method of 18F-radiotracers to this automated synthesis unit with minimum changes to the existing commercially available FDG kit.
Methods: Synthesis scripts were modified in a logical and systematic fashion by varying the reaction parameters such as: reaction heater temperature, heating time, and concentration of certain reagents with respect to the desired radiotracer and tested with multiple synthesis runs. After achieving the best parameter sets for each compound, several test runs were made to ensure consistent results.
Results: Four 18F-radiotracers (FLT, FHBG, Fallypride and FP-DTBZ) were synthesized at UPenn manually. We were able to adapt these methods to this synthesizer. The resulting automated production runs for these radiotracers showed improved yields and reliability. Syntheses of BFE, FMiso and F-A85380 were successfully developed on the synthesizer unit. Yields were high and consistent and the unit performed reliably. Commercially available synthesis disposables (kits) were used for all compounds and experiments and no additional hardware modifications were necessary.
Conclusion: The automated synthesis unit offers a convenient and flexible way to synthesize the aforementioned radiotracers under remote conditions. Huge advantages of the automatic syntheses in comparison to the previously done manual syntheses are less exposure, shorter synthesis duration, improved yields and reliability.

	Production runs	Average yield [d.c.%]	Improvement over manual
FLT	62	13.6	doubled
FHBG	8	9	doubled
FP-DTBZ	2	6	similar
Fallypride	10	36.2	by 60%
BFE	7	23.7	
Fmiso	6	31.4	
F-A85380	10	34.3