POLITECHNIKA ŚLĄSKA
WYDZIAŁ CHEMICZNY

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ROZPRAWA DOKTORSKA

Optymalizacja zautomatyzowanego procesu syntezy i oczyszczania związków biologicznie aktywnych znakowanych izotopem węgla [^{11}C] wraz z opracowaniem innowacyjnej linii kontroli jakości

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Abstract

The work summarizes subsequent stages of optimization of the [^{11}C] radiolabelled PET tracer synthesis and its quality control systems.

The importance of [^{11}C]-choline as a PET/CT marker has been described as an effective, although still absent in Polish and European pharmacopoeia, used for imaging cancers. The production of this radiopharmaceutical creates technical difficulties. First of all, is about short half-lives and the presence of dimethylformamide as a residual solvent. While losses due to radionuclide degradation can be minimized by shortening time of the process, the best solution to reduce DMF is to eliminate it from the reaction.

This work compares two optimized technologies: based on "green chemistry" and dry synthesis, with a method based on DMF. The solid phase synthesis proved to be the most effective in complete elimination of DMF. Optimized synthesis led to the desired product with high radiochemical efficiency in a short production time. It was possible to increase Carbon-11 activity obtained from the cyclotron. Each test batch met all quality control requirements, and residual DMEA levels were below the limits published in the Pharmacopoeia.

The directions for the development of research on new generation radiopharmaceuticals have also been outlined in line into the concept of theranostics.