Slovak Society of Chemical Engineering
Institute of Chemical and Environmental Engineering
Slovak University of Technology in Bratislava

PROCEEDINGS

51st International Conference of the Slovak Society of Chemical Engineering SSCHE 2025

Hotel DRUŽBA
Jasná, Demänovská Dolina, Slovakia
May 27 - 30, 2025

Editors: Assoc. Prof. Mário Mihaľ

ISBN: 978-80-8208-158-2, EAN: 9788082081582

Published by the Faculty of Chemical and Food Technology Slovak Technical University in Bratislava in Slovak Chemistry Library for the Institute of Chemical and Environmental Engineering; Radlinského 9, 812 37 Bratislava, 2024

Nagy, O., Balouch, M., Štěpánek, F.: Development of advanced methodology for in vitro testing of long-acting injectable depot systems, Editors: Mihaľ, M., In *51st International Conference of the Slovak Society of Chemical Engineering SSCHE 2025*, Jasná, Demänovská Dolina, Slovakia, 2025.

Development of advanced methodology for in vitro testing of long-acting injectable depot systems

Oliver Nagy [1], Martin Balouch [1], František Štěpánek [1]

[1]*University of Chemistry and Technology Prague, Technická 166 28 Praha 6, Czech Republic*

e-mail: nagyo@vscht.cz

Key words: dissolution, methodology, USP-4, injectables, depot, long-acting

Long-acting injectable depot formulations are promising dosage forms capable of controlled drug release over weeks to months, improving patient adherence and stability of therapeutic effect. In clinical practice, the LAIs are injected intramuscularly or subcutaneously and subsequently form a persistent depot, from which active pharmaceutical ingredient (API) slowly releases over a long period of time.

Current dissolution methodologies consist of injecting the formulation into liquid dissolution media and so the depot formation *in vitro* is omitted. Even though these methodologies can provide insight into formulation mechanism of release and pharmacokinetics, *in vitro* introduction of LAI depot formulation and slow absorption into surrounding tissue is critical for better predicting *in vivo* behavior of LAIs based on *in vitro* tests. United States Pharmacopeia apparatus 4 (USP-4) is commonly used for dissolution of long-acting formulations, however it also faces the mentioned shortcomings of the commonly used methods.

The dissolution method currently being developed in this project is based on USP-4 flow-through cell with in-house built adapters. Introduction of hydrogel matrix injected with LAI formulation into the USP-4 cell introduces depot formation and release into surrounding tissue. Hydrogel serves as a mimic of the tissue into which the drug is injected and as a solid but permeable barrier from which the drug gradually diffuses into the surrounding dissolution medium. Of course, hydrogel matrix is only a rough approximation of living tissue, however the results of these modified tests could provide more biorelevant insights than provided by currently used methods.