CASE STUDY

ANAXAM – IMPACT OF NEEDLE CLOGGING ON DRUG DISTRIBUTION

Problem – Challenge

Prefilled syringes (PFS) are a common packaging solution for the subcutaneous injection of drug solutions, offering both convenience and safety. However, the current trend towards developing increasingly concentrated drug solutions has led to a higher rate of needle blockage problems. These can result in increased injection forces and potential issues with correct drug delivery. One of the greatest challenges is understanding the impact of needle blockages on drug distribution in tissue and preventing this from affecting the effectiveness of the treatment.

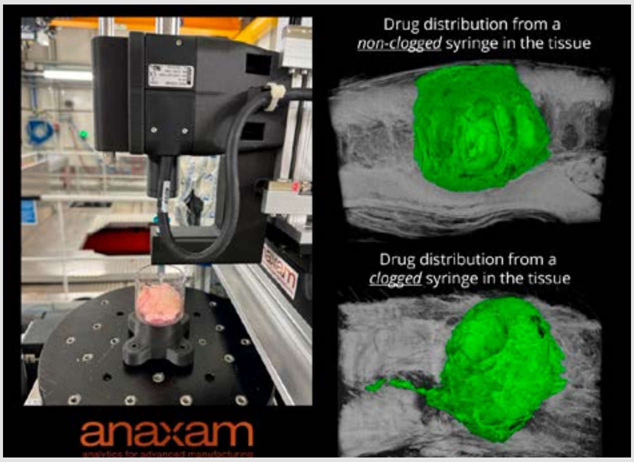
Solution

ANAXAM is a technology transfer platform for Advanced Manufacturing located in the Switzerland Innovation Park Innovaare and leverages the use of PSI's large research facilities. In collaboration with Novartis, ANAXAM conducted a groundbreaking study using synchrotron X-ray tomography.

The goal was to understand how needle blockages affect the distribution pattern of drugs in tissue. Using high-resolution 3D images generated through tube-based X-ray and synchrotron radiation microtomography, it was demonstrated for the first time that a blocked needle distributes the drug differently than an unblocked one. Without blockage, the drug spreads in a three-dimensional pattern mainly between fat lobules, whereas with a blocked needle, the drug is forced deeper into the subcutaneous fiber network under high pressure.

These results provide valuable insights into improving injection safety and efficiency and help address future challenges in the development of PFS injections.

Synchrotron X-ray tomography enables high-resolution visualization of drug distribution in tissue. The study revealed clear differences between injections from clogged and non-clogged syringes.



ANAXAM engineers setting up an experiment using advanced imaging techniques to support industrial research and innovation.