Scissor technology cuts out a collaboration between Bath and Arecor

Insulin is the mainstay of diabetes therapy, with both long-acting and fast-acting formulations on the market. However, a better understanding of what happens to insulin once it has been injected into the body — into the subcutaneous space underneath the skin — will aid the design of new insulin therapies that could lower the incidence of life-threatening hypoglycaemic episodes.

A business interaction voucher from BioProNET enabled Randall Mrsny from the University of Bath to partner with Jan Jezek from Arecor toinvestigate this. The collaboration brought together expertise in two areas: a new *in vitro* technique — known as Scissor; **S**ub**c**utaneous **I**njection **S**ite **S**imulat**or** — developed by the University of Bath that models events that occur following insulin injection, and Arecor's proprietary technologies for stabilising therapeutic proteins.

Because this method of stabilising proteins can alter the pharmacokinetic profile, work carried out under the business interaction voucher used the Scissor system to test the pharmacokinetic profile of Arecor's formulations of insulin analogues.

Results generated using the Scissor system showed clear differences in the behaviour of different insulin analogues. For example, differences in the precipitation behaviour of long-acting insulin formulations and fast-acting insulin formulations were observed, with the main differences being in the rate and intensity of the precipitation. These results shed light on the effect of formulation components on the fate of insulin in the subcutaneous space, and consequent differences in their bioavailability. "Further understanding of these effects could lead to the design of fast acting formulations of insulins that have more rapid effects, which is one of the Holy Grails of the diabetes management," says Mrsny.

To disseminate these findings to the wider bioprocessing community, a poster was presented at the BioProNET annual scientific meeting, held in Manchester in October 2015 with almost 180 attendees.

Although the collaborators were unable to optimise the performance of the instrument to follow the release characteristics of long-acting insulin, further studies using an optimised experimental design are being investigated. "The project gave us confidence in the Scissor instrument," says Jezek. "We are already discussing continuation of the collaboration with Professor Mrsny."

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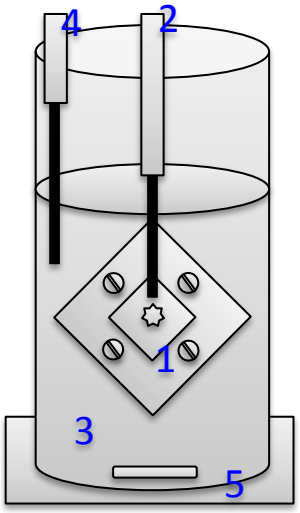

A schematic of the proof-of-concept subcutaneous injection site simulator (Scissor). 1. Simulated subcutaneous injection site; 2. pH probe; 3. Physiological buffer bath; 4. Thermocouple; 5. Stirrer/heater