Investigation of scaffolds for potent snake venom-based wound dressing

Supervisor: Dr Amanda Kijas (a.kijas@uq.edu.au) & Prof Alan Rowan

Death due to haemorrhage (bleeding) is a preventable death. Yet 30-40% of people in a civilian setting die as a result of bleeding to death. In a military setting 90% of casualties with potentially survivable injuries die due to haemorrhage. This project will specifically target this clinical need, through the design, construction and testing of a portable efficacious haemostatic agent to control bleeding based on potent recombinant snake venom proteins. This project will involve, investigation of scaffold choice, expression, purification and test them in assays to investigate their effectiveness to bring about rapid blood clotting.

Investigation of the functional domains of a snake venom protein responsible for rapid blood clotting

Supervisor: Dr Amanda Kijas (a.kijas@uq.edu.au) & Prof Alan Rowan

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Visualization of cellular response to external force

Supervisor: Dr Petri Turunen (p.turunen@uq.edu.au) & Prof Alan Rowan

Cells are able to sense and respond to external mechanical stimuli from their surrounding extracellular matrix (ECM) via a process called mechanotransduction. Increasing amount of studies show that the physiochemical properties of the ECM have a crucial role in determining cellular fate in various different cellular processes in tissues. Ability to visualize and localize intracellular proteins inside cells in 3D volumes, high precision and real time is required to truly understand the cellular behavior. We will achieve this using a unique STED confocal–rheometer instrument which allows for a real-time fluorescent imaging of 3D volumes and the simultaneous application of force to the ECM material while measuring its viscoelastic properties. This multidisciplinary project will approach this goal from several sides such as fluorescent labelling of both the ECM and cell proteins as well as their subsequent opto-mechanical studies.