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SNAKE VENOM-CONTRLLED 3D FIBRIN ARCHITECTURE REVEALED BY SANS/USANS DICTATES FIBROBLAST DIFFERENTATION

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Fibrin is the founding matrix after injury, delivering the key biophysical cues to promote wound healing in a timely and coordinated manner. The effect of the fibrin architecture on wound healing hasn't been studied due to a lack of control over the enzyme-catalyzed polymerization of the fibrin network in vitro. Here, we establish a new defined snake venom-controlled fibrin system with precisely and independently controlled architectural and mechanical properties. By utilising combined small-angle neutron scattering (SANS) and ultra-small angle neutron scattering (USANS) techniques, we characterize the full-scale architectural properties of the new system from the internal structure of the individual fibres to the structure of the fibrin networks and compare them to super-resolution optical methods. This very precise set of neutron scattering data confirms our full control over the network's architectural features, which serves as a foundation for the application of this defined system. The subsequent cell differentiation studies reveal that fibrin architecture has prevailing control over fibroblast spreading phenotypes and long-term myofibroblast differentiation. These findings implicate matrix architecture as a key activator of fibroblast differentiation and provide new biophysical strategies in the design of biomaterials to promote scarless wound healing.

Level of Expertise

Student

Presenter Gender

Man

Pronouns

He/Him

Which facility did you use for your research

Australian Centre for Neutron Scattering

Students Only - Are you interested in AINSE student funding

Yes

Do you wish to take part in the Student Poster Slam

Yes

Condition of submission

Yes

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