Advancing the huge potential of regenerative medicine

Regenerative medicine has been an important area for research in recent decades and as more products reach the market the many potential clinical benefits are being better understood. Regenerative medicine sits at the intersection of many scientific and engineering disciplines.

At Sagentia we watch for advances in many of these fields, including biomaterials, and we take great interest in understanding the clinical and commercial impact of technological advances.

A recent Qmed article, 'Tiny Bioengineered Structures Boast Regenerative Powers', reports on a recent advance in biomaterials involving tiny biodegradable microrods which have regenerative properties that can be used to repair tissue and help restore organ function – in this particular case the focus is on the heart, although the hope is that it will be useful for other areas too.

The article also refers to a 2014 study from Rice University which examined the potential uses for synthetic collagen fibres. These synthetic fibres are able to self-assemble from amino acid chains which form the collagen triple helix, or as Rice University described it, "sticky-ended triple helices". These examples of regenerative medicine developments - the synthetic nature of the microrods and collagen fibres - are news-worthy for a number of reasons.

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For a start, a synthetic tissue substitute could be very beneficial. There have always been health and regulatory concerns surrounding the use of collagen in medical implants as it is usually derived from porcine or bovine sources, and this carries a very slight risk of disease transmission. These days the risk may be extremely small, but the public perception of risk remains, due to a long history of high-profile media reports involving BSE (Bovine Spongiform Encephalopathy) and its human variant, Creutzfeldt-Jakob Disease. Other issues involve adverse immunologic and inflammatory responses. There are alternatives to animal-derived collagen such as recombinant human collagen which is able to mimic about half of the 20 different types of collagen present in the body, but the development of synthetic collagen has the potential for additional benefits such as the avoidance of immune problems and the promotion of natural blood clotting.

Another interesting feature of the microrods is their ability to limit the amount of collagen deposits that build-up after cardiac trauma often leading to scar tissue. This is important because scar tissue can interfere with an organ's function and prevent proper wound repair. Sagentia has worked on projects that involve trying to address the challenges of minimising scar tissue growth. Surgeons always try to minimise the build-up of scar tissue and there are treatments such as tissue sealants and hemostats which are also used to help reduce scar tissue problems.

The article also describes the ability of the microrods to mimic the cellular environment by altering the stiffness of the microrods to match the surrounding tissue's stiffness. This makes them adaptable and thus potentially suitable for use in most areas of the body.

The above advances serve to illustrate some of the work going on in the field of regenerative medicine. But they are also significant because of their focus. A review published last year, suggested that that if regenerative medicine is truly to become a reality research needs to concentrate on examining the environment in which stem cells need to growth and transform – and this is exactly what the above advances are aiming to achieve.