Treating pelvic organ prolapse

A tissue engineering approach using novel designed scaffolds embedded with autologous endometrial mesenchymal stem cells

Pelvic organ prolapse (POP) is a hidden burden affecting 50 per cent of all women. POP is the herniation of the uterus, bladder and/or bowel into the vaginal wall, leading to pain, urinary and bowel dysfunction, incontinence and sexual dysfunction.

HUDSON INSTITUTE OF MEDICAL RESEARCH

The biggest risk factor for POP is vaginal childbirth, but ageing and other clinical conditions will also increase the likelihood of POP onset. Current treatments involve surgery with or without the use of supporting synthetic meshes. These current approaches are largely unsatisfactory.

Working with the Hudson Institute for Medical Research (HIMR), CSIRO is researching a novel tissue engineering approach to improve the current treatment of POP, by incorporating endometrial mesenchymal stem cells into a more mechanically-suitable mesh.

Our approach

Reconstructive surgery alone to repair POP has not been successful, leading to the augmentation of damaged tissue with synthetic meshes, largely fabricated from polypropylene. This has introduced a new set of clinical issues including infection, erosion into the tissue wall and mesh shrinkage.

A recent FDA Public Health Notification warned about complications arising from the use of current synthetic meshes which fail to repair the damaged support tissues of the pelvic organs. These complications occur in up to 29 per cent of cases.

A tissue engineering approach – which uses mechanically-matched meshes with the patient's own endometrial MSC to repair the damaged pelvic support tissue – *has the potential to revolutionise the treatment of POP.*

CSIRO has designed newer mesh types using various polymers blended with biological coatings to enhance cell compatibility and tissue integration.

The HIMR has identified and characterised a unique mesenchymal stem cell population from the highly regenerative endometrial lining of the uterus (eMSC), easily accessible in a simple office biopsy procedure.

CSIRO and HIMR, along with Monash and Flinders Universities, have a "one stop shop" approach to treating POP encompassing: quantitative anatomical diagnosis using a multi sensor fibre optic device; mesh design and optimisation using FEA, biomechanical and biological validation; quality controlled stem cell amplification; and small and large animal models of POP.

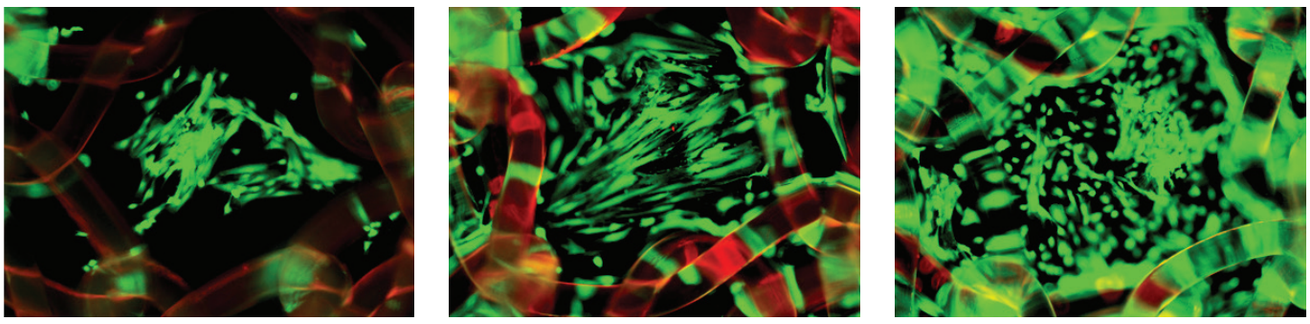
This collaborative research has demonstrated the possibility of scaling up these eMSC and delivering these cells on or within these new meshes for a better treatment of POP.

Potential impact

Approximately 500,000 operations for POP disorders are conducted annually in the US alone. This new technology will result in significant reductions in adverse effects associated with current practice and will become universally available to millions of women worldwide.

Doing business with CSIRO

CSIRO welcomes opportunities for collaboration or co-investment. CSIRO and the HIMR are currently undertaking a number of pre-clinical animal validation studies to take this technology to the next level. There are opportunities to engage with commercial companies specialising in mesh design and manufacture as well as those companies targeted towards QA cell therapeutics.



Proliferating eMSC on mechanically compliant biologically-coated meshes

CONTACT US
t 1300 363 400
+61 3 9545 2176
e csiroenquiries@csiro.au
w www.csiro.au

FOR FURTHER INFORMATION
CSIRO Biomedical Manufacturing
Dr Paul Savage, Program director
t +61 3 9545 2523
e paul.savage@csiro.au
w www.csiro.au/biomedical

Prof Jerome Werkmeister, Chief research scientist
t +61 3 9545 8112
e jerome.werkmeister@csiro.au

B&M | 16-00164