

## Professor Julie Campbell's research

### Grow-your-own artificial blood vessels in the abdominal cavity

**Researchers** - Professor Julie Campbell, Professor Gordon Campbell

### Scientific explanation

Patients who have diseased or damaged blood vessels often require bypass grafts to restore blood flow to affected tissues. These bypass grafts are traditionally transplanted from other parts of the patient's body or are synthetic. However, many patients do not have healthy vessels of the right size that can be used as bypass grafts and synthetic grafts of small diameter tend to thrombose.

The 'grow-your-own artery' project is developing a device in which an artificial artery is grown in the abdominal (peritoneal) cavity of the patient. This novel graft will provide new options for haemodialysis of renal failure patients and for patients with damaged blood vessels in the heart, legs or elsewhere in the body. There are no rejection problems because the new artery is made from the patient's own cells.

This project has been underway for three years using the dog as a model. Results have shown that living tissue grown in the abdominal cavity within a device designed to prevent adhesives can function as a blood vessel with the necessary strength and durability.

It is planned that the artificial artery may be trialled in a number of human subjects in the near future.

*"It is anticipated that patients will be able to grow their own arteries to be used as bypass grafts to restore blood flow to affected tissues."*

### Publications and abstracts

Campbell JH, Walker P, Chue W-L, Daly C, Cong H-L, Xiang L, Campbell GR. (2004) Body cavities as bioreactors to grow arteries. *Atherosclerosis XIII International Congress Series, Volume 1262, Elsevier* 118-121.

Chue W-L, Campbell GR, Caplice N, Muhammed A, Berry CL, Thomas AC, and Campbell JH. (2004) The dog peritoneal and pleural cavities as bioreactors to grow autologous artificial blood vessels. *J Vasc Surg* 39:859-867.

Daly C, Campbell GR, Walker PJ, Campbell JH. (2004) In vivo engineering of blood vessels. *Front Biosci* 9:1915-24.

World CJ, Merrilees MJ, Beaumont B, Campbell JH, Campbell GR, Rolfe BE. (2004) The effects of leukaemia inhibitory factor (LIF) on neointimal formation in injured arteries. *Biomed Res.* 15:169-175.

Hoening M, Campbell GR, Rolfe BE, Campbell JH. (2005) Tissue engineered blood vessels – alternative to autologous grafts? *Arterioscler Thromb Vasc Biol* 25:1128-1134.

Daly C, Campbell GR, Walker PJ, Campbell JH. (2005) *Vascular engineering for bypass surgery, Expert Review of Cardiovascular Therapy*, Editor L Savill, London 659-665.

Daly C, Campbell GR, Campbell JH. *Tissue engineering of arteries. Cardiovascular Research: New Technologies, Methods and Applications* Editors: G Pasterkamp, DPV de Kleijn. Kluwer Academic/Plenum Publishers (in press).

## **Presentations and conferences**

### ***International***

XVIII World Congress International Society for Heart Research, Brisbane, Australia, August 2004.

International Society Applied Cardiovascular Biology Mini Conference, Capetown, South Africa, January 2005.

Indo-Australian Conference Biomaterials – BITE 2005 Thiruvananthapuram, India, January 2005.

2nd International Conference on Healthy Ageing and Longevity, Brisbane, Australia, March 2005.

### ***Australia***

52nd Annual Scientific Meeting of the Cardiac Society of Australia and New Zealand, August 2004.

Colorectal Surgical Society of Australia, Sanctuary Cove, Queensland, September 2004.

Queensland Institute of Medical Research, Brisbane, October 2004.

Hypertension and Related Diseases 'New vascular conduits', Sydney, February 2005.

Mater Medical Research Institute, Brisbane, May 2005.

### ***Community***

University of Queensland Research Week, Brisbane, September 2004.

Opening Address, 5th Annual Orthopaedic Nurses Conference, Brisbane, November 2004.

Smart State Strategy Summit, Brisbane, November 2004.

## **Teaching and students**

Four PhD students at the University of Queensland have been involved in different aspects of this study, including the analysis of the cells that contribute to the artificial artery.