Gap in stem cell funding could drive Australian brain drain

In late May, the Australian Research Council announced an AUD$21 million ($18 million), seven-year effort called the Special Research Initiative in Stem Cell Science. Many saw the decision as a move to plug a funding hole that will arise when the Australian Stem Cell Centre (ASCC) shutters its doors next June. But whether or not the new funding will serve as a sufficient replacement remains a point of debate.

The ASCC was founded in 2002 to kick-start research collaborations and to help scientists commercialize discoveries relating to stem cell biology. However, the AUD$115 million, taxpayer-funded center soon became mired by infighting and management woes. And, after failing to become commercially self-sufficient within about a decade—a business aspiration that proved to be ahead of scientific reality—the ASCC is set to close in a year.

The new special research initiative, which will fund one or more proposals (applications were due 30 July), is being hailed for focusing on the science over the profitability of stem cells.

"This is a mechanism that will bring together some of the key groups around the country," says Martin Pera, who left Monash University in Melbourne in 2006 to head up a new stem cell center at the University of Southern California in Los Angeles. "It will build a network that will be a strong platform for future growth."

Another new government scheme, worth AUD$2 million over five years, the details of which are yet to be fully announced by the National Health and Medical Research Council, will add a further modest boost for regenerative medicine, with an emphasis on translational research.

Nadia Rosenthal, director of the Australian Regenerative Medicine Institute at Monash, admits that the funding for the new schemes is "miniscule" compared to the ASCC's former budget. But, she hastens to add, "I don't see this as the great disaster. I see this as an opportunity for Australia to recraft its approach to stem cell research and to use its expertise in certain areas to regain its competitive edge."

Still, many researchers say that the money does not go far enough to keep Australian research competitive on a global stage.

"It's a bit disappointing and frustrating," says Richard Harvey of the Victor Chang Cardiac Research Institute in Sydney. "Stem cells are not getting the boost that they need."

In addition to supporting research, the ASCC also funds a core stem cell facility, performs public outreach and provides scholarships and travel awards to students and junior researchers, notes ASCC chairman Graham MacDonald. The special research initiative's reduced budget, MacDonald says, will be "inadequate to fund stem cell research to its current level in Australia and will lead, furthermore, to the loss of the important ASCC functions that underpin the research."

Scientists also worry that the lack of funding will drive a brain drain of young talent. "Frankly, when there's $300 million a year going into California alone, our best scientists are saying 'hey, that's not a bad place to live, not a bad place to work,'" says Monash immunologist Richard Boyd, referring to the relative wealth of the California Institute for Regenerative Medicine, the state's $6 billion stem cell agency. "Our best scientists are being—as they should be—head hunted."

One such scientist is Ernst Wolvetang, who studies reprogrammed stem cells at the Australian Institute for Bioengineering and Nanotechnology in Brisbane. "I've had offers to go elsewhere, and I'm not the only one," he says.

Last year, an eight-institute consortium led by Wolvetang received more than AUD$2 million from the ASCC to study induced pluripotent stem cells. Now, Wolvetang is competing against all stem cell scientists in the country for almost the same amount of money. "If that doesn't get funded in some way, then there will be other options that I'll have to consider," he says.

Elie Dolgin

Lab-grown organs seen as remedy for long donor waitlists

Patients around the world face terrifying waitlists for organ transplants. In the US, the wait time for a liver transplant averages 26 months; for a lung, it can be nearly three years. To make matters worse, even if a donor becomes available, there is still a risk that the transplant will be rejected.

The ability to bioengineer organs would solve both of these problems. An organ fabricated from the recipient's own cells could be made to order and would not face the risk of immune rejection. "These organs would be available on demand and thereby overcome donor organ shortage," says Harvard Medical School's Harald Ott, lead author of a paper published in this issue of *Nature Medicine* detailing lab-grown lungs (page 927).

In recent years, replicating complex three-dimensional tissue structures has become more feasible thanks to a technique called decellularization. In this process, cells are washed away from an organ with special detergents, leaving behind the extracellular matrix of collagen. This matrix serves as the scaffold on which a transplant is grown, and it doesn't provoke an immune response because the donor's collagen is similar to the recipient's.

In humans, the technique has been used successfully to make transplants of simple, hollow organs such as the bladder or trachea. Other lab-grown organs are still years away from becoming available, but scientists have taken the important first steps by creating whole functioning organs in rats. Here are some recent successes:

Heart: One of the earliest demonstrations of the scaffolding strategy came from Ott and his colleagues, who grew a rat heart that beat when given an electric current (*Nat. Med.* **14**, 213–221, 2008).

Lungs: Ott's team again used the decellularization technique to create a complete set of rat lungs. After transplantion, the rats could breathe for up to six hours with the engineered organs (*Nat. Med.* **16**, 927–933, 2010). This study comes on the heels of work from a team at Yale University in New Haven, Connecticut that used a similar technique, but in that study the rats survived for only two hours (*Science* doi:10.1126/science.1189345, 2010).

Liver: Replicating the liver's intricate vascular structure has proven particularly challenging, but successful liver grafts were grown and transplanted into rats at Massachusetts General Hospital in Boston, as reported last month in *Nature Medicine* (**16**, 814–820, 2010).

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