Research Update • Le point sur la recherche

This little piggy went to market, this one went for an MRI . . .

The little piggies at the National Research Council of Canada's Institute for Biodiagnostics in Winnipeg may not be destined for market, but they will contribute to human society in another way. Heart and brain research conducted on pigs by NRC researchers has contributed practical knowledge on topics such as the effect of hypothermic circulatory arrest on brain metabolism.

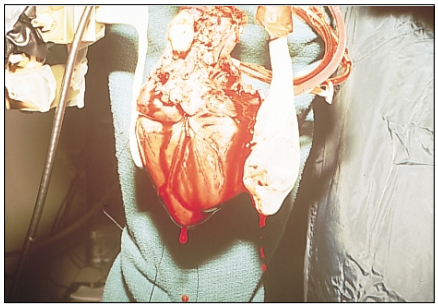
Dr. Roxanne Deslauriers, head of the Biosystems Group at the institute, explains that the researchers are using MRI scans and MR spectroscopy to investigate surgical regimens that have not been well documented in the medical literature.

For example, in some surgical procedures involving the heart, such as repair of the aortic arch, complete circulatory arrest is performed and the patient's body temperature is cooled to about 18°C.

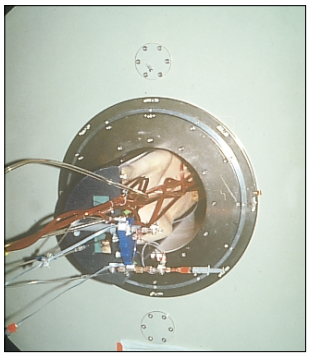
"The surgeon is racing against the clock because the brain won't survive much more than 45 minutes without blood flow. In some countries, doctors use retrograde perfusion to protect the brain during surgery."

The Biosystems Group at the Institute for Biodiagnostics was asked to evaluate the efficacy of this technique using spectroscopy in a pig model. The researchers looked at what happens to the energy levels in the brain as a function of time and compared the behaviour with that occurring with no blood flow, backward flow or, by selectively cannulating vessels to the head, normal blood flow.

"To make a long story short, our research revealed retrograde perfusion is better than no perfusion, but it's not very good. I think this is very valuable information for surgeons." (Results of this research were published in the *Journal of Thoracic and Cardiovascular Surgery* [1995;110:55-62]).



The effect of retrograde warm-blood cardioplegia is examined with the use of this pig heart.



A pig undergoes magnetic resonance imaging to determine the effect of retrograde perfusion on the brain.

Deslauriers says that this study led to further investigations of blood flow in pigs to determine where the blood flow goes. An MRI technique using contrast agent is being used to image the pig undergoing a normal bypass during circulatory arrest with retrograde perfusion, antegrade perfusion and normal flow, once it is re-established.

Results indicate that blood forced backward through the brain perfuses specific regions of the organ, leaving some areas starved for energy. Similar studies have been carried out on the heart, since retrograde perfusion is used to nourish the heart during surgery. Deslauriers says the studies have revealed that retrograde perfusion is effective in perfusing areas beyond blocked arteries, but is patchy relative to normal antegrade perfusion.

The NRC Institute for Biodiagnostics was opened in Winnipeg 6 years ago and comprises 4 groups. A complete list of research papers published by those groups is available from the institute, 435 Ellice Ave., Winnipeg MB R3B 1Y6. — © *David Square*

In the news . . .

Strain of antibiotic-resistant enterococci sweeps Boston

When a strain of vancomycin-resistant enterococci (VRE) appeared in Brigham and Women's Hospital in Boston in 1996, it provided researchers with a chance to study the spread of antibiotic-resistant bacteria (*J Clin Microbiol* 1998;36[4]:965-70). The type A strain swiftly became dominant in a hospital where there were already at least 12 strains of VRE. There was no association with the risk of a patient acquiring the type A strain and hospital service, ward or floor. Only care in the medical intensive care unit and receiving 2 or more antibiotic drugs a day were associated with a risk of type A VRE.

Human cells eat their dead

At any given time the body is full of cells undergoing programmed death (apoptosis). Now biologists understand how these cells are rapidly cleared (*Nature* 1998;392:505). Macrophages recognize, engulf and degrade dying cells thanks to a protein called CD14 on the surface of the macrophage. CD14 is also involved in triggering inflammatory responses in the body, and its overstimulation can cause toxic shock syndrome. However, in doing its clean-up work, the protein apparently causes no inflammation.