

Western University

From the Selected Works of Vivian C. McAlister

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How pigs' blood could save lives: Canadian study could end need for human donations

Allison Hanes, *Ottawa Citizen*

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ABSTRACT (ABSTRACT)

Dr. [Vivian McAlister] agrees that the risk of inter-species infection remains a key obstacle to producing safe pig-blood products for people: "The most important thing is that the safety of this sort of thing has to be thoroughly assessed before any implementation. We're dealing more with the immunological barriers, not the infectious disease," he says of his research. "However, if the infectious risks were overcome, or they were understood, an animal source for blood donation" could revolutionize blood-supply services around the world, he says.

Currently mired in a depressed pork market that is threatening to put many producers out of business, the industry has recognized the rich humanitarian and economic prospects of animal-to-human transplants: "As well as a rich source of nutrition, pigs may soon provide mankind with the most precious gift of all: life," said a recent issue of *Pork Producer*, the trade journal of the Ontario pork industry, citing Dr. McAlister's research.

Research into using animal blood in humans -- including ill-fated transfusions in earlier times -- has been going on since the 17th century. Blood from any animal besides large primates was always attacked and its red cells destroyed by human antibodies. But in 1988, the major difference between human blood and that of other mammals was learned to be the sugar alpha gal, which Dr. McAlister's team says it can now treat.

FULL TEXT

A Canadian scientist is heading a study that shows pigs could one day pump out the world's blood supply, putting an end to the need for human donations.

Early results of a research project led by Dr. Vivian McAlister, associate professor at Dalhousie University and director of the liver-transplant program at the Queen Elizabeth II hospital in Halifax, suggest pig blood can be treated to remove the risk of human rejection.

Remarkably, the breakthrough came when Dr. McAlister's team blended pig blood with an enzyme distilled from coffee beans, which blocks human antibodies from attacking the infused blood and causing rejection.

If the promising preliminary results lead to a viable pig-blood product, it would mean costly and risky blood banks drawn from human donors could be made obsolete by ultra-sterile pig farms supplying blood for transfusions.

Blood collected from humans has caused widespread problems in Canada and around the world, with infectious diseases such as HIV and hepatitis slipping into the supply during the 1980s. Developing a substitute supply source would also mean an end to the perpetual shortage of some blood types in storage.

"Eventually you could have pig blood farms that would be able to supply the needs of human medicine," says Dr.

McAlister.

Normally the human immune system is triggered into rejecting pig blood by a sugar it contains called alpha galactose.

Dr. McAlister has furthermore found some pig blood has low levels of alpha galactose that can be treated with the coffee enzyme to reduce the chance of an immune-system reaction.

Dr. McAlister also says the technique opens the possibility of introducing a second immune system into a patient - perhaps even reversing the fatal effects of immune-system diseases such as HIV, the AIDS virus.

Dr. McAlister says the research is at a preliminary stage.

He he plans to start trials of the technique on animals next year and, if successful, tests on humans within two years.

While the discovery opens important avenues in medicine by keeping the blood supply safe from infectious diseases passed on by humans, it also opens the danger of passing infections between species.

"A pig's blood supply would be very useful as it would not be necessary to cross-match blood types, and so in emergencies people could be given blood straight away," says Dr. Stephen Dealler, a British medical microbiologist. "However, great care would have to be taken to ensure lethal diseases were not transferred across the species."

Dr. McAlister agrees that the risk of inter-species infection remains a key obstacle to producing safe pig-blood products for people: "The most important thing is that the safety of this sort of thing has to be thoroughly assessed before any implementation. We're dealing more with the immunological barriers, not the infectious disease," he says of his research. "However, if the infectious risks were overcome, or they were understood, an animal source for blood donation" could revolutionize blood-supply services around the world, he says.

Dr. David Cooper, an immunologist at Harvard Medical School, said: "The more control that is exerted over blood donors, the better. The problem with human donors is that each individual's blood must be checked each time and sometimes viruses get through, as in the case of HIV."

The financial incentive for developing pig blood farms would be particularly strong in the United States, where blood donors are paid. In Canada most blood is donated free, but collection and screening procedures can be costly.

The commercial potential of using pigs for blood transfusions or other kinds of organ replacement -- all part of the futuristic branch of science known as "xenotransplantation" -- has already caught the attention of the Canadian pork industry.

Currently mired in a depressed pork market that is threatening to put many producers out of business, the industry has recognized the rich humanitarian and economic prospects of animal-to-human transplants: "As well as a rich source of nutrition, pigs may soon provide mankind with the most precious gift of all: life," said a recent issue of *Pork Producer*, the trade journal of the Ontario pork industry, citing Dr. McAlister's research.

The magazine noted "that demand for transplants is so great that people have died waiting for donors" and that new livestock breeding techniques are being developed to help scientists who are "looking for pigs with organs most compatible with the human system."

Dr. McAlister says the technology he is pioneering is particularly promising because of the potential use of pig-blood transfusions to battle immune diseases.

"You can't do it with a human cell right now, because AIDS would attack the human cell," he says.

Other pig organs could potentially be used in transplants to humans, eliminating the long and often fatally fruitless wait for a donor, he adds.

"The number of organ transplants done now could double or even triple."

But the idea of raising animals to harvest their parts for use in human medicine ignites a host of ethical debates featuring the objections of animal rights activists and the disgust of some people at the thought of having a pig's blood coursing through their veins.

A 1996 survey of 2,000 Canadians showed 24 per cent would rather die than have an organ transplanted from another animal. It also showed three-quarters of respondents with incomes over \$60,000 said they would choose the animal organ.

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"Synthetic substitutes often use the hemoglobin from inside the red cells and in our case we're using the whole red cell," he says. "The human race reacts to the hemoglobin that's free from the cells in a very negative fashion and the research is an effort is to try and overcome that response that we would make to free hemoglobin."

Illustration

Black & White Photo: Halifax Daily News / Vivian McAlister and some of the pigs helping him research the use of pig blood to use in humans. ;

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