

XENOTRANSPLANTATION

Designer Piglets, Crossover Viruses

Xenotransplantation, a Greek-based word, does not come easily to the tongue but it has been part of the working lexicon of researchers and scientists for over a century. *Xeno* means *strange* or *foreign*; *transplantation* denotes *transfer*. These terms together refer to a procedure in which an organ (i.e. kidney or liver, etc.) OR live cells (i.e. brain cells) from a healthy animal (itself possibly genetically engineered just for this purpose) are transplanted or grafted into a human patient. The transplanted or grafted material is called a **xenotransplant** or **xenograft**. Xenotransplants in which the animal organ or cells stay outside the patient's body, though not true transplants, are called **extra-corporeal** (outside-the-body) **xenotransplants**.

Some animal organs or tissues are already being used for the transplants; i.e. replacement heart valves from pigs. These "therapeutic products" are chemically treated and thus are not considered functional, living tissue when transplanted. Only organs **viable** at the time of transplantation are considered xenotransplants.

A Short History

- 1905** **Xenotransplantation** attempts for the first time in Western history.
- 1923** First cited xenotransplant -- Lamb's kidney transplanted into human who dies 9 days later.
- 1954** First successful organ transplant between identical twins.
- 1960's** **First xenotransplants** involved the kidneys, usually from baboons or chimpanzees. A few human patients live as long as 9 months, though most die within a few days or weeks.
- 1934** **Baby Fae**—A newborn girl received a baboon heart and died 20 days later.

All these xenotransplants failed and the patients died because the human immune system rejected the animal organ.

Early 1990's More powerful drugs for preventing rejection developed. Xenografts using animal hearts or livers are attempted but patients do not survive beyond three mo.

1995 **US patient** receives baboon marrow, which is later rejected. The patient, however, is still alive.

1999 March **A community in Sarpy County, Nebraska**, denies a permit to a transplantation pig breeding/research facility because of environmental concerns.

2000's **Ten Swedish patients** with diabetes receive cells from pig pancreas. None of the pig cells produce insulin as wished for. But neither did any of the patients get sick from xenografts.

Some Points To Consider

Ethical-----do no harm---1, Risk for the patient should not be greater or out of proportion with the intended effect of the treatment; 2, Potential for emotional upheaval in patient with animal transplant.

Community Health—1, Unwitting transfer of sickness from animals to human community; 2, No monitoring provisions of possibly recalcitrant patients as to mitigate or limit the spread of disease to others. For example, community health doctors would certainly want to keep track of patients with animal parts from a medical point of view not excluding performing autopsies at time of death regardless of patients' religious views. Do the rights and, indeed, possible safety of the community trump an individual's rights or vice versa?

Legal----Informed consent would become a binding contractual agreement covering not just the immediate surgery but after care monitoring without the right to opt out, justified on the basis of third party interests, in this case, the larger community.

Quality of Life-----Do we save patients at any cost, even to the detriment of their quality of life?

Animal Rights—As stewards of the animal kingdom, do we have the moral right to take a species known to be highly intelligent and sensitive and reengineer them into our spare parts piglets?

Religious Objections—Some religions object to pigs as unclean, others object to unnecessary cutting of the human body or prolonging life through “unnatural” ways.

Economic Cost---The costs for human transplants range from \$116,000 for a kidney to over \$300,000 for a liver. Then add in years of follow-up care. A 1996 Institute of Medicine paper estimates that the addition of xenotransplantation will balloon the **annual cost** of transplantation from \$3 billion to \$20.3 billion.

Justice----Are the high costs justifiable if so few gain from xenotransplantation while health care for the many is in dire need of doctors and money?

Reasons Usually Given For Xenotransplantation

- potentially unlimited supply of animal organs
- potential solution to human organ shortage
- potential to aid patients with hemophilia, AIDS, diabetes, Alzheimer's, Parkinson's

Alternatives

--Other **more humane, cost effective and sometimes even less intrusive therapies** could eliminate the need for cross-species transplants; such as, ventricular remodeling; injection of liver cells from donated human organs; human, as opposed to porcine, pancreatic islet cells for diabetics, etc.

Economically, environmentally, ethically, legally, medically and socially, Xenotransplantation is not a viable alternative in health care. Scientific evidence shows it to be ineffective as well as dangerous. Xenotransplantation comes under the Food and Drug Act, Health Canada. **Currently, there are no regulations specifically designed for xenotransplantation.**

When **HIV** jumped from animal to man, not only were health authorities taken by surprise, they are still playing catch-up as Africa, in particular, loses a whole generation of mothers and fathers to **AIDS**, its communities decimated, its children orphans in the cruelest sense of the word. How much better are we prepared to confront viruses that xenotransplantation could enable to crossover and infect humankind?

Pigs are known to carry at least twenty viruses. The deadly Influenza Epidemic of 1918 is thought to have been caused by a porcine virus transmitted from pig to human. We know that Ebola, SARS, Avian flu and AIDS jumped from animals to people. Research on xenotransplantation is already advancing in such countries as Mexico, the USA, Germany, and many more. As Canadians, we cannot ignore what is whirling around us even now. Do we stay with a temporary moratorium or grant our scientists the green light? Is the answer somewhere in between? Is a collective No too late even if we were of that mind? Xenotransplantation exists. Now what do you want to do?

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