

If you desperately needed a heart transplant, but no human hearts were immediately available to you, would you feel comfortable accepting an organ donation from an animal? In the future, this question may become common. Each year, thousands of people die while waiting for vital organ transplants. Xenotransplantation, the transplantation of organs from one species of animal into another species of animal, is gaining interest because it provides a possible solution to the organ shortage worldwide. Xenotransplantation would result in the breeding of animals which would be used as organ donors for human recipients. Currently, this form of science is at an experimental level; however, it has the possibility of one day integrating into the world of mainstream medicine, existing alongside allotransplantation, or the typical transplantation of organs between two beings of the same species. If this were to occur, thousands of animals would be killed and used as “spare parts” for humans.

Throughout history, people have experimented with many forms of xenotransplantation. In his book *The Xeno Chronicles*, G. Wayne Miller describes the first documented attempt at xenotransplantation, which took place in 1628, in Padua, Italy, where sheep blood was transfused into an ill man. The transfusion of sheep blood into humans quickly became a trend, especially among those who believed that the peaceful nature of sheep could be transferred to humans through blood transfusions. However, it has since been proven that sheep blood has no beneficial effects on people (Miller 112). Since then, people have attempted to transplant organs from pigs, goats, dogs, baboons and other animals into humans, with many publicized failures and only a few tentative successes.

Currently, xenotransplantation is focused on the transplantation of organs from genetically altered, cloned, miniature pigs into humans. Miniature pigs were chosen as suitable organ donors because the pigs’ organs are similar in size and function to those of humans. A

miniature pig's heart resembles a human's in color and shape, and contracts at a speed similar to the speed of contraction of a human heart (Miller 39). Scientists originally considered primates, like chimpanzees, as organ donors; however, they found that primates resembling humans drew more sympathy from the public than pigs, which are slaughtered by the thousands each year for food.

The miniature pigs used in xenotransplantation must be genetically altered in order to transplant their organs into the human body. The human immune system reacts negatively when foreign cells or organs are introduced into the body. Immune cells produce proteins that attack and destroy foreign tissue (Brennan). This function of the immune system is meant to protect humans from germs and other foreign antigens; however, it also makes transplantation difficult. Even when a transplant organ is from another human, the body may reject the organ, leaving it, as xenotransplantation scientist David Sachs describes it, "a dark, useless mess"(Miller 14). When a transplant organ is from another species, the body will definitely reject the organ. Therefore, it was necessary to find a solution that would allow organs to be transplanted from one species to another without the recipient's body's rejection of the organ.

It was not long before scientists found their solution. Scientists in Oklahoma discovered in 1991 that the genes from normal miniature pigs produce a sugar molecule that sets off a rejection of organs or tissues that are transplanted into another species (Miller 14). The miniature pigs used in xenotransplantation today have been cloned from a cell that was genetically engineered to "knock out" both copies of the gene that produces this sugar molecule (Miller XV). Because the sugar molecule alerted the organ recipient's body that a foreign tissue was present in the body, organs transplanted from pigs lacking this sugar molecule did not provoke immediate rejection of the organ.

Experiments have led to the transplantation of organs from the genetically-altered miniature pigs into baboons. A pig's heart, kidneys, thymus, and bone marrow are typically transplanted into baboons, but other body parts, including pieces of pancreas, ear, liver, lymph nodes, tonsils, skin, stomach, large and small intestine, and salivary glands are often taken for testing (Miller 56). Scientists are still at a stage where they are attempting to achieve tolerance for xenotransplanted organs in baboons; however, it is likely that as this experimental science gains prominence, it will also gain funding which will lead to new progress and discoveries and, eventually, to the acceptance of xenotransplantation as a viable solution to organ shortage.

However, there are many who oppose xenotransplantation, not only for the possible dangers and ethical conflicts it could present to humans, but also for the suffering it causes to animals. According to Kantian ethics, people should be treated as ends in themselves, instead of as means to an end. But, does this philosophy apply simply to humans? Or do animals also deserve to be treated as ends in themselves? Xenotransplantation does not extend to animals the same right to life that is extended towards humans. Xenotransplantation would provide for the harvesting of animal organs as if animals exist simply so that they can be used by humans. Essentially, those who support continued funding for xenotransplantation studies also support the use of animals as "spare parts" for humans.

Scientists counter this accusation by citing the fact that each year, thousands of pigs are slaughtered for use in food production. However, this defense does not truly exempt this form of science from criticism. Simply because the slaughter of thousands of animals each year is socially accepted, does not mean that this social institution is morally justified. Animals do not exist simply to provide for humans, but should be afforded respect simply for the intrinsic value they possess.

Animal rights groups, such as PETA, have worked to get their voices heard in the xenotransplantation controversy. PETA argues that xenotransplantation is wrong because it is an example of a group in power taking control over another group that is not in power (Miller 139). Examples have even been drawn between the use of animals for xenotransplantation and the treatment of slaves in America not so many years ago. PETA also argues that animals are “subjected to sensory deprivation in sterile laboratory environments and are denied social interaction with members of their own species”( PETA Media Center Factsheets). Although scientists claim that all appropriate measures are taken to minimize the amount of suffering the animals undergo during surgeries, the animals still suffer in some ways. Dr. David Sachs, a xenotransplantation scientist, admits that although many doctors try to minimize suffering, there have been abuses to animals (Miller 132). Some animal rights groups have also claimed that xenotransplantation bridges the gaps between species and brings into question what a human is and where the line between humans and other animals is drawn (British animal rights activists charge xenotransplantation will create part human hybrids).

Despite the serious concerns involved with xenotransplantation and the impact it has on ethics and animal treatment, the goal of eliminating organ shortage is a good one. However, xenotransplantation is not the only solution to organ shortage. In an article entitled “Organ Shortage,” transplant educator Larry Swasey is quoted as saying, “Each year we lose 50,000 to 80,000 organs because doctors don't notify us about deaths, or because families say no”(Brennan). The biggest solution to organ shortage in the United States would be to allocate funds that would provide for the education of the American people on the necessity of organ donation. It would also be useful to fund programs that would advocate healthier lifestyles. The Campaign for Responsible Transplantation, which opposes xenotransplantation, has stated that it

finds it ironic pig organs can save lives while one of the biggest factors leading to organ failure, especially heart disease, is the consumption of pork and other meats (Miller 140).

Another possible solution to the shortage of organs in the United States could be the adoption of an “opt-out” policy for organ donation. In many countries, especially in Europe, policy assumes that a person will donate his or her organ unless otherwise specified. America, on the other hand, follows an “opt-in” policy, which gives people the option to donate organs, but does not immediately assume that all people will be donors (PETA Media Center Factsheets). The adoption of this type of system would increase the amount of organ donors, therefore decreasing the amount of people dying from organ shortage each year.

Xenotransplantation is a complicated issue, because few people are willing to gamble with the lives of their fellow humans in order to protect the lives of animals. Speciesism and a loyalty to one’s brothers and sisters automatically wins out over loyalty to another species; however, when one looks more closely at the controversy over xenotransplantation, one realizes that there are truly feasible solutions to the problem of organ shortage, solutions that do not sacrifice the lives of thousands of animals. Studies have shown that pigs are highly sensitive and intelligent animals (Miller 140), and man’s fight for self-preservation should not come at the price of animal suffering.

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