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Transplanting Animal Organs Into Humans: The Ethics Of Xenotransplantation

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Abstract: ***Xenotransplantation is the transplantation of animal organs and tissues to replace failing organs or treat disease in humans. It has gained considerable attention in recent times because of the reason that the imbalance between the organ transplant request and the number of organs ready to transplanting. The increasing instance of the vital organ failure and inadequate supply of organs have created a wide gap between organ supply and demand. In these circumstances one possibility is that the imbalance could be redressed by using other animals as source of material for transplantation into human beings. Despite this progress and tremendous clinical potential, xenotransplantation raises a number of ethical dilemmas that require consideration. An evaluation of these dilemmas requires the identification of all those who are directly involved in, and of those who may potentially be affected by xenotransplantation. This includes human recipients, scientists, general public as well as source animals. This paper concludes with the remarks that xenotransplantation has definitely raised a lot of good questions that lead to both the positive and negative sides. By weighing its pros and cons we have to decide whether this technology that pursue as a society.***

Keywords: Xenotransplantation-Xenograft- Zenosis-Transgenic animal-Transgenisis

I. INTRODUCTION

Today, the infiltration of technological advancement into all aspects of daily living is rapid and pervasive and it changed the world in which we live. Medical technology is not immune to this extraordinary revolution. Clinical organ transplantation is relatively new procedure in the field of medicine has been recognized as one of the most gripping medical advances of the century as it provides a way of giving the gift of life to patients with terminal failure of vital organs. Organ transplantation has attracted many attentions because of the reason that the imbalance between the organ transplant request and the number of organs ready to transplanting. The increasing instance of the vital organ failure and the inadequate supply of organs have created a wide gap between organ supply and organ demand, which has resulted in very long waiting times to receive an organ as well as increasing number of deaths while waiting. In most of the western countries, there is a human organ shortage with waiting lists for the performance of transplantation. For instance, the world wide statistics point out the fact that there are currently more than 87000 patients on the waiting list for organ transplantation in the United States of America alone. Thus the demand for human organs and tissues for transplantation exceeds their availability and the gap between supply and demand is likely to attempts to develop animal organs that can be transplanted into humans.

Nowadays, there is remarkable progress in different organ transplant techniques which are classified into two general types. Homograft is used when both the donor and the recipient of the cell have tissue or the organ belongs to one biological species, despite their genetic differences. Another method called xenograft is applied when the donor and recipient belong to the two different biological species. ‘Xeno’ is the Greek word meaning ‘strain’ involves transplanting or grafting of animal organs, tissues, and cells to replace failing organs or to treat disease in humans. This transplanted or grafted organ, tissue or cell is called xenotransplant or xenograft and the process is called as xenotransplantation.

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It is need to set out scientific background of xenotransplantation to provide a basis for the discussion of ethical issues. The concept of xenotransplantation dates back as 1962, but was not until the 1960's that the technological world stimulate this idea for whole organ transplantation. In 1963, it was transplanted Chimpanzee kidneys into 13 patients with renal failure and also in1964 used Chimpanzee heart as xenograft. The patients did survive for long but the transplanted organs showed no significant rejection. Two of the most publicized xenotransplant operations in last two decades involved Baby Fae, the infant who received a baboon heart in 1984, and Jeff Getty, an AIDS patient who received a bone marrow transplant from a baboon in 1995. The success from these cases inspired more research and development in xenotransplantation, which resulted in the development of this process.

II. ARGUMENTS FOR XENOTRANSPLANTATION

The demand for human organs and tissues for transplantation exceeds their availability and the gap between supply and demand is likely to increase. In these circumstances one possibility is that the imbalance could be redressed by using other animals as sources of material for transplantation into human beings. Xenotransplantation offers promise, not only for organ transplantation of tissue and cells. Xenotransplantation of animal bone, skin, bone marrow, pancreatic islet cells, and fetal neural tissue have all been suggested. Xenotransplantation of tissue is a less drastic procedure than organ xenotransplantation. The impact on the recipient may also be less severe since it seems that people attach more significance to organ transplantation than to the transplantation of tissue or cells. Moreover, as mentioned above, it is the shortage of human organs that is particularly acute. For this reason, the discussion in this paper will focused mainly on the xenotransplantation of organs.

Proponents of xenotransplantation argue that there would be significant benefits if it were to become a successful and widely available treatment. Most importantly, enough animal could be reared to provide sufficient organs and tissue to overcome the present shortage of human organs and tissue for transplantation. This would eliminate the decline in health, the considerable anxieties and the loss of life associated with the current long waits for human organs and tissue. Instead, xenografts could be offered as and when they were needed Xenografts could also be offered to a wider group of patients who might benefit from transplantation but who are currently not eligible for a human organ or tissue transplant. Successful transplantation of genetically modified organs and tissue would also eliminate the need for the careful matching of the organ or the tissue with the recipient, require in transplants between human beings in order to reduce rejection by the immune system. This would be of particular benefit to people for whom it is currently more difficult to find compatible organs and tissue.

Xenotransplantation would also avoid the need to consult the relatives of dead people about organ donation at times of great stress and emotional turmoil. If there are alternative sources of organs, it will not be necessary for relatives to make such difficult decisions. The need to perform transplant operations at very short notice, as occurs when human organs become available, would also be avoided: patients and health care workers could prepare themselves for the operation in advance. Transplantation would become an easier service to coordinate and administer, and this might bring savings in cost.

For some xenotransplantation would be preferable to some of the current or proposed methods of obtaining human organs and tissue. Despite the legislation in many countries prohibiting this, the buying and selling of human organs, especially kidneys. If xenotransplantation were successful in reducing the shortage of organs and tissue, such ethically unacceptable commercial dealings might stop. Proponents of xenotransplantation have pointed out that, in addition, it might provide an alternative to the use of human tissue from aborted fetuses, and to methods for obtaining human organs such as elective ventilation or live donation, all of which have their difficulties.

III. ETHICAL QUESTIONS RAISED BY XENOTRANSPLANTATION

The prospect of using animal organs and tissue for Xenotransplantation itself raises important and wide ranging ethical issues which must be debated. Before a judgment can be made about its acceptability, the range of issues is set out below.

IS IT ACCEPTABLE TO USE ANIMALS AS SOURCE OF ORGANS AND TISSUES FOR TRANSPLANTATION INTO HUMAN BEINGS?

Xeno research is more problematic than any subsequent use of animals for organs. Xenotransplantation will lead to the breeding and killing of animals to provide organs for humans. People tend to respond in different ways to the issues raised by the question is it acceptable to use animals in this way? Some people believe it is acceptable to use animals for any purpose. Others have strong moral conviction against using animals for any purpose, no matter how humans might benefit. Finally, many people believe it would be okay to use animals if the benefits to humans are important and if the animals are properly cared for.

The way people feel about using animals for xenotransplantation reflex how we, as humans, feel about the moral status of animals. When we are talking about xenotransplantation, one way to clearly state the question is to ask ourselves. If animals are to be used for medical purposes in ways that would not be ethically acceptable if applied to human beings, on what bases do we draw a distinction between animals and human beings? If there are no convincing reasons to give animals a moral status lower than that of human beings then using animals for medical purposes will be hard to justify.

Non-human primates were considered as potential sources of organ because their similarity to human decreased the risk of immune rejection. At the present time, pig organs are being transplanted into human primates as part of a pre-clinical trials

and recent research points to pigs as the main source animals for xenotransplants. Scientists advice that domesticated animal pig can be considered as potential tissue and organ sources before non-human primates, such as monkeys, for a number of health, safety, and logistical reasons. Pigs are performed because; they mature very quickly, produce large litters and have organs of comparable size and function to human organs in both infancy and adulthood. They also can be breed to high standards in microbiologically controlled environments. Monkeys, another potential source of organs on the other hand, are undomesticated animals that do not fare well in controlled environments and therefore, it is difficult to raise them to the same high health standards as pigs. Furthermore their organs are much too small and like humans, monkeys mature slowly and tend to give birth to one offspring at a time.

IS IT ACCEPTABLE TO CREATE TRANSGENIC ANIMALS AS A SOURCE FOR XENOTRANSPLANTS?

The most recent scientific developments in xenotransplantation point to transgenic pigs as the most promising source of organs and tissues. Transgenic pigs are pigs that have been bred with human genes in order to lower the risk that their organs or tissues will be objected by the human patient who receives them. The genetic manipulation of pig may, in fact, be the key to the success of xenotransplantation. The case in favor of xenotransplantation will be harder to make if people consider it morally unacceptable to transfer human genes into pigs.

The creation of transgenic pigs is linked to many broader issues around genetic modification of living organisms. The essence of transgenesis is that a gene from one species is incorporated into another. Some see the production of transgenic animal as an unnatural act. It interferes with the natural order of the world, attempts to change the nature of animals, violate species boundaries, lets people play God and is not natural, may alter our views about living beings, and may have an impact on the environment and other animals, if inter breeding occurs. According to this view, genes have a particular significance because they contain the information that determines the essence of any species. To move genes around is to destroy the integrity of species as natural kinds, and so create unnatural hybrids.

A number of arguments, however, suggest that the production of transgenic animals need not be viewed as a drastic or unnatural procedure. Species boundaries are not in fact violate, but changes in evolution occur. Some argued that transgenic techniques are no more than as extension of traditional breeding techniques that artificially produce new animal breeds. Many transgenic animals are modified on a very small scale and specific way and the essence of any human or animal is not contained in any one gene. Therefore, the physical appearance and characteristics of the animal will not change in any measurable sense.

IS IT ACCEPTABLE TO USE XENOTRANSPLNTS IN HUMAN BEINGS?

BENEFITS FOR PATIENTS

- ✓ Xenotransplantation could provide an alternative source of organs and tissues for use in patients.
- ✓ Xenotransplantation could provide cells and tissue for new treatment of diseases where human organ transplants are not an option
- ✓ Xenotransplantation could alleviate the shortage of human organs and tissues.
- ✓ Xenotransplantation could provide temporary treatment options while patients want for a human organ to become available.
- ✓ Patients, who do not meet the criteria for human organ transplantation because there is a short supply, could be offered xenotransplants as an option

MEDICAL AND SAFETY RISKS FOR PATIENT

- ✓ The risk of immune rejection.
- ✓ The need for high doses of immune suppressive drugs to fight rejection, which puts a patient at risk for other kinds of potentially fatal infections.
- ✓ Risk of organisms by microorganisms transferred from pigs that could cause a range of more or less serious diseases, some of which may still be unknown to us.
- ✓ Risk that the animal organ will not be able to perform well inside the human body.

The effects of xenotransplantation on society may not be limited to medical and safety risks. Various social moral and cultural values may be at risk because of its development. For instance xenotransplantation may:

- ✓ Affect our views about what it mean to be humans.
- ✓ Affect how we see nature and environment.
- ✓ Disrupt social relationships.
- ✓ Disrupt views of death and immortality.
- ✓ Affect our trust in biotechnology.
- ✓ Concentrate economic resources in one area.
- ✓ Divert social attention from other solutions

IS IT ACCEPTABLE TO CONDUCT CLINICAL TRIALS INVOLVING XENOTRANSPLANTS?

Xenotransplantation, as with any other clinical therapy, presents a number of ethical dilemmas that require consideration. An evaluation of these dilemmas requires of all who are directly involved in, and of those who may potentially be affected by xenotransplantation. This includes potential human recipients, physicians, scientists, biotechnology personal, and the general public as well as the source animals. Xenotransplantation raises the question of how far, if at all, and in what ways it is acceptable for human beings to use other animals as a source of organs and tissue for transplantation. Even if one accepts in principle the use of animals in medicine and medical research, their use in xenotransplantation may raise particular difficulties.

Xenotransplantation, like any major innovation, may have wider ranging and unpredictable effects. There are so many public health issues arise from the prospect of xenotransplantation. The transplantation of animal organs or tissue raises the possibility that infectious organisms of animals may be transferred into the human population. Xenosis is the infection of human by agents such as bacteria or

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viruses that are derived from animals. The infection may or may not result in symptom of human disease. The possibility of xenosis raises questions about the safety of using xenotransolants in individuals. This potential threat to public health lies at the heart of the debate about the safety of xenotransplantation.

The major problem in organ transplant from animal to human is recipient's immune response. The transplanted organ is identified as alien. Therefore the immune system rejects it to protect the body. Based on time, this immunological rejection occurs in three forms of hyper acute, acute and chronic rejections. In the first form the transplanted organ is rejected within only seconds or minutes after the transplantation. In the second form, this rejection happens after some days to a week and in the third, in longer term within some weeks to years. In order to overcome this obstacle, scientists and physicians have shown great interest in using transgenic animals through applying genetic engineering. Currently transgenic animals are widely used in and it is expected that transgenic animals can provide an applicable source for human organ transplantations.

IV. CONCLUSION

The demand for organ transplantation has rapidly increased all over the world due to increased incidence of vital organ failure and the unavailability of adequate organs for transplantation to meet the existing demand has resulted in major organ shortage crisis. In this circumstance xenografts have been regarded as an expedient solution. There is a prospect that xenotransplantation may be able to supplement significantly the present inadequate supply of human organs both to save life and to improve the quality of life. There are however, complex questions of ethics and issues raised by xenotransplantation that need to be considered as a matter of urgency. Any ethical appraisal of xenotransplantation must be ultimately addressing the question of whether the introduction of a foreign organ into human body modifies a person's identity and the rich meaning of the human body. The ethical evaluation of the practicability of xenotransplantation, in light of the current situation requires the consideration of a whole series of factors some of which are derived from the general moral norms valid for all transplants, and others of which are more specifically related to xenotransplantation.

One of the fundamental ethical questions that should be examined when judging the legitimacy of xenotransplantation is that of the health risk involved in such procedures. This risk is depending on various factors which cannot always be predicted or assessed.Therefore, an ethical requirement of greatest caution is necessary as considering the possibilities of infections arising from the xenotransplant by known or unknown pathogenic agents which are dangerous for man. When the moment of clinical application of xenotransplantation arrives, it will be necessary to select patients carefully based on clear and well established criteria, and to monitor the patient very closely and constantly. One must also contemplate the possibility of placing the patient in quarantine to prevent the epidemic spread of infection. The use of organs from genetically engineered animals for xenotransplantation raises the need for certain reflections on transgenesis and it lead to the enumeration of some fundamental ethical conditions which must be respected. The concern for well being of genetically modified animals should be guaranteed and every experimental protocol on animals must be evaluated by a competent ethics committee.

The questions and issues related to xenotransplantation have implications of a very wide social character. There is thus an ethical need to acquire correct information on the topics of greatest public interest with regard to the potential benefits and risks along with introducing public health measures to prevent the conditions that currently require treatment by transplantation. This information should be communicated to large segment of the public as possible moreover by means of debates and public discussions in small and large groups, society itself, through its representatives. A serious ethical commitment on the part of scientists should not neglect to explore therapeutic paths which may represent alternatives to xenotransplantation such as developing artificial organs and the use of adult stem cells. Finally, I conclude this paper with the keen observation that xenotransplantation has definitely raised a lot of good questions that lead to both the positive and negative sides. By weighing its pros and cons we have to decide whether this technology that pursue as a society.

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