# Survey shows promising future for xenotransplantation

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(Medical Xpress) -- Xenotransplantation, or transplanting animal parts from one animal to another, is one area of medical research that has held more promise than payoff ever since the idea was first devised. Now however, research scientists from the Transplantation Institute at the University of Pittsburgh, believe there is reason to be more optimistic. They have published the results of a survey they've conducted regarding the current state of xenotransplantation in *The Lancet.*

First of all, the whole point behind such research is to find out if humans could benefit from animal parts, whether transplantation of whole organs, such as livers, lungs or hearts; or just some cells to help restore function in faulty parts, such as pancreatic islets, the part of the pancreas that contains the endocrine cells responsible for the production of insulin.

The Pittsburgh team, led by Doctors Burcin Ekser and Dr David K C Cooper, writes that because of advances in genetic modifications made in other animals, mainly in this case, pigs; parts retrieved from them are much less susceptible to attack by the human immune system. They appear so optimistic in fact, that they suggest clinical trials of certain pig parts being transplanted into humans could begin as soon as the next two years. At the same time, they are quick to point out that such trials will likely be more of the cell or tissue transfer type, rather than the bigger stuff, such as whole organs. This is because other problems with whole organs (such as clots or spontaneous bleeding) besides rejection haven't been resolved yet.

As one example, the team notes that research into ways to transplant islets of Langerhans, as the endocrine cells in the pancreas are officially called, is meeting with some success. Currently, research is being conducted in New Zealand to see if sites other than the hepatic portal vein can be used to increase their survival rates. Also under study is the use of encapsulation, where the cells are kept in a sort of capsule that protects them from the immune system. If successful, such research could lead to a cure for Type-1 Diabetes though the use of neonatal piglet islets, grown in labs rather than continually harvested from live animals.

The authors also note that headway is being made into other areas of xenotransplantation as well; for example, they note that there now exists a better understanding of the ways that neuronal cells might be taken from pigs and implanted into humans to help restore function in patients with such ailments as Parkinson's disease. Also, progress is being made in understanding how corneal transplants might work.

In summing up their findings, the team writes that it's all due to advances in genetic engineering that allows for the development of pigs with modified genes that produce parts that the human body won't reject. Once a certain level is reached in that area, which the authors seem to feel will happen over the next couple of years, clinical trials will move from other animals, to humans. And after that, it shouldn't be long before actual transplantations are taking place.

**More information:** Clinical xenotransplantation: the next medical revolution? *The Lancet*, Early Online Publication, 21 October 2011. doi:10.1016/S0140-6736(11)61091-X

**Summary**
The shortage of organs and cells from deceased individuals continues to restrict allotransplantation. Pigs could provide an alternative source of

tissue and cells but the immunological challenges and other barriers associated with xenotransplantation need to be overcome. Transplantation of organs from genetically modified pigs into non-human primates is now not substantially limited by hyperacute, acute antibody-mediated, or cellular rejection, but other issues have become more prominent, such as development of thrombotic microangiopathy in the graft or systemic consumptive coagulopathy in the recipient. To address these problems, pigs that express one or more human thromboregulatory or anti-inflammatory genes are being developed. The results of preclinical transplantation of pig cells—eg, islets, neuronal cells, hepatocytes, or corneas—are much more encouraging than they are for organ transplantation, with survival times greater than 1 year in all cases. Risk of transfer of an infectious microorganism to the recipient is small.