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Genome Editing Technology, CRISPR Cas-9, Provides a Potential Future for Xenotransplantation: Can Pigs Become Our New Organ Donors?

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Organ shortage has been a significant issue in United States for many decades. There were over 116,000 people on the transplant waiting list as of August 2017, with a new person added every 10 minutes. Animals have been considered as potential organ donors for humans, with the pig being the most ideal candidate because of its excellent breeding profile, low maintenance costs, large litters, rapid growth and organ similarity. A notable challenge that comes with porcine organs are endogenous retroviruses that establish themselves in the DNA of offspring in utero, thereby allowing for no time to prevent infection and integration. Porcine endogenous retroviruses (PERVs) have the ability to infect human cells and therefore must be removed or inactivated before considering transplantation. Genome editing technology, CRISPR-cas9, has been recently successful in targeting and inactivating PERVs in porcine fetal cell lines. Using PERV-inactivated cells, reproductive technologies have allowed for fertilization, implantation and the successful birth of 37 PERV-inactivated piglets from 17 sows. At this time, 15 piglets remain alive with the oldest piglet being 4 months of age. The success of this technology takes us one step closer to finding potential organ donors outside of our own species and instilling hope back into those who may need an organ transplant in the future.