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Presence of Porcine Endogenous Retrovirus C in Domestic Pigs

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Abstract

There is currently a shortage of organs avaliable to perform allotransplants in humans. To help alleviate some of this pressure, xenotransplantation has been increasingly studied as an alternative. Xenotransplantation is the transplantation of living tissues between different species. Porcine tissues are being highly considered for xenotransplantation for many reasons. That being said, there are some major concerns for cross species transmission. More specifically, there is concern for transmission of Porcine Endogenous Retroviruses (PERV) when considering this type of xenotransplantation. These are retroviruses that have infected germ-line cells of pigs and become permanently integrated into the host cells DNA, leading to vertical transmission of the virus. This is of note because two of the three subtypes of the PERVs, A and B, are infectious to humans and can recombine with the third subtype, C. The purpose of this study is to determine the presence of PERV-C in the domestic population of pigs at the FHSU university farm. So far, 12 positives have been identified out of 36 samples, (33% positives).

Introduction

Endogenous retroviruses (ERVs) are retroviruses that infected a hosts germ cell line leading to vertical transmission (Meyer et al., 2017). Of particular interest are porcine ERVs (PERVs). There are three subtypes of PERVs- A, B, and C. PERV- A and B are found in all pigs and can infect human cells, where as C is not. That being said, C can recombine with A and B. These recombinants can infect humans. This is a significant problems for several reasons. One of note is for the purposes of xenotransplantation. Xenotransplantation is transplantation of tissues from one species to another. Xenotransplantation of porcine tissues is being considered for a variety of reasons including physiology and size (Denner & Tönjes, 2012). Despite these advantages, there is still the chance for cross-species disease transmission.

PERV-C	F:5′-CTGACCTGGATTAGAACTGG-3′ R:5′-ATGTTAGAGGATGGTCCTGG-3′	281

Figure 1:PERV-C forward and reverse primers used for PCR amplification of the DNA, as found in (Acharya et al., 2019).

Methods

The sample used for this study were collected at the Fort Hays State University farm. The samples were stored at -20° C in 95% ethanol. DNA extraction was done using Qiagen Dneasy Blood and Tissue extraction kit, following the manufactures instructions for this type of tissue samples. PCR was run using the primer sequences shown in figure 1. Gel electrophoresis was used to analyze the results (Acharya et al., 2019). For a positive result, a band needed to be present at approximately 250 bp. Examples of positive and negative results are shown in figure 2.

Results

Of the 36 samples that have currently been tested, only 12 of them have been positive for PERV- C. This is a positive rate of about 33%.

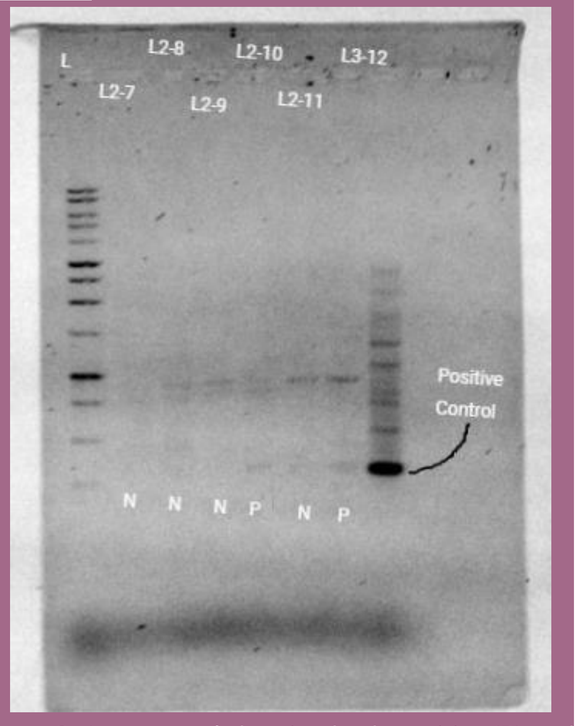

Figure 2: Agarose gel showing both positive (P) and negative (N) results. The samples on the far left is the ladder and the sample on the far right is a known positive control sample.

Results and Conclusion

These results are promising for a couple of reasons. First, according to Acharya and collogues in 2019, there was a 42% positive rate in their domestic samples and 85.7% positive rate in their feral samples. This shows two key points. First this highlights that domestic pigs are less likely to carry PERV-C than feral pigs. Secondly, this data shows that there can be variation in positive results between similar populations. One important note about the presented study is that there are still several samples left to be tested which could impact the overall positive rate. In relation to xenotransplantation, these results are hopeful. The fact that this data is consistent with previous studies findings that PERV-C is not present in all pigs, and is less prevalent in domestic populations, shows that our current strategies for managing the spread of PERV-C are working.

References

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