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GENUS AND THE ROSLIN INSTITUTE COLLABORATION UPDATE

Genus plc, a global pioneer in animal genetics, and The Roslin Institute are pleased to announce that a collaborative project has produced pigs that may be protected from PRRS (Porcine Reproductive and Respiratory Syndrome), a viral disease that costs the global pig industry billions of dollars each year, a finding that could have profound benefits to animal welfare and society.

PRRS causes severe breathing problems in young pigs and breeding failures in pregnant females.

The team, based at The Roslin Institute, has used advanced genetic techniques to produce pigs that are potentially resistant to the PRRS virus (PRRSv). Early tests have revealed that cells from the pigs are completely resistant to infection with both major subtypes of the virus that cause the disease.

The animals are otherwise healthy and the change, which was introduced using gene-editing technology, should not affect their ability to fight off other infections, the researchers say.

PRRS is endemic in most pig producing countries worldwide. Vaccines have mostly failed to stop the spread of the virus, which continues to evolve rapidly. Consequently, it is one of the greatest challenges facing pig producers today. In Europe alone, the disease is estimated to cost the pig industry more than €1.5 billion each year.

In the latest study, only the section of CD163 that interacts with PRRSv is removed and the molecule appears to retain its other functions.

Studies have shown that PRRSv targets immune cells called macrophages. A molecule on the surface of these cells called CD163 plays a key role in enabling PRRSv to establish an infection.

The research team at the University of Edinburgh's Roslin Institute, in collaboration with Genus, used a gene-editing tool called CRISPR/Cas9 to cut out a small section of the CD163 gene in the pigs' DNA code.

Laboratory tests of cells from the pigs with the modified CD163 gene have confirmed that this change in the pig's DNA blocks the virus from being able to cause infection.

The next stage in the study will be to test whether the pigs are resistant to infection when exposed to the virus.

Previous studies by another Genus-supported team have shown that pigs lacking the entire CD163 molecule do not become ill when exposed to PRRSv.

Lead researcher Professor Alan Archibald, of The Roslin Institute, said:

"Genome-editing offers opportunities to boost food security by reducing waste and losses from infectious diseases, as well as improving animal welfare by reducing the burden of disease. Our results take us closer to realising these benefits and specifically address the most important infectious disease problem for the pig industry worldwide."



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Jonathan Lightner, Chief Scientific Officer for Genus said:

"This result furthers the case for the criticality of CD163 in PRRSv infection and demonstrates that a targeted removal of the viral interacting domain can confer resistance while the remainder of the protein is present. This, and other gene edits, will be evaluated as Genus advances the development of gene editing to confer PRRSv resistance. Genus is committed to pioneering the responsible application of technology to animal genetic improvement to enhance the well-being of animals, the livelihoods of farmers, and the sustainable approach to producing food for a growing global population."

The study, published in the journal *Plos Pathogens* (<http://journals.plos.org/plospathogens/article?id=10.1371/journal.ppat.1006206>), was funded by the Biotechnology and Biological Sciences Research (BBSRC) Animal Health Research Club and Genus. The Roslin Institute receives strategic funding from the BBSRC.

Scientists from The Pirbright Institute also contributed to the research.

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About Genus:

Genus creates advances to animal breeding and genetic improvement by applying biotechnology and sells added value products for livestock farming and food producers. Its technology is applicable across all livestock species and is currently commercialised by Genus in the dairy, beef and pork food production sectors.

Genus's worldwide sales are made in seventy countries under the trademarks "ABS" (dairy and beef cattle) and "PIC" (pigs) and comprise semen and breeding animals with superior genetics to those animals currently in production. Genus's customers' animals produce offspring with greater production efficiency, and quality, and use these to supply the global dairy and meat supply chain. The Group's competitive edge has been created from the ownership and control of proprietary lines of breeding animals, the biotechnology used to improve them and its global supply chain, technical service and sales and distribution network.

With headquarters in Basingstoke, United Kingdom, Genus companies operate in thirty countries on six continents, with research laboratories located in Madison, Wisconsin, USA. For more information visit www.genusplc.com.