Using CRISPR to make warmer, less fatty pigs

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Domestic pig. Credit: Scott Bauer, USDA

A team of researchers with members from several institutions in China and one in the U.K. has used the CRISPR-Cas 9 gene editing technique to cause test pigs to retain less bodyfat. In their paper published in *Proceedings of the National Academy of Sciences*, the team describes

their gene editing experiment, their success rate and the condition of the genetically modified pigs that were born as part of the experiment.

Pig farmers know that piglets are particularly susceptible to cool or cold temperatures. This is because unlike most other mammals, they do not have a gene called UPC1. This particular gene has been found to play a major role in regulating body temperature, especially when it gets cold. Older pigs are at less risk in cold weather because they have stored more body fat to insulate themselves. Recognizing this to be a problem that could perhaps be solved by modern gene editing techniques, the researchers conducted experiments with CRISPR-Cas9 and pig embryos.

The researchers used the gene editing technique to add a mouse version of the gene to the pig genome by inserting it into embryo cells—the embryo was then implanted into the uterus of a normal mature sow. The team did this 13 times and report that three of the implants took, causing the female to become pregnant. Those three sows then gave birth to 12 male piglets.

The researchers monitored the piglets as they grew older and found that all of them were better at staying warm when it grew cold. Additionally, they had on average 24 percent less fat on their bodies. The lowered fat levels were due to a faster metabolism required for keeping warm. At six months, all of the pigs were killed and studied to determine if the gene editing caused any other changes. The researchers report that they found nothing unusual, and the pigs had a normal ability to reproduce—one of the test pigs had been allowed to mate before it was euthanized, producing healthy offspring.

At this time, it is not clear if such pigs would actually be used for human consumption in China. They almost certainly would not in the U.S. and many other countries due to health concerns surrounding GMO food products.

More information: Qiantao Zheng et al. Reconstitution ofUCP1using CRISPR/Cas9 in the white adipose tissue of pigs decreases fat deposition and improves thermogenic capacity, *Proceedings of the National Academy of Sciences* (2017). DOI: 10.1073/pnas.1707853114

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