

Researchers put mouse gene in cattle to make them less susceptible to TB

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Credit: Wikipedia

(Phys.org) —A team of researchers working at Northwest A&F University in China has found that introducing a particular mouse gene into cattle can give them better protection against tuberculosis. In their paper published in *Proceedings of the National Academy of Sciences*, the team describes how they moved the gene and then their tests to see how

well the cattle with the new gene were able to ward off a TB infection.

TB infections in [cattle](#) costs growers in many countries millions of dollars every year, the current strategy for combating the disease is to separate those that are infected from those that are not, and then either kill the infected animals, or try to keep them alive long enough to get them to slaughter. Neither approach has been satisfactory. In this new effort, the team in China sought to find out if a way might be had to give cattle immunity to the disease via genetic modification.

The team looked to mice, which are immune to *Mycobacterium bovis*, the virus that causes bovine TB—they have a gene (SP110) that protects them. Using a technique called Transcription activator-like effector nuclease (TALEN) the team extracted the gene from a mouse sample and spliced it into the genome of 23 calves—13 of which lived to grow to be adults. To see if the gene had any impact, the [researchers](#) deliberately placed virus samples directly into the lungs of three of the genetically modified cattle and three normal cows serving as a control group. One of the GM cows showed no signs of infection and the other two exhibited only moderate symptoms. The three normal cows all showed normal infections. In another test, the researchers housed nine of the GM cows with infected normal cows, along with nine normal cows. As expected the normal cows all got normal infections. Six of the GM cows on the other hand exhibited no signs of infection and the other three showed only moderate symptoms.

The team reports that introducing the SP110 gene into the cow genome did not appear to have any spillover, a term used to describe unintended changes to the genome. Also, they noted that the gene was passed onto offspring, possibly offering them immunity benefits as well. The team acknowledges that their work thus far is still preliminary—it is still not clear if the technique will work when cattle are exposed to very high amounts of the virus.

More information: TALE nickase-mediated SP110 knockin endows cattle with increased resistance to tuberculosis, Haibo Wu, *PNAS*, [DOI: 10.1073/pnas.1421587112](https://doi.org/10.1073/pnas.1421587112)

Abstract

Transcription activator-like effector nuclease (TALEN)-mediated genome modification has been applied successfully to create transgenic animals in various species, such as mouse, pig, and even monkey. However, transgenic cattle with gene knockin have yet to be created using TALENs. Here, we report site-specific knockin of the transcription activator-like effector (TALE) nickase-mediated SP110 nuclear body protein gene (SP110) via homologous recombination to produce tuberculosis-resistant cattle. In vitro and in vivo challenge and transmission experiments proved that the transgenic cattle are able to control the growth and multiplication of *Mycobacterium bovis*, turn on the apoptotic pathway of cell death instead of necrosis after infection, and efficiently resist the low dose of *M. bovis* transmitted from tuberculous cattle in nature. In this study, we developed TALE nickases to modify the genome of Holstein–Friesian cattle, thereby engineering a heritable genome modification that facilitates resistance to tuberculosis.

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