Gene-editing Alpine goats for resistance to prion disease

From paper

SHORT SUMMARY FOR PRACTITIONERS:

Prion diseases — such as scrapie in goats and sheep, or BSE ("mad cow disease") in cattle — are fatal brain disorders caused by misfolded proteins. They pose a significant threat to animal health and, in some cases, to human health. It is already known that animals lacking the prion protein (PrP) are fully resistant to these diseases. This study used CRISPR/Cas9, a precise gene-editing tool, to inactivate the gene responsible for producing this protein – the PRNP gene – in Alpine goats, creating what are known as knockout (KO) animals.

Using gene editing on early goat embryos, the researchers produced 10 live offspring, 8 of which carried at least one edited version of the target gene (PRNP). Among these, five different mutations were predicted to eliminate prion protein production entirely — the key requirement for full disease resistance. One male goat carrying a confirmed KO version of the gene on both chromosomes has already been used to breed with normal females, allowing a line of prion-resistant Alpine goats to be established for further study.

The practical recommendation from this work is that gene editing offers a viable route to produce goats that completely lack the prion protein, enabling the creation of PRNP-knockout lines with genetic resistance to scrapie and potentially other prion diseases — including emerging threats such as chronic wasting disease in deer. This could significantly reduce animal losses from prion disease, improve biosecurity in goat farming, and reduce reliance on costly disease management practices. Future studies will evaluate whether these goats remain healthy and productive across all farming conditions and compare the gene-edited approach with traditional breeding methods for disease resistance.

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