Evidence provided by researchers from the University of Warwick has helped cut the number of lame sheep in the UK national flock by half, saving the industry £700M over ten years and preventing 7.5 million sheep from becoming lame every year.

In 2004, approximately 10% of sheep in the UK were lame, and 80% of cases were caused by footrot, a bacterial disease that causes inflammation in the feet and results in substantial weight loss, chronic pain and stress for diseased animals.

The researchers, led by Professor Laura Green, found that a single injection of antibiotic helped sheep suffering from footrot recover much faster than traditional treatments. They also showed that foot-trimming, a traditional recommendation to prevent lameness actually causes lameness in some animals.

Over the past 15 years, Green and colleagues have worked with the Sheep Veterinary Society (SVS) and industry body AHDB Beef & Lamb to engage UK sheep farmers, vets and other key players in the industry. As a result of their work, the prevalence of lameness among English sheep has fallen from 10% in 2004 to 5% in 2013.

BBSRC funding, alongside funding from Defra, AHDB and others, played an important role in enabling the researchers to understand the mechanistic biology and epidemiology of footrot and disseminate their findings.

Throughout the research, Green collaborated with colleagues at Warwick as well as Dr Jasmeet Kaler at the University of Nottingham (a former PhD student and post-doctoral researcher in Green’s research group) and Dr Rose Grogono-Thomas at the University of Bristol.

Chronic pain
In 2015, in the UK, there were 15.1 million sheep and lambs, and 75,000 flocks of sheep in England alone. Lameness is an endemic disease of UK sheep, meaning that it is always present. In 2004, around 10% of the UK national flock suffered from lameness, and it is often reported as the top welfare concern of farmers. Green calculated that lameness cost UK farmers between £70M and £210M annually.

80% of cases of lameness in sheep in the UK are due to footrot; a bacterial disease caused by the bacterium Dichelobacter nodosus. Diseased sheep have inflamed, red and painful skin on their feet, causing them to limp. “Ultimately the infection goes under the horn, like going...
Lameness treatment guidelines save UK farmers £700M

under a nail, and the horn will pop away, so you can imagine how painful that is,” Green explains.

Within a week of becoming lame, sheep with footrot start losing weight. The chronic pain also leaves the animals with a reduced ability to cope with other stresses.

Farmers typically managed lameness through twice-yearly foot-trimming of the whole flock, where they cut away overgrown hoof horn, and sprayed any infection with a disinfectant. However, causing feet to bleed during foot-trimming leads to chronic lameness, and affected sheep often have to be killed because they do not recover. Use of these techniques is often rooted in tradition rather than scientific evidence, but now more than half of sheep farmers no longer routinely foot-trim their sheep.

An antibiotic injection

Green was interested in reducing lameness rates, and in understanding whether foot-trimming and spraying were the most effective treatments for footrot. By surveying farmers, Green could identify those who were successfully controlling the disease. From that, the researchers ran a clinical trial to test different treatment options and showed that traditional foot-trimming strategies were not the most effective treatment. Instead, they found that 95% of sheep treated with an antibiotic injection recovered fully within ten days, compared with 25% of those treated using traditional methods.

“Although there was evidence previously that if you use an antibiotic injection some sheep get better, it was rarely done. It wasn’t recommended by vets, and a lot of farmers didn’t like to use antibiotics because they like to view sheep as a ‘green’ product, so antibiotics are avoided” says Green. There are also concerns around the misuse of antibiotics, which is leading to a rise in antibiotic resistance infections.

However, the research showed that treating lameness caused by bacterial disease with a single dose of antibiotic is appropriate and, used in a timely way, protects the health and welfare of the flock and ultimately reduces antibiotic use.

Alongside the epidemiological work with farmers, BBSRC funding also helped the researchers understand the underlying biology of footrot, and showed that what was previously thought to be two diseases, interdigital dermatitis, or scald, and footrot, were in fact the same disease, caused by *Dichelobacter nodosus*.

“That’s really important for control,” Green explains. “By explaining this to vets and farmers, instead of treating this as two conditions managed in two different ways, they’re now seeing it as one condition they need to manage in the same way, and they get control much faster. The underlying biology is really useful to explain the ‘why’ to people.”

BBSRC International Scientific Interchange Scheme (ISIS) funding enabled Green to work with Indian farmers, where footrot is an emerging disease. “A lot of the flocks are very small, and they’re owned by very poor farmers,” says Green. “Some of the flocks we visited have sheep that had been lame for two years. Their productivity is really low which keeps these farmers in poverty. They were trying very traditional treatments and were not using antibiotic treatments.”

Through their visits, Green and colleagues were able to run a trial and found that, even for sheep that had been lame for two years, antibiotics were an effective treatment.
‘A large number of isolated farmers’
“In the sheep industry you have a large number of isolated farmers,” Green explains. “Trying to get information to them and understanding why they do what they do, and where they got their information from is all part of the process of rolling out information and stimulating change.”

To reach such large numbers of independent farmers across the UK, as well as vets and others in the sheep farming industry, and to address their concerns about changing their methods, Green worked with several different groups. For instance, since 2002 Green has worked with the Sheep Veterinary Society to deliver talks to vets to ensure they are aware of the outputs of her research. In 2012, SVS produced national recommendations for managing footrot, based on Green’s research. As most cattle vets also see sheep, the British Cattle Veterinary Association has started hosting talks on sheep at their annual conference. Green attended the first of these, and ran a session on footrot in sheep, which was full to capacity. “It is great to see cattle vets engaged in updates on sheep research, so they can help their clients,” says Green.

Working closely with AHDB Beef & Lamb, the organisation for beef and lamb levy payers in England, enables Green to engage with farmers through the ‘Better Returns’ programme1. 18,000 farmers subscribe to the programme, which informed a publication on lameness in sheep with recommendations to Government that farmers in Great Britain have a target to reduce lameness to 5 % by 2016 and 2 % by 2021. The 2016 target has already been met.

These engagement activities have made a difference to attitudes and practices in the sheep farming industry. Attendees at a focus group for key players in the sheep farming industry, run by Green and colleagues, felt that Green’s research had given them ‘permission’ to use antibiotic injections. According to Green, “there was a feeling that it could only be used when you had a sheep that had been lame for a very long time – as a last resort, give an antibiotic injection - whereas our research showed it should be your first, quick treatment so you don’t get these animals in a position where they’re chronically lame before you try to treat them.”

With foot-trimming, “they genuinely didn’t know the harm that trimming was doing, so that was a completely new finding that came out of the work we’d done,” says Green.

**Farmers of the future**
Green is keen to engage future farmers and vets during their training. At least three of the UK’s vet schools are using the results of Green’s research, and she hopes to work with students on further and higher education agricultural studies courses to ensure they are using the most appropriate practices.

**REFERENCES**
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The 2016 target of 5 % prevalence of lameness in sheep was achieved in 2013. Green’s research suggests it could fall further ‘we think around a third of lameness is now down to over-trimming feet. If we could stop those farmers still doing that we could reduce lameness again to about 3.5 %’ says Green.