

**R**esearchers from the UK and India have proposed improved methods to sustainably control the endemic cattle disease Brucellosis in Punjab, India. The team<sup>1</sup> is now working with animal and public health officials in Punjab to inform control programmes for the disease.

The project was enabled by joint funding from BBSRC and the Department of Biotechnology (DBT) in India.

Brucellosis is an infectious animal disease that can cause infertility, abortions and low milk yield in infected cattle<sup>2</sup>. It is also a zoonosis, meaning that it can be passed on to humans who have contact with infected animals or consume milk and dairy products from those animals. Symptoms in humans include fever, headaches, joint pain and fatigue. The World Health Organization estimates that in 2010 there were more than 400,000 new cases of human brucellosis acquired from food<sup>3</sup>.

In Punjab, India, the disease creates a huge societal and economic burden as people with the disease may be too unwell to work, and will require a long course of antibiotics. Infected livestock are less productive, imposing a cost on farmers<sup>4</sup>. However, livestock farmers in the region are not always aware of either the disease or the importance of prevention to protect their health and livelihoods<sup>5</sup>.

## Widespread in the area

To identify sustainable control strategies that are appropriate for the region, researchers in the UK and India, led by Professor Javier Guitian and Hannah Holt at the Royal Veterinary College used a multidisciplinary approach involving surveys in dairy farms and simulation of potential control programs based on livestock vaccination<sup>6</sup>.

In addition, Dr Rajesh Kumar from the Post-Graduate Institute for Medical Education and Research (PGIMER) and Dr Punam Mangtani from the London School of Hygiene and Tropical Medicine (LSHTM) led a parallel survey of brucellosis in the general population, where cattle ownership is relatively common.

The project demonstrated for the first time that the general rural population in Punjab are also exposed to brucellosis, as well as it being an important occupational zoonosis. The researchers also found that contact with cattle may be more important as a route of disease transmission than consumption of cattle dairy products. This was exacerbated by a lack of hygiene around calving as well as some social and institutional barriers to control including cultural sensitivities regarding the slaughter of cows and a lack of sufficient quantities of vaccines.

Computer models of how the disease is spread within herds of cattle in the region suggest that vaccination campaigns would need to run for longer in dairy farms in Punjab than in standard European production systems, due to the age of Indian cattle. According to lead researcher Professor Javier Guitian, "it is not enough to just vaccinate once or twice and just stop. Discontinuation has been a huge issue in some countries."<sup>5</sup>

As well as this, models of transmission between herds suggest that targeted vaccination of high-risk farms, may be more cost-effective in comparison to mass vaccination. However, "The importance of vaccination being made available to poorer household herds is an equity issue and should be considered," says Mangtani.

They also found that vaccination efforts should focus on calves, as there are known side effects with adult animals, such as inducing abortions and the study found farmers are reluctant to vaccinate adult animals.

## IMPACT SUMMARY

**Researchers in the UK and India have identified sustainable control strategies to reduce the prevalence of bovine brucellosis in Punjab, thanks to joint funding from BBSRC and the DBT in India.**

**Brucellosis is one of the most commonly acquired zoonoses worldwide and it creates a huge burden in Punjab, India through human disease and reduced livestock productivity.**

**Lessons learned from applying diagnostic assays in Punjab have benefitted testing being done as part of the surveillance program to ensure the UK remains free of Brucellosis.**

**Professor Guitian has been appointed a member of the Expert Committee for a programme establishing Brucella free villages in India. This will be established in phases by at least ten Indian States, including Punjab, for the effective management of Brucellosis.**



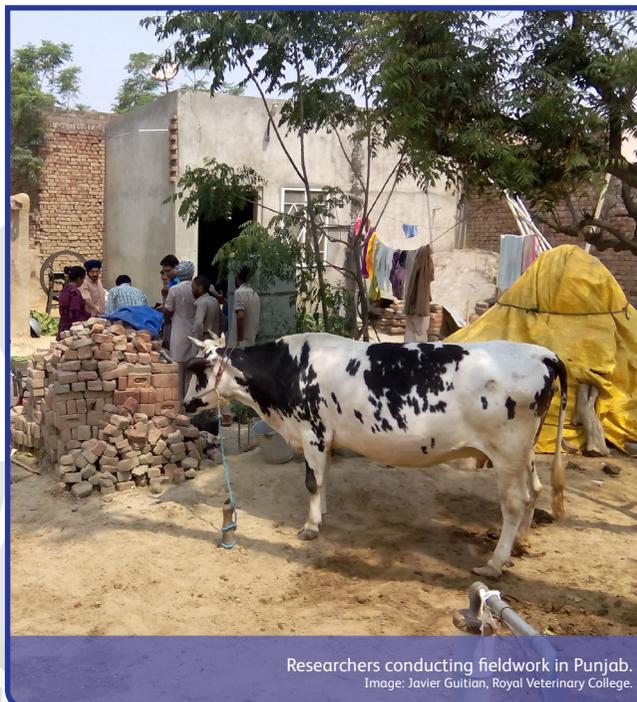
Cattle in Punjab, India. 15% of cattle in the region have been exposed to Brucellosis.  
Image: Javier Guitian, Royal Veterinary College.

## Improved disease control and testing

Based on their findings, the researchers recommended strategic vaccination with the aim of sustained reduction in prevalence of Brucellosis in Punjab, which Dr Guitian says is “a realistic objective; more realistic than expecting full elimination of the disease.”

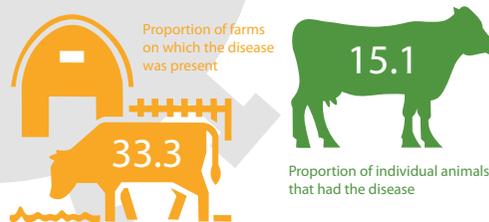
The Punjab State Health Department has been engaged with the project from the outset, and animal and public health officials in Punjab are now using the results and protocols developed during the project. These are also being shared more widely across India through Professor Guitian’s participation in the expert committee for the Brucella Free village programme, a pilot control program to be established in phases by at least ten Indian States, including Punjab. Stakeholder workshops held as part of the project have resulted in plans to tackle the disease through enhanced inter-sectoral collaboration. In addition, a State-level working group has been formed by Professor Kumar at PGIMER to develop best practice guidelines for diagnosis and treatment in humans.

The research will also benefit the UK. At the moment, the UK is free from brucellosis, although, significant resources are dedicated to surveillance in order to ensure that this free status is maintained. The project provided an opportunity to deploy the assays that are currently being used as part of the UK surveillance program in an area where infection is common. Dr John McGiven who works at the OIE Reference Laboratory for Brucellosis at the Animal and Plant Health Agency in the UK and a co-investigator on this project says, “the study in Punjab gave us an opportunity to test an adaptation designed to improve a critical surveillance tool, a method to detect anti-Brucella antibodies in milk that is also used in the UK.”



Researchers conducting fieldwork in Punjab.  
Image: Javier Guitian, Royal Veterinary College.

During the study, the researchers showed that the disease was widespread in the area



In the human population, the number of people testing positive for Brucellosis antibodies\* was higher in farm workers:

General population: 2.4%

Farm workers: 6.6%

\*presence of antibodies indicates the person has previously been exposed to the disease

## REFERENCES

- 1 Including researchers from: the Royal Veterinary College, the London School of Hygiene and Tropical Medicine (LSHTM) and the Animal and Plant Health Agency in the UK, together with the Guru Angad Dev Veterinary and Animal Sciences University (GADVASU) and the Post-Graduate Institute for Medical Education and Research (PGIMER) in India.
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- 3 Burden of foodborne diseases, World Health Organisation: [http://www.who.int/foodsafety/areas\\_work/foodborne-diseases/ferg/en/](http://www.who.int/foodsafety/areas_work/foodborne-diseases/ferg/en/)
- 4 Combined use of novel diagnostic tools and strategic vaccination to control bovine brucellosis in endemic areas, BB/L004836/1. UKRI. [http://gtr.ukri.org/projects?ref=BB % 2FL004836 % 2F1](http://gtr.ukri.org/projects?ref=BB%2FL004836%2F1)
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- 6 Awareness, knowledge, and risks of zoonotic diseases among livestock farmers in Punjab. [www.ncbi.nlm.nih.gov/pmc/articles/PMC4819370/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4819370/)