UK-INDIA COLLABORATION ON BLUETONGUE RESEARCH

A research project co-funded by BBSRC and the Department for International Development (DFID) is supporting a unique collaboration between UK and Indian researchers investigating bluetongue virus in India.

The international team of researchers, led by Dr Simon Carpenter from the Institute for Animal Health (IAH), are investigating the causes of regular damaging 'hyper-endemic' outbreaks of bluetongue in farm animals in India[1]. They are also looking at ways to control the Culicoides midges that spread the virus that causes the disease.

The project[2] was funded as part of the £13M BBSRC-DFID Combating Infectious Diseases of Livestock for International Development (CIDLID) initiative[3], which also received a contribution from the Scottish Government.

Bluetongue is endemic in India, and some strains of the virus cause substantial damage to the sheep flocks kept by rural subsistence farmers. Regular hyper-endemic outbreaks can also kill 30 per cent of animals in a flock.

BBSRC's actions as a leading UK funder of bioscience research and training enable it to have a significant impact on society in the UK and overseas. Often, that impact is delivered in partnership with researchers, users and other funders. The CIDLID programme aims to have a long-term impact on issues of global importance by bringing together researchers and stakeholders from around the world.

As a result, Carpenter's research has brought together leading UK research institutions such as IAH, which has an excellent track record of research into bluetongue epidemiology, with local experts. In particular, Carpenter was the first UK scientist invited to attend a meeting of the All India Network Programme on Bluetongue[4] (AINP-BTV), which aims to understand bluetongue in India and develop a strategy to control the disease.

"Because of the existing network, we can roll out techniques such as the molecular identification of biting midges to other labs across India very effectively and rapidly," says Carpenter.

The research also relies on the involvement of co-investigator Dr Gaya Prasad at the Indian Council of Agricultural Research[5]. According to Prasad, the collaboration helps to address gaps in the network's expertise; "Substantial progress has been made under this [AINP-BTV] programme, including development of a pentavalent inactivated vaccine based on local strains. One area which the All India Network could not address effectively was the [Culicoides midge] vector, due to lack of expertise."

"The joining of IAH and other UK experts in the

Impact Summary

BBSRC and DFID co-funding has enabled UK researchers to work with counterparts in India to study the causes of devastating 'hyper-endemic' outbreaks of bluetongue disease. The work builds on IAH's strengths in bluetongue epidemiology research, which includes being Community Reference Laboratory for Europe, and the local knowledge and expertise provided by researchers from the All India Network Programme on Bluetongue.

The IAH researchers are also providing training for Indian researchers and PhD students to help build capacity to tackle bluetongue.

A sheep in Karnataka state showing clinical signs of bluetongue. *Credit: Dr Mudassar Chanda*

Indian Council of Agricultural Research-funded AINP-BTV has greatly strengthened the bluetongue research programme in India, particularly the vector aspect. The understanding of seasonality, vector density, vector species and other vector-related aspects at rural farm level, and environmental factors contributing to occurrence of the disease will help in developing an effective intervention strategy for this economically very important disease."

Prasad's local contacts and understanding of the research approval process in India also ensured the project was approved by the Indian Council for Research. "The systems in India are very different to the UK so, without a local contact, getting the project off the ground would have been extremely challenging," Carpenter adds.

Bluetongue in India

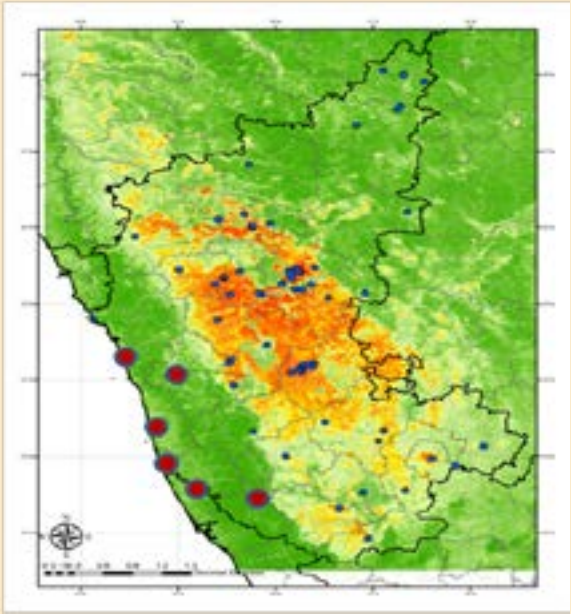
The livelihoods of many rural Indian communities depend on their flocks of sheep. "Livestock husbandry is one of the major sources of livelihood for landless and marginal farmers in India. Therefore, multi-host livestock diseases such as bluetongue have serious consequences for livelihood security for resource-poor farmers," says Prasad.
"The animal husbandry sector has shown high growth in India, and its contribution to agricultural GDP (gross domestic product) has gone up over the years from 13.8 per cent in 1981 to 24.2 per cent in 1999-2000," says project PhD student Dr Mudassar Chanda.
The loss in productivity caused by the virus has serious health implications for India. "Even though India ranks third in sheep population globally, and it's one of the important sources of meat along with goat, there is still a 7.71 kg per year per person deficit[6] as per the dietary requirements guidelines proposed by ICMR (Indian Council for Medical Research)," Chanda explains.

"One of the important reasons affecting production is infectious diseases of sheep, of which bluetongue is among top five diseases, causing huge economic losses to the farmers, affecting their livelihood, and also a threat to food security of the country," he adds.

While bluetongue virus is endemic in India, some strains inflict substantial numbers of clinical cases each year. Flocks are also at risk from regular hyper-endemic outbreaks, which the researchers believe could be caused by the annual monsoon. During one of these outbreaks, bluetongue can kill 30 per cent of sheep in a flock.

"We think that these outbreaks may be linked to monsoon conditions, as these determine the availability of Culicoides larval habitats and the extent to which grazing livestock are bitten by infected midges" says Dr Beth Purse, an ecological modeller from the Centre for Ecology & Hydrology in Edinburgh and one of the project's co-investigators.

Predicting bluetongue outbreaks



Credit: Dr Mudassar Chanda

This map shows areas suitable for bluetongue outbreaks (yellow to red) and unsuitable (green). The final project risk maps should be useful for State Veterinary Officers involved in planning vaccination and surveillance programmes.

Although not always fatal, the virus also causes a fever and swelling of an infected animal's feet, mouth, lips and nasal passages[7]. Those animals that survive the infection can lose weight and produce less meat, and the costs of on-going veterinary care can be significant[8]. A vaccine developed by the AINP-BTV will soon be available in India, but it is likely to be too expensive for some rural subsistence farmers and will be used on a voluntary basis.

Future Impact

Carpenter, Purse and colleagues are also beginning to examine what factors affect the distribution of bluetongue at the farm level, in the landscape around farms and at a regional level. Purse has found that contact with the AINP-BTV has helped Chanda access local expertise and data which might not have been accessible otherwise. So far, Chanda has collated data on how the patterns of bluetongue in India have changed over the last two decades. The research has already produced preliminary maps to predict high risk areas for bluetongue.

"The knowledge derived through AINP and BBSRC funded project is used to advise the resource poor sheep farmers to minimise the impact bluetongue disease in hot and humid season from August through November when clinical disease outbreaks occur," says Prasad.

The project will also help to build capacity in India by providing PhD training and training courses for Indian researchers.

Their ultimate aim is to create an early warning system that can be used by Indian state veterinary officers to plan vaccinations. According to Purse, "with bluetongue in India, it's a good example of where we might be able to have an impact."

Notes and references

1. Project details: http://www.bbsrc.ac.uk/pa/grants/AwardDetails.aspx?FundingReference=BB%2fH009205%2f1
2. IAH CIDLID project: http://www.iah.ac.uk/CIDLID/A648.aspx
3. Project announcement: http://www.bbsrc.ac.uk/news/food-security/2010/100215-pr-livestock-threat-reduce-poverty-increase-food-security.aspx
4. All India Network Programme on Bluetongue: http://www.ainpbt.com/
5. Indian Council of Agricultural Research: http://www.icar.org.in/animal-science.htm
6. Figures from the Indian Government Planning Commission 10th Five Year Plan 2002-2007: http://planningcommission.nic.in/plans/planrel/fiveyr/10th/volume2/v2_ch3_3.pdf
7. Bluetongue disease facts: http://www.iah.ac.uk/disease/Bluetongue.aspx
8. See: http://edis.ifas.ufl.edu/in768