

The Walk to Boma'. Credit: Rebecca Bodenham



Zoonoses and Emerging Livestock Systems (ZELS)

Reducing the risk to livestock and people

Supplementary Research Projects 2019-2021

About the Zoonoses and Emerging Livestock Systems (ZELS) programme

The vision of ZELS is to make a step change in the research evidence available to inform decision makers on how to minimise the health risks associated with the rapidly changing nature of livestock systems in developing countries, focusing on those risks which impact on the livelihoods and health of poor people.

Key aims

The key aims of this programme are:

- To reduce the impact of zoonoses on poor people and their livestock. The initiative recognises that priorities for endemic, new and/or (re)-emerging zoonotic diseases may vary from region to region. It will address the problem of zoonoses by generating high quality research in technical and policy areas.

- To forge mutually beneficial interdisciplinary partnerships between researchers in the UK and developing countries that improve intellectual collaboration and generate long-term enhanced scientific capacities for southern partners.

Research and Training

Launched in October 2012, the first tranche of the initiative was made up of 11 projects, worth £18.5M of funding, investigating emerging and endemic zoonotic diseases in developing countries.



Credit: Poppy Berdoy-Webster

This call consisted of two components:

1. Topic Specific Project Grants (TSPGs) are multi-partner, small and targeted projects that either address specific research gaps in knowledge, which are likely to constrain delivery of the overall goal and may be relevant to a number of livestock systems or address contextual issues relevant to ZELS;
2. Research Partnership Grants (RPGs) are multi-partner larger system-level projects aimed at understanding the functioning of various parts of the system, as well as the system as a whole, and which will thereby deliver the type of integrated output required for a step change in evidence provision. Some of these integrated outputs may incorporate findings from TSPGs.

Since then, UK researchers have worked in partnership with more than 30 overseas institutes and organisations to generate scientific evidence to inform the selection of risk-based and cost-effective prevention and control options which may contribute to decreasing the likelihood of occurrence, prevent the transmission, and reduce the impact of major zoonotic diseases.

Live birds market, Hanoi, Vietnam. Credit: Munir Iqbal



The projects offer significant benefits to British farmers and consumers. Several of the zoonoses being tackled by the initiative have already had serious consequences in the UK. Global supply chain systems and climate change may result in more zoonoses crossing our borders.

A key outcome of these collaborations is to enhance the scientific capabilities of developing countries for the longer term. £1.5M of the funding was set aside specifically to do this. Since 2015, a cohort of 16 students from the UK and developing countries received doctoral training in ZELS related research.

In 2019, a further tranche of £2.6M funding was made available by the Department of International Development. Six projects have been awarded to take earlier or ongoing ZELS research to the stage of practical application to deliver benefit and impact in developing countries.



Tito community workshop. Credit: Alicia Davis

Operationalizing One Health Interventions in Tanzania

Operationalizing One Health Interventions in Tanzania will work with animal and human health workers, and local community and national government stakeholders, as it seeks to develop interventions to prevent and control zoonotic diseases in poor, livestock-keeping communities in Tanzania. By causing ill health in people, and productivity losses in livestock, these diseases have a severe impact on people's livelihoods.

The project builds directly on two ZELS projects, Social, Economic and Environmental Drivers of Zoonoses in Tanzania (SEEDZ) and the Molecular Epidemiology of Brucellosis in Tanzania. It will see two linked spheres of activities that focus on pastoral communities which are most vulnerable to zoonotic diseases.

The first activity will focus on improving human healthcare for zoonotic diseases by undertaking a survey on people's use of healthcare service to see where enhanced access and provision is needed. The second will see community based co-researchers working with academic researchers to develop and carry out interventions aimed at reducing multiple infectious disease risks through behaviour and livestock-management change. The span of research activities also aims to strengthen Tanzania's interdisciplinary capacity for One Health interventions.

The team's partnership with the Tanzanian One Health Coordination Desk in the Prime Minister's Office, established during the original ZELS projects, will ensure that the findings from this second phase of research will directly inform the Tanzanian One Health Strategic Plan.

Collaborators

- University of Glasgow, UK
- Kilimanjaro Clinical Research Institute, Tanzania
- Duke University, USA
- Otago University, New Zealand
- Nelson Mandela Africa Institution of Science and Technology, Tanzania
- Ministry of Livestock and Fisheries, Tanzania
- University of St Andrews, UK

Contacts

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- Dr Jo Halliday, University of Glasgow. jo.halliday@glasgow.ac.uk

ENABLES: Enabling Livestock-Keepers to Eliminate Sleeping Sickness

ENABLES will test the hypothesis that a simple insecticide application to cattle could provide a cheap and easy One Health solution to control sleeping sickness in people. The research builds on the ZELS project Life on the Edge: Tackling Human African Trypanosomiasis on the Edge of Wilderness Areas, which worked in areas where the Serengeti National Park in Tanzania meets farmed land. Here, tsetse flies transmit the trypanosomes that in people cause sleeping sickness, an acute and fatal disease for which there is no preventative vaccine or drug.

Wilderness areas, where pathogens in wild animals can spill over to infect people and livestock, present a chronic source of trypanosome infection. However, Life on the Edge found that livestock-keepers in the research area were preventing the spread of sleeping sickness by applying pyrethroid insecticides to their cattle, encouraged by a government subsidy for pyrethroids.

Cross-sectional cattle sampling, Serengeti District. Credit: Harriet Auty



Farmers use insecticides to control the ticks and tsetse that carry livestock diseases, but these measures also interrupt transmission of disease in humans.

ENABLES researchers will use satellite data to identify sleeping sickness ‘hotspots’, test cattle for infection and pyrethroids presence, and survey herd owners and others along the pyrethroid supply chain to gain insights into the causes and consequences of insecticide use. They will use models to integrate data and assess the benefit of pyrethroid-treated cattle. Their findings will form the basis of a toolbox to help Tanzania and other countries develop evidence-based policies and practices for the sustainable control of sleeping sickness.

Collaborators

- The Roslin Institute, University of Edinburgh, UK
- Scotland’s Rural College, UK
- University of Glasgow, UK
- Tsetse and Trypanosomiasis Research Institute, Tanzania
- South African Centre for Epidemiological Modelling and Analysis, Republic of South Africa

Contacts

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Sustainable Control of Livestock Schistosomiasis in Africa to Improve Human and Animal Health and Productivity (CATTLES – Control And Targeted Treatment for Livestock Emerging Schistosomiasis)

Sustainable Control of Livestock Schistosomiasis in Africa to Improve Human and Animal Health and Productivity will work within a One Health framework to improve the understanding and control of schistosomiasis, a neglected tropical disease which affects the poorest people of the world and has severe livelihood impacts.

The research will build on the work of the previous ZELS project ‘SHEEP’ (Schistosoma Hybridisation Evolution, Epidemiology and Prevention), which found that hot-spots of schistosomiasis transmission and sickness among both children and adults in West Africa are being driven not by the human form of the parasite, as previously assumed, but through the viable hybridisation of the human species of the parasite with the species found in livestock. These zoonotic hybrid parasites have a broader host range and are having a substantial impact on the incidence and distribution of the disease. They also present new challenges for effective control of the disease, particularly as it becomes apparent that the disease cannot be eliminated in people if there are animal reservoirs of infection.

The new project will research human-livestock interactions and quantify the costs of infected animals to subsistence farmers. It will design and evaluate a targeted Test, Treat, Track (T3) control programme for livestock schistosomiasis, with integrated predictive mathematical modelling assessing the potential for evolution and establishment of drug resistance. Inherent within this, it will help enable access to and appropriate use of suitable veterinary-approved drug formulations to implement on animals and improve sustainable disease control for people. Finally, through a series of workshops and training, together with a broader international symposium, it will help educate on the importance of a One Health perspective if successful disease control is to be achieved.



Senegalese boys before testing for schistosomiasis. Credit: Poppy Berdoy

Collaborators

- Royal Veterinary College, London, UK
- Institute of Development Studies, UK
- St Louis University Gaston Berger, Senegal

Contacts

- Professor Joanne Webster, Royal Veterinary College. jo.webster@rvc.ac.uk



Mix of different bird and mammal species at live market in Cairo, Egypt. Credit Munir Iqbal

Reducing the Economic and Zoonotic Impact of Avian Influenza (REZIAI): Delivering Novel Vaccines and Diagnostics from Laboratory to the Field.

The REZIAI project will work in Pakistan and Vietnam to produce innovative disease control tools which will improve the livelihoods of smallholder farm workers while helping to make the world safer from the threat of pandemic avian flu.

Safe and disease-free poultry production systems are crucial for sustainable growth of the poultry sector, but in recent years a range of avian influenza viruses have caused devastating damage to poultry production in Pakistan and Vietnam, as well as presented a risk to human health on a global scale.

Detection of circulating viruses and vaccination is key to disease control. However, the viruses evolve over time resulting in vaccine and diagnostics failure.

The ZELS project Combating Bird Flu by Developing New Diagnostic Tools and Vaccines researched how avian influenza viruses evade vaccine-induced immunity in poultry, and developed new vaccine technologies and important diagnostic tests.

The new REZIAI project will take these data sets, resources and technologies to further improve vaccines and diagnostics and transfer them to in-country collaborating laboratories. This will increase these countries' ability to produce next-

generation disease-control tools to help reduce poultry production losses, directly benefiting farming communities, in particular for the women and young people who comprise a high proportion of the farming workforce. This work will also be important for global food security and help to reduce the possibility of zoonotic avian influenza transmission to people.

Collaborators

- The Pirbright Institute, UK
- Imperial College London
- Royal Veterinary College, London
- National Centre for Veterinary Diagnosis, Hanoi, Vietnam
- University of Veterinary and Animal Sciences Lahore, Pakistan

Contacts

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Myanmar Pig Partnership Project Expansion

Diarrhoea and vomiting caused by direct and indirect contact with animals and animal products are deeply damaging but often unrecognised blights on human health and wellbeing, particularly for poor people in low- and middle-income countries. The Myanmar Pig Partnership Project Expansion will generate information on the toll such illness from pigs and pig products takes on people in Myanmar, whether acquired through eating infected meat or through direct contact with animals on farms.

The work builds on data gained in the ZELS project An Integrated Management-Based Approach For Surveillance and Control of Zoonoses in Emerging Livestock Systems: Myanmar Pig Partnership, which has identified opportunities for interventions to improve animal health, farm productivity, rational use of antibiotics and awareness of occupational and food-borne zoonotic risks.

This second phase of work will see a pilot diarrhoea surveillance set up to obtain data on the leading pathogens causing infectious diarrhoea in Myanmar. It will also develop, pilot and evaluate consumer and occupational health advice for the prevention of pig and pig-meat associated zoonoses in Myanmar.

Finally, it will convert research outputs into useful communication tools to inform policy development in food safety and antibiotic resistance, for strengthening veterinary expertise in pig health management, and to enable understanding and uptake of relevant findings by the widest possible group of stakeholders.

Collaborators

- University of Cambridge, UK
- Institute of Development Studies, UK
- Myanmar Department for Medical Research, Myanmar
- Myanmar Livestock Breeding and Veterinary Department, Myanmar
- Oxford University Clinical Research Unit, Vietnam

Contacts

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Field visit to a farm in the Yangon region of Myanmar. Credit: Naomi Marks





Skin Testing Holstein Fresian Cattle in Addis Ababa. Credit: Bedaso Edao

ETHICOBOTS 2 – One Health Research for Impact

ETHICOBOTS 2 – One Health Research for Impact will provide practical control strategies for bovine tuberculosis in Ethiopia, a country where cattle farming is intensifying to meet the high demand for dairy products from its rapidly growing urban population.

The ongoing ZELS project Ethiopian Control of Bovine Tuberculosis Strategies (ETHICOBOTS) is currently providing the scientific basis for control strategies and ETHICOBOTS 2 will go one step further by addressing a major evidence gap regarding the cause of tuberculous in people at high risk of exposure to infected cattle. The project will provide clear, evidence-based tools needed to tackle bovine tuberculosis in different sectors of the dairy industry as well as its zoonotic transmission to people.

The team will work closely with Ethiopia's Ministry of Agriculture and Livestock to clear government farms of bovine tuberculosis, so providing a local exemplar of how surveillance programmes can be successfully implemented.

The team will also bring to Ethiopian dairies innovative ways to communicate with farmers that have proved successful in other parts of Africa.

By working closely with government and industry stakeholders, the project aims to prevent geographic spread of the disease from the intensive livestock systems which use imported animals and where disease prevalence is high, and to minimise the risks of transmission to Ethiopia's national zebu herd, to protect the livelihood of poor farmers.

Collaborators

- Addis Ababa University, Ethiopia
- Armauer Hansen Research Institute, Ethiopia
- National Animal Health Diagnostic Centre, Ethiopia
- University of Cambridge, UK
- University College London

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Further Information

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Details of DFID supported research can be found at: www.gov.uk/dfid-research-outputs
Details of BBSRC funded research can be found at: www.bbsrc.ukri.org