

**BBSRC-FAPESP JOINT PUMP-PRIMING AWARDS for ANTI-MICROBIAL RESISTANCE (AMR) and INSECT PEST RESISTANCE IN LIVESTOCK AND AGRICULTURE: *Understanding and managing resistance, including novel methods, for pathogen and pest control.***

The Biotechnology and Biological Sciences Research Council (BBSRC) in the UK and the São Paulo Research Foundation (FAPESP) in Brazil held a partnership building workshop in São Paulo, Brazil on 5/6<sup>th</sup> October 2017. The workshop brought together UK and Brazilian scientists with expertise relevant to the call, to provide opportunities for face-to-face networking and for new UK-Brazil collaborations to develop. The workshop also enabled participants to better understand key challenges around AMR in Brazilian agriculture, and consider the research landscape and relevant expertise available in the UK and the State of São Paulo. A key aspect of the workshop was for participants to explore how their existing expertise in AMR could have new applications in the agricultural sector.

The partnering workshop involved a series of presentations by UK and Brazilian delegates, focussing upon their key research interests relevant to the call, the expertise and facilities their institutions can offer and the key challenges that could be addressed through this funding opportunity. The talks were interspersed with networking/discussion sessions to help potential applicants make contact with each other and develop shared understanding of the research landscape in Brazil and the UK, the priorities for the funding agencies, and to highlight key research ideas.

All of the talks that were delivered at the partnership building workshop are now available to view on the FAPESP website, please follow this link: <http://www.fapesp.br/11193>.

Some of the key points raised during the discussion sessions have been collated below (in no particular order). These focus around the current state of knowledge and key challenges relevant to AMR and insect pest resistance in Brazilian agriculture and livestock research that new collaborative research projects could aim to address.

### **Key challenges relevant to AMR in Brazil**

- Problems with policing antibiotic restriction policies
- Fungicide resistance – monitoring does occur but scale is unknown
- It is uncommon for the government to use information from scientists in the field to inform agricultural policy
- Use of antibiotics as growth promoters
- No government legislation is in place to prevent use of antibiotics
- Same antimicrobials used in human and veterinary medicine
- Brazil 2013 - two insects resistant to most pesticides used in field identified, likely imported accidentally from India/China
- Cost of research/consumables is high - sequencing capabilities hindered by cost
- Education of farmers - resistant to advice around usage of antimicrobials, legislation needed
- Transdisciplinary research is difficult in Brazil
  - Competitive, cultural – reluctance to share ideas
  - Reward/recognition structure is disciplinary-based

- Uptake of new technology is relatively slow
- Management/sharing of genomic data and capacity to analyse data limited – difficult to get full picture, problem in UK too
  - Lack of network across São Paulo/Brazil to discuss challenges in data evaluation
  - Limited regions that ‘pool’ data together
  - Mostly research projects rather than surveillance
- Common theme – new approaches to genomics and genetic sequencing needed
  - Key challenges include cost (access to facilities available, but very expensive) and training
- Chain of primary research – secondary research – application lacking
- Uniform seasons in Brazil challenging – insect pests die off in winter in UK, but not in Brazil
- Modelling – need more calibration of models using real data (most comes from literature)

### **Key knowledge gaps relevant to AMR in Brazil**

- Diagnostics
- Surveillance e.g. antibiotic usage by farmers (consumer behaviour)
- Invisible resistance (non-culturable microorganisms)
- Local rates of resistance e.g. in mastitis
- Alternatives to traditional antimicrobials or management practices
- Precision targeting, including timing – understanding lifestyle of host/pest/vector
- Repurposing of existing drugs
- Agricultural disease model for Brazil
- Molecular modelling of underpinning mechanisms – gene exchange
- Epidemiology - dissemination of plasmids/clones and associated reservoirs
- Study of metabolomics alongside resistance can help to identify resistance factors
- Collaboration in organic chemistry is needed
- Different transfer mechanisms not well understood – how much resistance is transferred in each direction (complex system)
- Exploration of genome sequencing techniques – reconstruction of whole plasmids is very difficult
- Biochemical characterisation of sugarcane
- Lack of food surveillance system in Brazil and the UK
- Chemo-ecology and ecological toxicology need further exploration
- Immunobiological bases of AMR development
- The quantity of antibiotics used in poultry in Brazil is unknown – likely to be more than anticipated
- Analysis of farm-specific risk factors for resistance
- Study of genetic evolution of resistance
- Soluble polymers as a source of delivery - needs further exploration