EXPLOITING THE POTENTIAL OF RAPID DIAGNOSTIC TEST TECHNOLOGY AND MOBILE CONNECTIVITY

29 - 30 MAY 2019

UNIVERSITY OF SURREY

OUR SPONSORS

EPSRC

This workshop is funded and supported by i-sense, a five year £11 million interdisciplinary research collaboration (IRC), funded by an the Engineering and Physical Sciences Research Council (EPSRC).

i-sense aims to build a new generation of digital sensing systems to identify and prevent outbreaks of infectious disease and antimicrobial resistance, much earlier than ever before. Early detection and accurate diagnosis is key to helping patients gain faster access to care and protecting populations from disease.

Their mission strongly aligns to the United Nation's Sustainable Development Goals and the Global Challenge Research Fund. We work in partnership with end users in low and middle-income countries, to build innovative digital technologies that meet their needs.

i-sense.org.uk

The Institute of Advanced Studies

This workshop is funded and supported by The Institute of Advanced Studies (IAS). The IAS was established in 2004, at the University of Surrey (IAS), and sponsors workshops on interdisciplinary topics suggested at the 'cutting edge' of science, engineering, social science and the humanities. Through this scheme, the Institute fosters interdisciplinary collaborations and encourages a flow of international scholars to visit, enjoy their stay at Surrey and leave behind excellent ideas and innovations. Over the years IAS events have resulted in many research grants, new collaborations, journal articles and books. The Institute's principal objectives in supporting these workshops, are to attract international scholars to the University and to encourage new and productive research collaborations.

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INTRODUCTION

There is vast unexploited potential in combining recent advances in diagnostic test development, with advances in connectivity and digital technology. Rapid diagnostic tests are essential to prevent and control zoonotic diseases, reduce the development of antibiotic resistance, and improve livestock productivity. However, test results are of no value unless they are available to those that need them, at the right time. Digital technology and connectivity is also advancing at an exponential rate that should make this communication of results possible, but combining test development with advances in connectivity has thus far been limited.

In this workshop we will explore the potential for combining current state of the art diagnostic point of care (POC) testing, with improved connectivity, 'Big Data' storage and interrogation. Specifically, we aim to examine POC testing and 'e-Health' in the veterinary and human health sectors, recent advances in storage, interrogation and protection of diagnostic test data, barriers to implementation, including technological, political, logistical and financial, and the potential for combination of test technology and connectivity to improve disease control.

This workshop will bring together experts in diagnostic test development, digital technology and related disciplines to examine the state-of-the-art tools in human and veterinary medicine, and crucially to explore barriers to implementation - technical as well as cultural. We expect attendance from biologists and engineers but also from anyone with an interest in the acceptability and uptake of novel technology and will feature a wide range of exciting talks, discussions, and networking opportunities with experts and researchers in human and veterinary medicine, rapid diagnostics, mobile connectivity and digital technology.

Organisers:

Dr Dan Horton, Senior Lecturer in Veterinary Virology and School Research Director at the School of Veterinary Medicine, University of Surrey, UK

Professor Roberto La Ragione, Head of the Department of Pathology and Infectious Diseases and Deputy Head of the School of Veterinary Medicine at the University of Surrey, UK

Dr Jono Betts, Senior Research Fellow and Academic Lead for the Bacteriology Laboratories at the School of Veterinary Medicine, University of Surrey, UK

PROGRAMME

DAY 1 - WEDNESDAY 29 MAY
WATES HOUSE, TREETOPS ROOM

12 pm	Lunch and Registration
1pm	Opening Remarks – **Prof Vince Emery** (University of Surrey)
1:15pm	Keynote Speaker - **Prof Theo Kanellos** (Zoetis, IE) - *"Digital and diagnostic aids to advance the continuum of care approach to animal health"*
Session 1	
2:10pm	**Prof Wamadeva Balachandran** (University of Brunel) - *"Low-cost Portable Molecular Diagnostic Platform for Rapid Detection of Poultry Infectious Pathogens"*
2:45pm	**Dr Aurore Poirier** (University of Surrey) - *"Development of a rapid molecular diagnostic assay for the detection of poultry pathogens"*
3:20pm	Coffee break and poster viewing
Session 2	
3:50pm	**Dr Nick Morant** (Optigene) - *"'Genie and the LAMP' - rapid and portable molecular diagnostics."*
4:25pm	**Dr Dorina Timofte** (University of Liverpool) - *"New molecular tools for diagnosis of animal infections - the Liverpool experience"*
5pm	Discussion and Q&A with Expert Panel
7pm	Workshop Dinner

DAY 2 - WEDNESDAY 29 MAY
WATES HOUSE, TREETOPS ROOM

9am	Introduction - **Dr Dan Horton/Prof Roberto La Ragione**
9:15am	Keynote Speaker – **Dr Marta Broto-Aviles** (Imperial College London) - *"Bioengineered materials as a tool to tackle rapid diagnostic limitations"*
Session 3	
10am	**Dr Donald King** (Pirbright Institute) - *"Are we there yet? – the challenges of deploying field tests for the rapid diagnosis of transboundary diseases"*
10:40am	**Prof Alasdair Cook** (University of Surrey) – *"Veterinary Health Innovation Engine (vHive)"*
11:15am	Coffee break and poster viewing
Session 4	
11:45am	**Dr Arnoud van Vliet** (University of Surrey) - *"Use of genome sequencing and public repositories in target selection for molecular diagnostics of infectious diseases"*
12:20pm	Future Perspectives – Opportunities for Funding and Collaboration
1pm	Lunch

KEYNOTE SPEAKERS

Prof Theo Kanellos

Director Business Development and Alliances, Zoetis, IE

Prof Theo Kanellos is a veterinarian with postgraduate studies in business and life sciences. During his career he worked as a clinician, an academic, a governmental official and for the last fifteen years as part of the management within the Pharmaceutical Industry where he has held several strategic roles. He has managed research laboratories, business development transactions, scientific and multi-functional alliances teams and programmes in several organisations that have led to the spinoff of biotechnology companies, the award of significant scientific grants, the founding of major strategic partnerships and the registration and licensing of successful commercial products and services. In his current role as the Director of Commercial Alliances in Zoetis he establishes entrepreneurial partnerships with companies, VCs, universities, and governmental institutions, internationally. He holds a visiting professorship at the School of Health and Medicine at the University of Surrey and is a board member of the Pirbright Institute in UK, the Global Alliance for Livestock Veterinary Medicines (GALVmed) in Africa and head of the action groups of the One Health Platform.

Keynote address: *"Digital and diagnostic aids to advance the continuum of care approach to animal health"*

The evolution of rapid point-of-care (POC) diagnostic technologies, in parallel with recent advances in information technologies grants the animal health industry invaluable opportunities to improve animal health management, disease surveillance, response and where appropriate eradication on a global scale - in both livestock and companion animal species, zoonotic and non-transmissible diseases, developing and developed countries. These powerful pocket technologies include everything from the cutting-edge, such as handheld deep sequencing and microfluidic platforms, to more trivial smartphone application technologies. The convergent evolution in these technologies will culminate in rapid, individualised early detection of disease in (near) real-time becoming a reality, as portable diagnostic and communications technologies improve the speed and efficiency of data capture, exchange, analysis, transfer and reporting across the globe. However, as with any pioneering technology, there are implementation challenges with their use and widespread adoption (regulatory frameworks, clinical validation, data governance, security etc.), which need to be addressed. Nevertheless, these technologies have been harnessed for rabies and tuberculosis surveillance and elimination campaigns which is promising, and ongoing progress on these technologies will advance their remit in the prediction, prevention, detection and treatment of disease.

Dr Marta Broto-Aviles

Postdoctoral Research Associate, Imperial College London, UK

Dr Marta Broto-Aviles has been a Postdoctoral research associate in the internationally renowned Stevens Group, Imperial College, since 2017. During this time she has been developing particle-based diagnostic devices and surface biofunctionalisation strategies. Dr Broto-Aviles has a Master degree in advanced chemistry and a PhD in multiplexed and multimodal diagnostic platforms in Nanobiotechnology, from the University of Barcelona. Dr Broto-Aviles's research focuses on lateral flow immunoassay designs and preparing and characterising nanomaterial-based components for biomarker detection.

Keynote address: *: "Bioengineered materials as a tool to tackle rapid diagnostic limitations"*

Rapid diagnostics have the properties of being reliable, low-cost, fast and portable. These combined characteristics make them ideal in a wide range of applications; including veterinary diagnosis and food safety. Nevertheless, the current limitations of rapid diagnostics are low sensitivity and multiplexed capability. New bioengineered materials and bioconjugation strategies offer the chance of tackling these limitations. These advances have allowed to develop ultrasensitive tests and to detect more than one compound. Furthermore, combining the results of these decentralized tests with a centralized automated result analysis provided by mobile connectivity can help the refinement of guidelines and monitor infectious disease outbreaks.

INVITED SPEAKERS

Prof Wamadeva 'Bala' Balachandran,
University of Brunel, UK
Professor Wamadeva Balachandran is Professor of Electronic Systems and served as Head of Department of Systems Engineering at Brunel University London, UK, from 1999 to 2004. Before joining Brunel University London in 1995, he was a Reader in the Department of Electronics & Electrical Engineering at the University of Surrey, UK. Professor Balachandran is a Fellow of IEEE (USA), IEE (UK), InstPhy (UK), InstMC (UK) and Royal Society of Arts (UK). His research interest spans several different disciplines: Electrostatics & Charge Particle Dynamics, Electrohydrodynamics, Micro/ Nano particles and fibre generation, Transport of DNA using DEP force, Lab-on-a-chip, Electromagnetic Field Sensing, EM Interaction with Human Body, Dynamic Measurement Systems, Global Positioning Satellite System for Navigation and Medical Electronics.

Title of presentation: *"Low-cost Portable Molecular Diagnostic Platform for Rapid Detection of Poultry Infectious Pathogens"*

Prof Alistair Cook,
University of Surrey, UK
Alasdair "Alex" Cook is a veterinary epidemiologist with more than 25 years national and international experience in livestock animal health in Government, academic and development environments. He joined the new School of Veterinary Medicine in January 2013. Previously, he worked in the Animal Health and Veterinary Laboratories Agency (AHVLA) where he was a senior member of staff engaged in leading research and surveillance programmes as well as part of the senior management team formulating strategy and implementing change. Alex's research interests are primarily in the epidemiology and control of zoonotic diseases, especially foodborne zoonoses. He also has a strong interest in surveillance and the impact of endemic disease on farm animal welfare and productivity.

Title of presentation: *"Veterinary Health Innovation Engine (vHive)"*

Dr Tina Joshi,
University of Plymouth, UK
After completing BSc and PhD studies at Cardiff University, Dr Joshi undertook several postdoctoral roles from 2012-2017 before commencement of a Lectureship at the University of Plymouth. In 2018 Dr Joshi was awarded the Hind Rattan "Jewel of India" Award from the Indian Government (Non-Resident Indian Welfare Society of India) for diasporal achievements in academia within the country of my birth - the UK. Dr Joshi is currently a Lecturer in molecular microbiology and the lead for the microbial diagnostics and infection control research group.

Title of Presentation: *"Development of rapid diagnostics for infections"*

Dr Don King,
Pirbright Institute, UK
Dr Donald King is Head of the Vesicular Disease Reference Laboratory Group and leads the Food and Agriculture Organisation (FAO) World Reference Laboratory for foot-and-mouth disease (WRLFMD). He has a background in veterinary virology and immunology (University of Leeds, University of California, Davis, USA), and has research interests in understanding the processes that drive the evolution of positive-stranded genome viruses such as foot-and-mouth disease virus (FMDV).

Title of Presentation: *"Are we there yet? – the challenges of deploying field tests for the rapid diagnosis of transboundary diseases"*

INVITED SPEAKERS

Dr Nick Morant,
Optigene, UK
Dr Nick Morant is a senior scientist at GeneSys Biotech Ltd. (Camberley, UK) and is responsible for the research and development of OptiGene's reagent portfolio. With a PhD in Biochemistry from the University of Bath, directed at the development of novel enzymes for isothermal nucleic acid amplification (LAMP) methods, he specialises in the enhancement of thermostable DNA modifying enzymes; enabling a wide variety of DNA and RNA diagnostic applications including PCR and LAMP.

OptiGene Ltd. (Horsham, UK) was established to deliver the highest quality instrumentation and performance-leading reagents to support isothermal amplification of DNA and RNA. Innovative products support sensitive and specific detection of bacteria and viruses for use in the fields of plant health, food safety, veterinary medicine, environmental monitoring and healthcare.

Title of Presentation: *"'Genie and the LAMP' - rapid and portable molecular diagnostics."*

Dr Dorina Timofte,
University of Liverpool, UK
Dr Dorina Timofte qualified as a veterinarian in 1991 and was awarded her PhD in 1998 from the University of Iasi, Romania. Dr Timofte is Senior Lecturer in Veterinary Clinical Microbiology at the School of Veterinary Science, where she also leads the Diagnostic Microbiology Service, which provides an essential service for the referral hospitals (Equine, Small animals and Farm animals) and first opinion practices at Leahurst & Liverpool as well as for the local veterinary practices. In 2012, Dorina was awarded a Visiting Chair at the Veterinary Faculty at Iasi, in recognition of her continuing research collaboration and postgraduate provision in veterinary microbiology.

Title of presentation: *"New molecular tools for diagnosis of animal infections - the Liverpool experience"*

Dr Arnoud van Vliet
University of Surrey, UK
Dr Arnoud van Vliet was awarded his Bachelors degree and PhD from Utrecht University, before working as a Postdoctoral researcher in the Department of Genetics of the University of Leicester, UK, working on gene regulation and virulence of the zoonotic foodborne pathogen Campylobacter jejuni. He then obtained a personal fellowship in 1999 from the Dutch Organisation for Scientific Research (NWO) to work on metal metabolism, gene regulation in the human gastric pathogen Helicobacter pylori, first at the Vrije Universiteit Amsterdam, and subsequently as lecturer at the Erasmus MC-University Medical Center in Rotterdam. In 2007, he took up a position as Research Leader at the Institute of Food Research, Norwich, UK, where he has led a research group focusing on the foodborne pathogens Campylobacter and Listeria, combining microbiology, molecular biology, genomics and other 'omics with bioinformatic technologies, to understand the processes allowing these bacteria to survive in the food chain and cause illness. Arnoud had joined the Surrey Vet School as Senior Lecturer in Veterinary microbiology in October 2016.

Title of Presentation: *"Use of genome sequencing and public repositories in target selection for molecular diagnostics of infectious diseases"*

SHORT TALKS AND POSTER PRESENTATIONS

Dr Aurore Poiriel, University of Surrey, UK
Title of Presentation: *"Development of a rapid molecular diagnostic assay for the detection of poultry pathogens"*

Title of Poster Presentation: *"Development of a molecular assay for the detection of bacterial poultry pathogens"*

Dr Jai Mehat and Mrs Lucy Rhys-Davies, University of Surrey, UK
Title of Poster presentation
"Genomic signatures associated with methicillin-resistant Staphylococcus pseudintermedius lineage ST-71"

Dr Jono Betts, University of Surrey, UK
Title of Poster Presentation *"Development and validation of loop-mediated isothermal amplification (LAMP) assays for the detection of Acinetobacter spp., Corynebacterium spp., Enterobacter spp. and Streptococcus canis recovered from surgical site infections (SSIs) of companion animals"*

WORKSHOP ORGANISERS

Dr Dan Horton,
Senior Lecturer in Veterinary Virology and School Research Director at the School of Veterinary Medicine, University of Surrey, UK

Dan graduated as a veterinarian from the University of Cambridge, UK, with an intercalated MA in zoology in 2002. After a period in mixed and second opinion exotic animal veterinary practice he completed an MSc in Wild Animal Health in London in 2005. He then undertook a PhD working at Cambridge University, the APHA and CDC Atlanta USA, on zoonotic viral diseases of wildlife.

He completed his PhD in 2009 and joined the Virology Department at APHA Weybridge, undertaking surveillance and research programs for viral diseases of wildlife. In February 2014 he joined the School of Veterinary Medicine as a Lecturer in Veterinary Virology, continuing research into zoonotic viral diseases and teaching at undergraduate and postgraduate level. He is School Research Director and Programme Lead for the MSc in Veterinary Microbiology.

Professor Roberto La Ragione,
Head of the Department of Pathology and Infectious Diseases and Deputy Head of the School of Veterinary Medicine at the University of Surrey, UK

Roberto graduated in 1995 and then went on to study for a post graduate degree in veterinary microbiology at the Royal Veterinary College (University of London). In 1996 he moved to the government's Veterinary Laboratories Agency (VLA) to undertake a PhD on the pathogenesis of E. coli in poultry. On completion of his PhD studies, Roberto commenced a post-doctoral position at Royal Holloway, University of London, studying E. coli virulence factors and vaccine development. Since 2001 his work has focused largely on the analysis of the colonisation, shedding and transmission of E. coli O157:H7 by all farmed animal species and he has led a number of commercial, Defra, research council (BBSRC, MRC, EPSRC, AHRC) and EU projects in this area. He has published extensively in the area of host-microbe interaction with a particular emphasis on E. coli and Salmonella. His current research interests focus on the pathogenesis of food-borne pathogens with a particular interest on AMR and the development of intervention strategies including vaccination, pre and probiotics for the control of bacterial pathogens such as Salmonella, Brachyspira and E. coli in food producing animals. In 2005, Roberto was appointed Head of Pathogenesis and Control at the AHVLA and in 2010 he was appointed Professor of Veterinary Microbiology and Pathology at the University of Surrey. He gained the FRCPath in 2010 and in 2012 was appointed the Associate Dean for Veterinary Strategy in the new School of Veterinary Medicine at the University of Surrey. In 2014 he was appointed to the position of Head of the Department of Pathology and Infectious Diseases and Director of the Veterinary Pathology Centre. He is the current chair of the Royal College of Pathologists Veterinary Pathology SAC.

WORKSHOP ORGANISERS

Dr Jono Betts,
Senior Research Fellow and Academic Lead for the Bacteriology Laboratories at the School of Veterinary Medicine, University of Surrey, UK

After completing an MSc in Biomedical Science at the University of Hull in 2007, Jono was awarded an EPSRC CASE (Unilever PLC) PhD studentship in the Department of Chemistry at the University of Hull. The project involved the microfluidic synthesis of deuterium labelled polyphenols and their antimicrobial activity. Upon completing his PhD, Jono undertook a fixed term Postdoctoral position at the University of Hull to investigate the novel synthesis and antibacterial activity of metal nanoparticles. In December 2012 he began a 3-year Postdoctoral appointment in the Centre for Immunobiology at Queen Mary, University of London (QMUL), conducting several research projects investigating the in vitro and in vivo activity of novel antimicrobials and antibiotic combinations against multidrug-resistant bacteria, sponsored my Pfizer, MSD and Public Health England. He led several projects investigating the virulence of Gram-negative bacteria in the Galleria mellonella model and point of care rapid diagnostic tests, for the detection of antimicrobial resistance genes.

In October 2015, Jono became Postdoctoral Research Fellow at the University of Surrey on a BBSRC funded project with Prof Roberto La Ragione, to study the antibacterial activity and cytotoxicity of carbon monoxide releasing molecules (CORMs) against avian pathogenic Escherichia coli (APEC), Acinetobacter baumannii and Pseudomonas aeruginosa, in collaboration with University of Sheffield. Jono also acts as the Academic lead for the Bacteriology laboratories, in the School of Veterinary Medicine and undertakes significant collaborative research with the Universities of Edinburgh (UK), Cologne (D) and Leiden (NL)

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