INTRODUCTION

It gives me great pleasure to introduce this annual report, as I complete one year as Dean of Institute. The past 12 months has seen the Institute make strong progress against each of its five research challenges, and this report describes some of those achievements.

This year’s report also contains a special feature to mark the 70th Anniversary of the NHS; several case histories detail the Institute’s contribution to tackling the burden of infectious diseases in Merseyside. Veterinary infection research in Liverpool also has a notably long and distinguished history, and a distinctive feature of the Institute’s strategy is to address its challenges by bringing together Liverpool’s medical and veterinary researchers in a “One Health” approach to infection. Multidisciplinary working is essential to comprehensively tackle the world’s major infection and global health threats, and we will continue to develop internal and external partnerships to achieve this.

Over the past year, the Institute has made several strategic appointments to support its research challenges, including of both established and early career researchers. The Institute has also supported several successful Fellowship applications. Career development of all staff and students will continue to represent a vital part of our strategy.

Finally, I would like to thank all staff, both academic and professional services, for their continued hard work and exceptional contributions. I hope you enjoy reading this report and I look forward to another exciting year ahead.

Professor Nigel Cunliffe

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INSTITUTE OF INFECTION AND GLOBAL HEALTH (IGH)

Department of Infection Biology
Department of Clinical Infection, Microbiology and Immunology
Department of Epidemiology and Population Health

MAJOR CHALLENGES

1 GLOBAL CHANGE
2 FOOD SECURITY
3 ANTIMICROBIAL RESISTANCE
4 DIAGNOSTICS
5 VACCINES

The Institute is organised into three departments with cross-cutting research themes. Through them we are addressing the five major research challenges identified in our strategic plan.

Image on cover shows mammalian cells infected with Zika virus. Infected cells appear round and slightly detached in comparison with elongated healthy cells. Gaps show where cells have been destroyed due to viral infection. Credit: Shona Moore, Postdoctoral Researcher

Research Income

2014/15 £9.3M
2015/16 £9.9M
2016/17 £10M
2017/18 £10.6M

Research Awards 2017/18

RCUK £1,977,227
UK Charities £2,325,666
UK Govt & Health £1,895,393
Non-UK & other £2,828,748
Total: £9.1M

Department of Infection Biology
Department of Clinical Infection, Microbiology and Immunology
Department of Epidemiology and Population Health

Theme 1 Understanding how pathogens cause disease
Theme 2 Pioneering diagnostics, treatments and vaccines
Theme 3 Enhancing food safety and security
Theme 4 Tracking emerging and zoonotic infections
Theme 5 Improving the health of pets, working animals and their owners

Image on cover shows mammalian cells infected with Zika virus. Infected cells appear round and slightly detached in comparison with elongated healthy cells. Gaps show where cells have been destroyed due to viral infection. Credit: Shona Moore, Postdoctoral Researcher
Vapers are vulnerable to pneumococcal infection

While the impact of tobacco smoking on health has long been known, the impact of using e-cigarettes is less clear. However, new research by Professor Aras Kadioglu and colleagues has shown that exposure to inhaled e-cigarette vapour significantly increases colonization of bacteria in the mouse nasopharynx, making them more susceptible to invasive pneumococcal disease. Increased bacterial adherence to airway lining cells is caused by e-cigarette vapour increasing the level of Plasmin-Activating Factor Receptor (PAFR), a molecule which pneumococcal bacteria use to stick to airway cells, and subsequently invade body tissues and cause disease. Professor Kadioglu said: “Our studies show that vaping significantly increases colonisation density. One of the key findings was to precisely define the impact of temperature on disease risk. For every 1°C rise in the average local temperature, there was a 33% increase in the risk of flystrike, with risk peaking between June and August. Rabbits over the age of five were also more likely to be affected. The University’s Small Animal Veterinary Surveillance Network (SAVNET) team have published research that analysed electronic health records from over 40,000 pet rabbit consultations collected from UK veterinary practices to identify the risk factors for flystrike across the nation.”

The ability of pneumococcal strains to cause serious disease leads to devastating and frequently fatal consequences for very young children, and for adults who may be the chief breadwinners in their homes and communities. It is now urgent that a vaccine is developed to combat this dangerous infection.”

The University’s Professor Melitta Gordon who was involved in the project, and who first described the epidemics of disease caused by ST333 strains in Africa, said: “The ability of Salmonella strains to cause such serious disease leads to devastating and frequently fatal consequences for very young children, and for adults who may be the chief breadwinners in their homes and communities. It is now urgent that a vaccine is developed to combat this dangerous infection.”

First case of oriental eye worm reported in UK

Researchers have diagnosed the UK’s first known case of canine oriental eyeworm in a dog that had been recently imported from Romania. The disease is caused by a vector-borne parasite (Taenia colpoda) and is spread by the males of a species of fruit fly (Phoritocircus viroyi) that is found in the UK. Documented cases of the disease have been growing across several European countries including France, Italy, Spain, Greece, Croatia and Romania, but until now there have been no recorded cases in the UK. Lead author of the report, John Graham-Brown said: “This case raises awareness of a new imported disease and highlights the ongoing risks associated with pet travel and importation, and the need for vigilance when examining these animals.”

Asking the burden of dog bites

Preventing dog bites is an increasingly recognised public health and political issue with implications for both human and animal health and welfare; it is of particular importance in Merseyside which has the highest number of dog-related injuries and deaths in the UK. Dog bites usually rely on hospital records, but research led by Dr Carri Westgarth has shown that the actual number of dog bites may be much higher than hospital records indicate, with only 0.6% of people in the study who had been bitten referring hospital admission. The research also showed that personality type may be linked to a heightened risk of being bitten by a dog, with people of a more anxious disposition more likely to be ripped. However, it remains difficult for researchers to understand the circumstances leading up to dog bites, with most studies relying on evidence collected after bites happen. In a new study researchers have, for the first time, used YouTube videos to directly observe and analyse dog bites in situ.

Lead author of this study Sara Owocki-Garstec said: “Online videos present us with an unexplored opportunity to observe dog bites first-hand, something which is just not possible using other methods. Making more use of this type of shared content for research could help us better understand how and why bites occur and contribute to the development of bite prevention strategies.”


Zoonoses in Livestock in Kenya (ZooLinK)

Parts of East Africa are currently experiencing cases of Rift Valley Fever, an acute, fever-causing viral disease that is transmitted by insects and usually seen in livestock but can also infect humans. The current cases are thought to result in part from unusual weather patterns that allowed proliferation of the mosquito vector. ZooLinK is a collaborative project that aims to enable Kenya to develop an effective surveillance programme for such zoonotic diseases (diseases transmitted between animals and humans). Recent research from the team, led by Professor Eric Pare, measured antibodies to the disease in people in western Kenya, a tropical region where transmission was assumed not to occur. The research showed that while there was a risk of local infection and that in particular, certain occupational animal exposures such as working with and slaughtering in a slaughterhouse in this region were particularly risky. During this year’s outbreak of Rift Valley Fever in Kenya, at least one slaughterhouse worker contracted the disease and died. The results highlight the need to expand existing climate based risk models to account for occupational risks and animal movement networks, and recommendations have been fed into national decision making processes in Kenya. Further zoonotic disease surveillance activities are essential to enable early detection of such transmission events.


Rapporteur Conference Minutes – 2019

The University of Liverpool’s Small Animal Veterinary Institute of Infection and Global Health

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Assessing the burden of dog bites

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Food Security

1 in 10 people globally lack sufficient food for a healthy, active life. Feeding current and future populations requires a secure and safe supply of food. The Institute is an international leader in food security research, especially through improved control of infectious disease in food producing animals, and improved food safety.

Launch of HORN

February 2018 saw the official launch in Nairobi, Kenya, of the £7.8M Global Burden of Animal Diseases (GBADs) to a programme has begun with a workshop in Paris, led by Professor Diana Williams and supported the launch in March 2018 of the University’s Centre of Excellence for Sustainable Food Systems (CESFS). The CESFS is a cross faculty initiative directed by Professor Rushton and is supported by the N8 Agrifood programme. The Centre has been created in order to address real world issues through basic and applied research in the link between animal health and the global burden of disease, including the economic impacts.

Research with impact: helping farmers to manage disease resistance

The parasitic liver fluke, Fasciola hepatica, is a significant cause of disease and production losses in sheep and cattle worldwide. It is common in the UK and its prevalence is likely to increase as a result of climate change. Control of the parasite relies almost exclusively on the use of a limited number of drugs, for one of these, triclabendazole (TCBZ), resistance to the drug is being increasingly reported. Research led by Professor Diana Williams in 2012 described a field test to detect resistance to TCBZ in populations of fluke affecting sheep. Researchers then worked with farmers’ organisations in England and Wales to measure the levels of resistance on participating farms, and subsequently shared the findings with the industry to highlight the problem of resistance and to provide advice as to how to reduce its impact. Using funding from the University’s Impact Accelerator fund, a study was conducted earlier this year to evaluate if the information and advice provided to farmers in 2012/13 has helped them manage resistance on their farms and improve control of the disease. The evaluation demonstrated the real impact that engaging key stakeholders in our research can have.

Reducing livestock lameness

Lameness in domesticated ruminants, including cattle, sheep and goats, both compromises farm animal welfare and threatens global food security. Recent studies have suggested that nearly half the dairy cows in the UK face reduced mobility and lameness issues at some point in their life, costing the dairy sector approximately £250M annually. Infectious causes of lameness, including Bovine Digital Dermatits in cattle and Contagious Ovine Digital Dermatitis in sheep, are responsible for a significant proportion of all lame cases in livestock, and remain one of the greatest unresolved challenges facing the modern farming industry. The newly formed Liverpool Livestock Lameness Group is primarily focused on undertaking research into the aetiology, epidemiology, management and prevention of infectious dermatological disorders of the foot in which lameness is the primary clinical feature. As part of the group’s portfolio of research, Professor George Oikonomou and Professor Stuart Carter, together with collaborators from the Scottish Rural College and the Royal Veterinary College, have received over £5M in funding from the Biotechnology and Biological Sciences Research Council to study risk factors, genetics and breeding strategies to reduce the impact of non-infectious claw horn disruption lesions on dairy cattle.

Controlling disease and improving gut health in chickens

In many countries, poultry meat and eggs are an important source of food and nutrition, whether produced in large commercial units with modern breeds, or in small scale flocks using indigenous breeds. However, the bacterial zoonotic pathogens, Salmonella enterica and Campylobacter jejuni, frequently colonise poultry and consequently present a very significant human health risk due to contamination of meat or eggs. Professor Paul Wigley has received over £500K in two grants from the Biotechnology and Biological Sciences Research Council to study risk factors, genetics and breeding strategies to reduce the impact of non-infectious claw horn disruption lesions on dairy cattle.

Launch of £7.8M Network for the Horn of Africa (HORN) project

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The IHG food security group led by Professor Jonathan Rushton and Professor Jane Hodgkinson supported the launch in March 2018 of the University’s Centre of Excellence for Sustainable Food Systems (CESFS). The CESFS is a cross faculty initiative directed by Professor Rushton, and is supported by the N8 Agrifood programme. The Centre has been created in order to address real world issues affecting both humans and animals, such as climate change, access to safe and sufficient food, and food choice. It will address these issues via innovative research projects, techniques, and cutting edge technology and resources, capitalising on strategic cross disciplinary collaborations. The launch of the Centre showcased the range of work the University carries out across the food system, from production through to consumption as well as public health and economic impacts. The newly formed Liverpool Livestock Lameness Group is primarily focused on undertaking research into the aetiology, epidemiology, management and prevention of infectious dermatological disorders of the foot in which lameness is the primary clinical feature. As part of the group’s portfolio of research, Professor George Oikonomou and Professor Stuart Carter, together with collaborators from the Scottish Rural College and the Royal Veterinary College, have received over £5M in funding from the Biotechnology and Biological Sciences Research Council to study risk factors, genetics and breeding strategies to reduce the impact of non-infectious claw horn disruption lesions on dairy cattle.

The launch brought together partners, stakeholders and non-governmental organisations to establish the One Health Regional Network, and identify key research priorities in the area of One Health. Over the next four years, the HORN project will undertake research capability assessments of partner Institutes across the Horn of Africa, to assess current and target One Health research capacity, provide training and placements for research support staff, advance the knowledge and skills of researchers conducting One Health research; undertake basic and applied research in the area of One Health, through the co-creation of research projects at small events, and create the One Health Regional Network.
Antimicrobial Resistance

Microbes are gaining resistance to the treatments used to control them, making antimicrobial resistance one of the greatest current threats to human and animal health. The Institute will investigate the clinical and environmental factors that drive the evolution and development of resistance, and develop novel antimicrobial treatment strategies.

Addressing antibiotic resistance in pneumococcal infections

A new European research project to tackle the emergence and spread of drug-resistant bacteria is underway at the Institute. Funded by the Joint Programming Initiative on Antimicrobial Resistance (JPI-AMR), the project focuses on antibiotic resistance in Streptococcus pneumoniae; a major human pathogen causing 1.3 million deaths worldwide annually due to diseases such as pneumonia, meningitis and sepsis.

Epidemiological studies have demonstrated that resistance is spread globally by a limited number of particularly successful multidrug-resistant pneumococcal clones. It is not known however, how these resistant pneumococcal clones are acquired or spread globally.

The £1.6M three year project brings together world leading researchers in the Karolinska Institute, the Institute of Infection Immunology, Hannover and the Royal Institute of Technology Stockholm, with the Bacterial Pathogenesis and Immunity Group at University of Liverpool. Professor Aras Kadioglu who Heads the Group said: “We know that vaccination has decreased AMR among vaccine-covered pneumococcal strains, but AMR now emerges by expansion of non-vaccine covered strains of pneumococci. The goal of our project is to understand the genetic and functional properties of these AMR clones with the aim of pneumococcal infections.

The £1.6M national clinical trial to tackle antibiotic overuse in hospitalised children

A new £1.4M national clinical trial to tackle antibiotic overuse in hospitalised children and thus reduce the spread of antimicrobial resistance is being led by the Institute and Alder Hey Children’s NHS Foundation Trust. The ‘Biomarker-guided duration of Antibiotic Treatment in Children Hospitalised with confirmed or suspected bacterial infection’ (BATCH) trial is funded by the National Institute for Health Research Health Technology Assessment Programme (NIHR HTA) and will be conducted across ten sites in the UK. Currently, when children are hospitalised with bacterial infections there are no evidence-based guidelines on how long to treat the infection for, and doctors may treat for longer than is necessary, leading to overuse of antibiotics, which contributes to antimicrobial resistance.

The BATCH trial will use a personalised approach to safely reduce antibiotic duration in children hospitalised with bacterial infection, through the use of a specific blood test called Procalcitonin.

Professor Enitan Carroll who is leading the study said: “Our work on diagnostic and prognostic biomarkers of infection in children with bacterial infection over the past five years has generated evidence suggesting that a personalised approach will lead to improved safety and quality of care in hospitalised children with infections, reductions in the spread of antimicrobial resistance, and reduced time in hospital.”

Chicken or Egg: Drivers for Antimicrobial Resistance in Poultry in India (DARPI)

The emergence of Antimicrobial Resistance (AMR) is a major threat to human and animal health. It affects livestock productivity, impacting farmer livelihoods, food security and safety. Poultry is the fastest growing livestock sector in India, supplying an affordable source of protein. However, there is evidence that AMR of significance to human health is highly prevalent within the poultry industry, but the practices and pressures which inform antimicrobial use are not understood.

Professor Nicola Williams and collaborators have been awarded a £3M Newton Funded project to undertake an interdisciplinary project that will address the gaps in knowledge by characterizing the use and drivers for antimicrobial use and the development of AMR in the whole broiler supply chain.

‘Inspirational’ tuberculosis research highlighted at parliamentary debate

Liverpool’s world-leading infectious diseases research has been highlighted at a parliamentary debate on ending tuberculosis (TB). Louise Elman, Labour MP for Liverpool, Riverside spoke at the House of Commons debate in June to draw attention to the collaborative work being led by the University of Liverpool and Liverpool School of Tropical Medicine to tackle the disease. She went on to talk in detail about the PredICT-TB project being led by Professor Gerry Davies and the work of Dr Tom Wingfield, who is leading studies in the UK, Peru and Nepal that fight poverty to control TB.

Treatment of TB, caused by the bacterium Mycobacterium tuberculosis, is long and arduous, lasting at least six months and involving combinations of four antibiotics. Rifampicin is the key drug in achieving a successful cure and patients with bacterial strains that are resistant to it require treatment with more and much older drugs for three times longer at much greater cost. However, since its introduction in the 1970s there has been concern that the dose of rifampicin in TB is not optimised, raising the possibility that it could be used at much higher doses to shorten treatment. Working with colleagues at Harvard University and Socio en Salud, Professor Gerry Davies carried out a Phase II clinical trial in Lima, Peru which doubled the dose of rifampicin, showing that higher doses accelerated elimination of tuberculosis bacteria and did not result in any safety problems. The trial also showed that the higher the concentration of rifampicin in the blood the better the response, and that many patients on standard doses probably had suboptimal concentrations. These results suggest that higher doses of rifampicin should be urgently studied in Phase III trials as part of a shorter, more effective treatment for TB patients everywhere.

A study published in Nature Communications has found evidence that as bacteria adapt to the human body, they can sometimes become more susceptible to antibiotics and therefore easier to kill. Pseudomonas aeruginosa is an ‘opportunist’ bacterium that can cause serious infection when the body’s normal defences are weakened, and is a major cause of lung infections in patients with cystic fibrosis. Using models of long-term lung infection, the team identified mutations that appeared in the bacterial DNA which led to changes in the ability of Pseudomonas to survive in the lungs. The mutations enabled the bacteria to attach to lung cells more effectively; however, the same changes also made Pseudomonas more susceptible to antibiotics.

Dr Dan Neill was part of the team that led the study, alongside Professor Craig Winstanley, Professor Aras Kadioglu and Dr Jo Fothergill, and said: “This study raises hopes that even bacteria that are well adapted to the lung environment could be contracted with conventional antibiotics, and may lead to better diagnosis and treatment of Pseudomonas aeruginosa infection in people with cystic fibrosis.”

Dr Mohammad L et al. Nat Commun. 2018;9:2635

Bacteria adapted to the lungs are easier to kill with antibiotics

£3M award

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Tracking and preventing HIV transmission

The UK has a relatively small HIV epidemic of 100,000 people. In 2016, the number of new infections declined for the first time since records began over three decades ago, mainly as a result of reduced HIV transmission among men who have sex with men (MSM).

HIV care has achieved a remarkable success in the UK: over 90% of people diagnosed with HIV are accessing antiretroviral treatment (ART) and are virologically suppressed. Professor Anna Maria Geretti’s work is contributing to the fundamental understanding that suppressing HIV replication with ART is both beneficial to patients’ health and effective in preventing HIV transmission.

The Europe-wide PARTNER study provided an affirmative answer to two key questions: Does effective treatment prevent HIV transmission among couples that engage in unprotected sexual intercourse? Does the protection apply equally to heterosexual couples and couples formed by MSM? Not a single case of HIV transmission occurred within heterosexual and MSM couples in the PARTNER study. Some of the initially HIV-negative partners in some couples became HIV-positive during follow-up. However, using phylogenetics, Professor Geretti demonstrated that the viruses of the two partners were not related and that transmission did not occur within the couple.

These results underline the importance of diagnosing early and starting treatment promptly. Yet, despite many advances, around 12% of people living with HIV remain undiagnosed, and about 42% of HIV diagnoses continue to occur late in the disease course.

Professor Geretti’s group is investigating ways of improving diagnosis of infection with HIV, as well as hepatitis B and hepatitis C. Research ranges from pioneering new diagnostic platforms that allow sensitive and rapid virus detection at point of care using a drop of blood collected by fingerprick, to outreach initiatives among the homeless to understand how improvements in diagnostics and therapeutics can benefit the most vulnerable and excluded populations in our society.

Developing diagnostic tests for sepsis

Sepsis is a bacterial infection of the blood that causes whole body inflammation and is the leading cause of death worldwide. It affects 18 million people, is increasing by 15% each year and 30% of cases die from it. A major problem is that prompt diagnosis of sepsis is difficult. Early diagnosis is crucial to avoid clinical complications, secure appropriate antibiotic treatment and thus can be life-saving. There is a pressing need for rapid detection systems that can indicate bacterial infection at the patient bedside because conventional blood cultures take over 24 hours to generate a result.

Research at the University of Liverpool has developed and successfully evaluated a straightforward diagnostic test method for bacterial blood infections. The pioneering research, led by Professor Cheng-Hock Toh, demonstrated that a simple optical test that can be conducted during routine testing of coagulation is an effective diagnostic, prognostic and monitoring marker for sepsis that can be routinely applied in clinical settings. It can detect sepsis at an earlier stage than existing sepsis biomarker measurements which are expensive and take hours for a result. Research on the underlying molecular mechanisms has also enabled the development of new assays for sepsis, which form the key technology platform for routine point-of-care tests to be used in clinical settings.

Thanks to this research, there are now established UK and international laboratory standards in place. In 2010 a spinout company was formed to exploit the technology and incorporate the technology into a point-of-care device suitable for all clinical settings. The company, Sepsis Ltd, has raised £1.45M of investment. Tim CH, et al. Blood. 2002;100:2522-9

Improving the management of meningococcal disease

Meningococcal disease (MCD) is a major cause of morbidity and mortality in children and adults worldwide. The University of Liverpool, through the late Professor Tony Hart, has undertaken ground-breaking meningococcal research since 1977. Under Professor Hart’s supervision, Professor Enitan Carrol in collaboration with the Meningococcal Reference Unit, which provides a national and diagnostic and surveillance service, evaluated the impact of meningococcal DNA testing in blood and cerebrospinal fluid by PCR.

The research demonstrated the feasibility of whole blood PCR testing for MCD diagnosis. Professor Carrol evaluated the method in a “health” clinical settings, as opposed to simply using laboratory samples, and demonstrated that the meningococcal PCR test significantly increased the diagnostic sensitivity in children presenting to Alder Hey Children’s Hospital from 31% to 88%, establishing this test as the gold standard for confirming cases of MCD.

The outcome of better diagnosis is better patient management and outcomes. Working closely with patients and the public, especially the Encephalitis Society and Meningitis Research Foundation, the Group has shown that viruses are also the most common cause of meningitis in the UK, with a significant health economic impact.

For both meningitis and encephalitis, delays in diagnosis and treatment lead to worse outcomes. Working closely with patients and the public, especially the Encephalitis Society and Meningitis Research Foundation, the Group has shown that viruses are also now the most common cause of meningitis in the UK, with a significant health economic impact.

Improving the diagnosis of brain infections

Infections of the brain, such as meningitis (inflammation of the brain membranes) and encephalitis (inflammation of the brain itself) are major causes of death and disability across the UK. Over the last 15 years, the University of Liverpool’s Brain Infections Group, led by Professor Tom Solomon, has been conducting research to address this through the NHS.

BrainInfectionsUK, this is a £10M portfolio of studies, funded by the NIHR and MRC, running across a network of 70 NHS Trusts.

Working with Public Health England, the Group showed that the most common cause of viral encephalitis in the UK is herpes simplex virus, but that autoimmune encephalitis caused by the body’s own defences attacking the brain, is also important. More recently the Group has shown that viruses are also now the most common cause of meningitis in the UK, with a significant health economic impact.

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Many people and animals remain untreated for infectious diseases because of a lack of accurate, affordable and available diagnostic tests. The Institute is undertaking research to develop new diagnostic tests for diseases of humans and animals, as well as improving existing diagnostic tests.

Diagnostic delays in meningitis

Meningitis, a brain infection, is a devastating illness that causes death and disability in the UK, and worldwide. The first major paper looking at the causes and consequences of meningitis in the UK has found that viruses are the most common cause of meningitis in adults and cause substantial long-term ill health.

The study also found that the management of many patients with meningitis is sub-optimal. Diagnosis of meningitis is often delayed due to unnecessary brain scans being performed before lumbar puncture – which is the essential investigation to determine the cause of the illness. Recommendations in national guidelines urge doctors to perform a lumbar puncture within the first hour in patients with suspected meningitis unless the patient has specific features which make it unsafe to do so.

Being able to quickly determine which bacteria or virus is causing the illness is essential for the appropriate treatment of patients.

Lead author on the study Dr Fiona McGill said: “Diagnosing a specific cause of meningitis quickly is key to getting the right treatment. Rapid diagnostics will enable appropriate treatment to be given in a timely manner to those who need it, and allow patients who don’t need treatment to be discharged quicker.”


Development of a novel blood test to diagnose meningitis

A new commercial blood test is being developed to improve the diagnosis and management of patients with suspected meningitis. The £1.6M project, which is funded by the Medical Research Council and industrial partner Fast Track Diagnostics, could also help cut unnecessary antibiotic treatment – a practice that is contributing to the growing antimicrobial resistance crisis.

A key decision for doctors is to decide whether the meningitis is of bacterial or viral origin. Symptoms of both can be similar, but bacterial meningitis requires urgent treatment with antibiotics for the best possible outcome.

Project lead Dr Mike Griffiths said: “Due to a fear of ‘missing’ bacterial meningitis, doctors can end up giving unnecessary antibiotics to patients who are really suffering from viral meningitis. This test will help doctors to rule out bacterial meningitis more quickly, reducing unnecessary antibiotic treatment, shorten in-patient stay and reduce the burden on health care.”

New pen-side test for liver fluke in development

Liver fluke is a common parasite which is growing in prevalence across the UK. The parasite infects sheep and cattle and has significant implications for the productivity of the UK’s agricultural sector. Current methods for testing for liver fluke infection are both costly and time consuming, and the window within which treatment can be given is short, leaving farmers a very small period of time to administer it. As a result, many farmers end up blanket treating their cattle and sheep leading to growing resistance to the common treatments.

Researcher Dr Tessa Walsh has developed a pen-side test based around lateral flow technology (similar to that used for the home pregnancy test) which could soon be made available to farmers for use on their farms. Equipped with an easy to use testing kit, farmers will be able to pin point which animals require the treatment, reducing their costs and reducing the spread of resistance to the treatments used to control fluke.

The team has recently been awarded a £23,500 Biotechnology and Biological Sciences Research Council follow-on-fund pathfinder grant to continue the work.

Major new global brain infections project launched

Funding has been secured from the National Institute for Health Research (NIHR) to improve the management of devastating brain infections in low and middle income countries. The three-year, £2M project will establish a NIHR Global Health Research Group on Brain Infections, which will be led by Professor Tom Solomon in partnership with seven leading research organisations.

Acute brain infections, such as meningitis and encephalitis, are a major cause of death and disability globally. There is relatively little global research expertise in tackling them. For many brain infections appropriate therapies exist, but doctors fail to diagnose, and thus treat them properly.

To tackle this, the new Global Health Research Group will In Liverpool, with its outstanding reputation in brain infections research, to the internationally renowned Warwick Centre for Applied Health Research and Delivery, and to leading research institutes in Malawi, India and Brazil. The overall aim is to improve the diagnosis of acute brain infections in adults and children in these countries, to guide treatment and improve outcomes.

Diagnosis of urogenital infections in low resource settings

Sexually transmitted infections (STIs) and other urogenital infections cause a major burden of disease worldwide. Long-term complications include increased risk of HIV acquisition and transmission, pelvic inflammatory disease, cervical cancer, pregnancy complications, and invasive neonatal infections.

Most low- and middle-income countries manage gential infections when symptoms are reported, however, many women with urogenital infections do not have symptoms, and such asymptomatic infections can also cause the above complications.

Professor van de Wijgert’s team conducted a study in Kigali, Rwanda, aimed at improving STI and urogenital infection control in high risk women by introducing diagnostic point-of-care tests (POCTs) for the most common infections. POCTs are designed for use in clinic and outreach settings, in the absence of a laboratory. The POCTs greatly improved case-finding and infection management in these women compared to syndromic management, and most POCTs performed well compared to gold-standard testing. These results were shared with the Rwanda Ministry of Health and other key stakeholders and with the WHO team responsible for STI control guidelines.

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£2M Award
VACCINES

Vaccines are the single most effective method to reduce the burden of infectious diseases in humans and animals, but many major diseases lack effective vaccines for their control. The Institute is undertaking research to improve the effectiveness of current vaccines and drive the development of new vaccines for major diseases of humans and animals.

Rotavirus vaccine benefits vulnerable populations in Malawi and Merseyside

A new study has shown that rotavirus vaccination reduced infant diarrhoea deaths by a third in rural Malawi, and provides the first population-level evidence from a low-income country that rotavirus vaccination saves lives.

Professor Nigel Cunliffe, who led the study published in Lancet Global Health, said: “Rotavirus remains a leading cause of severe diarrhoea and death among infants and young children in many countries in Africa and Asia. Our findings strongly advocate for the incorporation of rotavirus vaccine into the childhood immunisation programmes of countries with high rates of diarrhoea deaths, and support continued use in such countries where a vaccine has been introduced.”

Meanwhile a study from Merseyside, led by the Institute in collaboration with Public Health England, has demonstrated that rotavirus vaccine has reduced hospitalisations, outpatient attendances and GP visits for diarrhoea since its introduction in the national immunisation programme in 2013. Importantly, vaccine impact was found to be greatest among the most deprived populations despite lower vaccine uptake in these areas.

Lead author Dr Dan Hungerford said: “For infants in the most deprived communities of Merseyside, the hospitalisations averted for acute gastroenteritis was double that in the least deprived communities. Therefore, if we prioritise increasing vaccine uptake in the most deprived populations the rotavirus vaccine is likely to give the greatest health benefit and can contribute to reducing health inequalities.”

First child vaccinated with typhoid conjugate vaccine in Africa

History has been made in the fight against typhoid fever this year as the first child in Africa was vaccinated using a new generation of typhoid vaccines. The clinical trial in Malawi is being led by Professor Melitta Gordon and the Malawi-Liverpool-Wellcome Trust Clinical Research Programme, and will recruit and vaccinate over 24,000 children in Blantyre, Malawi. The goal of the trial is to assess the efficacy and cost-effectiveness of a new typhoid conjugate vaccine (TCV) in African children. TCVs are the first major advance in typhoid vaccines in a generation. They have been found to improve immunological response and memory, with the promise of increasing vaccine efficacy from around 55% to over 90%.

“This clinical trial is the culmination of over 20 years of research focused on Salmonella disease here in Malawi,” said Professor Gordon. “Our teams of health workers, our local scientists, and our longstanding partners in the Malawi Ministry of Health and College of Medicine are tremendously excited to see the impact our research could finally have for health. We’re ready to go, and really feel like this could be the first child in Africa was vaccinated using a new generation of vaccines for major diseases of humans and animals.

Developing a vaccine for animal Trypanosomiasis

African animal trypanosomiasis (AAT) is a livestock disease caused by blood parasites spread by tsetse flies, and is endemic in 37 sub-Saharan countries. AAT causes chronic anaemia and severe loss of condition, resulting in death of the animal if untreated.

The Food and Agriculture Organization of the United Nations considers AAT to “lie at the heart of Africa’s struggle against poverty” with 50 million cattle at risk and billions of dollars lost in agricultural productivity annually. Resolving AAT is an enormous challenge; vaccines have always been considered unfeasible because, while in the bloodstream, the trypanosome surface structure constantly changes with that no antibody can become effective.

In a new GBox Biotechnology and Biological Sciences Research Council funded study, Dr Andrew Jackson and colleagues will evaluate a panel of novel vaccine candidates for AAT, focusing on proteins expressed by the parasite only while it inhabits the tsetse fly, which are typically invariant but produce strong immune responses. Dr Jackson said: “The potential commercial application of AAT vaccines is enormous, and the likely positive effect on animal health and livestock productivity across Africa and South America would be profound.”

Liverpool leads new Zika vaccine project

A major new collaborative project has begun to develop a Zika virus vaccine that is suitable for use in pregnancy. Supported by a £4.7M award from Department of Health and Social Care, and managed by Innovate UK, the new project aims to take two new vaccine candidates through to a clinical trial in humans within the next three years.

Pregnant women continue to be the population at highest risk following Zika virus infection as the virus can cause severe fetal birth defects. However, no approved vaccine or treatment is currently available.

The research is being led at the Institute by Professor Neil French and Dr Lance Turtle through the Centre for Global Vaccine Research. Professor French said: “Although the current Zika outbreak has slowed, there remains a significant risk of fatal abnormality when pregnant mothers become infected, and the changing climate raises the possibility of major epidemics occurring in previously unaffected parts of the world. A ready to use vaccine would dramatically reduce the threat that we face from Zika.”

This year has seen the culmination of several important studies for the Centre, which have led to new avenues of research and also informed public health. As members of the GCRF funded IMPRINT (Immunising Pregnant Women and Infant Network), we are at the centre of an international collaboration to prevent disease in mothers and their new-born babies. Funding through this network has led to a fellowship award for Dr Shadha Khadrak to better understand Group B Streptococcus immunity, and a project award to Dr Qiobo Zhang to investigate the maternal wheebling cough vaccination and impact on infant response.

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£4.7M Award

Typhoid vaccination field in Malawi

Institute of Infection and Global Health
Fellows

MICHAEL ABOYANNIS
Michael joins the Institute as a Wellcome Trust Clinical PhD fellow primarily working on the epidemiology of infectious diseases. His academic experience includes HIV research at the Infectious Diseases Institute in Uganda, and an MDR-TB national prevalence survey in Malawi.

CHARALAMPOS ATTIPA
Charalampos is a Diplomate of the American College of Veterinary Pathology with a special research interest in zoonotic infections. His academic experience includes veterinary pathology, canine leishmaniasis, zoonotic vector borne infections and diagnostics. Charalampos joins the Institute as a Wellcome Trust Clinical PhD fellow working on zoonotic parasitic infections.

NATALIE BEVERIDGE
Natalie is a newly appointed Academic Clinical Lecturer, and was previously a Clinical Fellow at the Institute. In 2014 she moved to Liverpool for clinical training in Infectious Diseases, based at the Royal Liverpool University Hospital. Natalie's research interests include mucosal and T cell immunology, pneumococcal disease and HIV.

KHUZWAYO JERE
Khuwayso is a Welcome Trust Training Fellow based in Malawi at the College of Medicine and at the Malawi-Liverpool Wellcome Trust Clinical Research Programme. He previously worked as a postdoctoral scientist at the Institute and has been recently appointed as Tenure Track Research Fellow. Khuwayso's research investigates how rotaviruses evolve in nature and characterises immune responses induced by rotavirus vaccination in infants from low-income settings.

“Doing my PhD in IGH has been a fantastic experience, not only due to the excellence of the academics and fellow students that I've met there but also because of the opportunity to create profound relationships. Through the challenging nature of my work I have become more creative, skilled and confident. All of which has been invaluable for my personal development and has certainly improved my professional path.”

Arturo Hernandez Colina, PhD Student

SHADIA KHANDAKER
Shadia has been awarded a two-year post-doctoral Fellowship from IMPRINT, a network focusing on maternal and neonatal immunisation, funded by the Medical Research Council / Biotechnology and Biological Sciences Research Council Global Challenges Research Fund. Shadia’s Fellowship is addressing Group B Streptococcal pathogenesis and host immunity, bringing together collaborators from Bangladesh, Imperial College London, and the University of Liverpool.

MAYAH WARDEH
Mayah has been awarded a Fellowship from the Biotechnology and Biological Sciences Research Council, through which she will develop a network model to investigate sharing, transmission and emergence of pathogens between host species. The research will utilise existing data to examine networks between different species and help to identify potential future emerging pathogens.

CATHARINE WILSON
Catherine is a veterinary surgeon and first year Wellcome Trust Clinical PhD Fellow currently based at the Malawi-Liverpool Wellcome Trust Clinical Research Programme, Blantyre, Malawi. Her PhD investigates the epidemiology of E. coli and non-typhoidal Salmonella in Malawi at a household level, determining the prevalence of these bacteria and the antimicrobial resistance determinants which they carry in samples taken from humans, livestock, domestic animals, peri-domestic wildlife and the environment.

Professors

MICHAEL DOCKRELL
Michael’s research interests lie in investigating vector competence for arboviruses, particularly the effect of temperature on virus transmission, to identify regions at risk from invasive or endemic viruses. He is also interested in the potential for viruses to adapt to different conditions, and consequently, the risk they may pose in the future.

CHARALAMPOS ATTIPA
Charalampos joins the Institute as a Wellcome Trust Clinical PhD fellow working on zoonotic parasitic infections.

MANONKALI KUMAR
Manonkali currently coordinates the Strep to Streptococcal Infections team as well as overseeing a specialisation focus on emerging STIs, Sexually Transmitted Infections. His academic experience includes veterinary pathology, canine leishmaniasis, zoonotic vector borne infections and diagnostics. Manonkali joins the Institute as a Wellcome Trust Clinical PhD fellow working on zoonotic parasitic infections.

REBECCA DE COO
Rebecca is a PhD student, based at Leahurst.

Some of our new appointments

Academic Staff

PEERS DAVIES
Peers joins the Institute as a Senior lecturer in Livestock Health and Welfare and is based at Leahurst. His research interests have focused on production limiting infectious diseases of sheep as well as antibiotic usage and resistance in cattle and sheep production systems. He is currently responsible for the emerging ‘iceberg’ diseases of sheep project funded by the Agriculture and Horticulture Development Board. He works with a network of farmers and industrial collaborators, primarily in the commercial sheep sector, seeking innovative approaches to emerging health and production challenges.

SIOBHAN MOR
Siobhan is an infectious disease epidemiologist from Australia and has joined the Institute as a Reader in One Health. A veterinary scientist by original training, she did her PhD on cryptosporidiosis in children in Uganda at Tufts University in the United States. She will be based in Addis Ababa where she will be leading the Ethiopian hub of the HDIN project.

Our Institute continues to be a reflection of the excellent work of our dedicated team of staff and students, all working to further the understanding, diagnosis, treatment and prevention of today’s prevalent and emerging infectious diseases affecting humans and animals. We continue to encourage and support the next generation of researchers through our active Postgraduate Society and Post-Doctoral Association, which run training and career progression activities through the year.

“Doing my PhD in IGH has been a fantastic experience, not only due to the excellence of the academics and fellow students that I’ve met there but also because of the opportunity to create profound relationships. Through the challenging nature of my work I have become more creative, skilled and confident. All of which has been invaluable for my personal development and has certainly improved my professional path.”

Arturo Hernandez Colina, PhD Student

Professional Services Staff

NATASHA LAMB
Natasha has rejoined the Institute as a Management Services Administrator after completing her apprenticeship with the Institute in 2014. Natasha will be working closely with The Centre for Global Vaccine Research, providing administrative support to various academic staff members and taking on a wide range of tasks across the Institute.

NADIAH MIAH
Nadiha joined the Institute in August 2017 as a Core Technician. As well as providing laboratory and technical assistance to staff and students in the Department of Clinical Infection, Microbiology & Immunology, she uses genomic and molecular techniques to provide support to the Gram-negative Bacterial Pathogens research group.
PhD student crowned third in FameLab Spain

FameLab is an international competition which celebrates effective science communication in young scientists. Institute PhD student Raquel Medialdea Carrera, who gave a passionate and engaging talk about Ebola, was crowned third in the national final of FameLab Spain. Watched by a 400-strong audience, Raquel performed alongside seven other finalists in front of the King and Queen of Spain at the event in Madrid.

Infectious fun at Bluedot Festival

Staff and students from the Institute have taken part in the 2018 Bluedot Festival at Jodrell Bank. Set against a backdrop of the iconic Lovell Telescope in Cheshire, Bluedot 2018 combined music with a ground-breaking programme of live science experiments, expert talks and immersive artworks. The Institute delivered an activity called Bad Bugs vs. Good Bugs: Make a Microbe!, which gave visitors the chance to see bacteria grown from everyday items and to make their own petri dish filled with crafted bacteria. It was also a great opportunity to share their research with a much wider audience. The podcasts will focus on our five major research challenges, and can be found on our website.

IGH Podcast launched

Researchers at the Institute have begun delivering a monthly podcast series, covering the breadth of research at the institute. The podcast will give researchers at the Institute, from PhD students to senior academics, the opportunity to share their research with a much wider audience. The podcasts will focus on our five major research challenges, and can be found on our website.

Public Engagement work in Brazil

Researchers from the Institute have been working alongside Fiocruz and Saude Crianca in Brazil to develop workshops for parents with children who have microcephaly caused by infection with Zika virus. PhD student Raquel Medialdea Carrera has been leading the project in Brazil, which brings families together with physical and musical therapists to help their children reach their full potential, and also to share our current research into the virus with parents. The work has been funded by Wellcome Trust.

Engaging with food workers in Kenya

Researchers looking at disease risks in animals entering the food chain have been engaging with slaughterhouse workers in Kenya. As well as feeding back results and advice from the studies to the larger community, the team have also been investigating occupational risk of disease spread to workers and have gone on to gain funding to provide personal protective equipment to the 750 workers in this region. These have been distributed alongside much needed information on animal welfare during slaughter, and recent funding has been awarded to assess the impact of this engagement.

Outbreak in a box!

Our popular Bug Terror activity, which sees researchers stage an interactive outbreak scenario for participants, has been made into a resource pack for anyone to use. Styled as a board game, the box contains everything you would need to teach people about the role of an epidemiologist in an outbreak situation in a fun and hands on manner!

PPI Panel

The Institute’s Public and Patient Involvement Panel (PPI) has been running for three years now, and has reviewed and provided assistance on over 30 research proposals. From commenting on patient questionnaires to advising on the feasibility of studies, the panel has helped Institute researchers to secure funding and strengthen their studies, and will continue to play an important role in our research.

Summer School

Our summer school for 16-17 year olds interested in a career in research is now in its fourth year, and has gone from strength to strength. This year we had an overwhelming number of applications and selected 16 students from across Merseyside to join us for a diverse range of activities, from hands on laboratory experience to careers talks from PhD students, and even a spot of crafting new vaccines with pipe cleaners and glitter!
Some of our major funders:

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