



UNIVERSITY OF
BIRMINGHAM



INSTITUTE OF MICROBIOLOGY AND INFECTION

The University of Birmingham is at the forefront of pioneering research into microbiology and infection. From the laboratory bench through to clinical trials, our translational work is assisting with the development of treatments and drugs to fight killer diseases, debilitating illnesses, superbugs and re-emerging diseases that were once wiped out in the UK but are now making a comeback.

Researchers at the University of Birmingham are working to tackle the growth in antimicrobial resistance which is a serious threat to global public health, threatening the effective prevention and treatment of infections caused by bacteria, viruses and fungi.

We are pioneering 21st-century techniques aimed at increasing the effectiveness of the diagnosis, tracking and treatment of infections. This is vital research because medical microbiology still relies on techniques devised in the 19th century, such as microscopy and the growing of cultures, to identify pathogens within clinical samples.

A key area of research for the University is the impact of infections caused by microscopic organisms on trauma patients whose ability to resist infection as a result of their injuries can be reduced, leaving them particularly vulnerable. The University is internationally recognised as a centre for world-class research in immunology and infection. This research, which focuses on areas such as microbiology, immunology and genetics, is helping to provide a greater understanding of the world at a cellular and sub-cellular level.

The University's Institute of Microbiology and Infection (IMI) was established in 2011, bringing together outstanding researchers from across campus to form one of the largest microbiology research centres in Europe.

Research within the Institute is diverse, encompassing the fundamental science of model organisms, the biochemical and

biophysical analysis of microbial components, as well as international research on key pathogens of medical and veterinary importance. The key research strengths of the Institute include pathogen genomics, chromosome architecture and gene regulation, plasmids and mobile DNA, microbial responses to changing environments, cell wall structure and membrane proteins, pathogenesis and host-pathogen interactions, infection and host immune response, antibiotic and antimicrobial resistance.

Background

□ Microbiology involves the study of microscopic organisms that can cause infections in humans. This research covers several disciplines including virology (study of viruses), bacteriology (study of bacteria) and mycology (study of fungi).

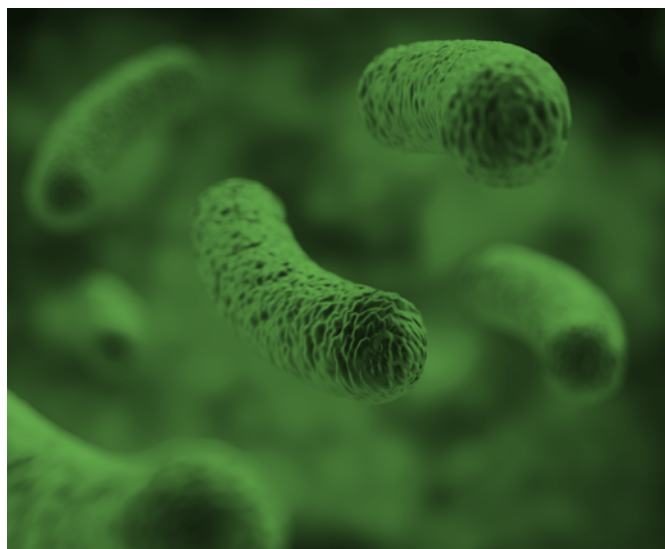
- According to the O'Neill Review on Antibiotic Resistance, drug-resistant infections could kill an extra ten million people across the world every year by 2050 if they are not tackled. By this date they could also cost the world around \$100 trillion in lost output, which is more than the size of the current world economy, and roughly equivalent to the world losing the output of the UK economy every year for 35 years.
- Patients with infections caused by drug-resistant bacteria are generally at increased risk of worse clinical outcomes and death, and consume more healthcare resources than patients infected with the same bacteria that are not resistant (WHO factsheet 194)

RESEARCHERS AT
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CHALLENGES OF THE
21ST CENTURY.



The Evidence

- ❑ Researchers in the Institute of Microbiology and Infection are expert microbiologists, immunologists, biochemists and chemists. It represents the largest grouping of microbiologists in the UK with technical expertise in next-generation sequencing, genomics, proteomics, molecular and structural biology, biotechnology and modelling
- ❑ The area around campus has the highest density of medical and life sciences activity in the UK:
 - There are over 500 medical technology companies based here, more than in any other UK region
 - With unique access to more than five million people, the region has high ethnic and socio-economic diversity and the youngest age profile of any UK city. Access to one of the largest patient cohorts in Europe is crucial to the translational data required in medical research.
 - We have the largest clinical trials base in Europe, outside Oxford.
- ❑ The University of Birmingham has the second-largest medical school in the country and provides significant numbers of high calibre graduates in medical, biochemistry and related fields to meet the future needs of the sector
- ❑ Microbiology and infection research is supported by the Institute of Biomedical Research, which includes the Medical Research Council Centre for Immune Regulation (MRC CIR), Birmingham University Stem Cell Centre (BUSCC) and the Centre for Human Virology
- ❑ This work is further supported by the Centre for Translational Inflammation Research at the Queen Elizabeth Hospital Birmingham, which includes the NIHR Surgical Reconstruction and Microbiology Research Centre



Key Projects

ANTIBIOTIC RESISTANCE

Our researchers are highlighting novel strategies to combat antimicrobial resistance by inhibiting bacterial efflux pumps; an approach that may enable existing antibiotics to be used against resistant infections. At the same time, they have demonstrated that chemicals commonly used in veterinary medicine or as disinfectants are a key factor in increasing antibiotic resistance of pathogenic bacteria. This evidence has been used by the European Commission to underpin new legislation now in force across the EU.

TACKLING OUTBREAKS

By exploiting cutting-edge DNA sequencing tools, we have been able to respond to infectious disease outbreaks on hospital wards with unprecedented speed. This expertise proved invaluable during the Ebola outbreak, when our research team flew out to West Africa and worked closely with colleagues from around the world to provide real-time information on the spread of the virus. This work has given a unique insight into the epidemiology and evolution of this deadly pathogen, helping the world become more prepared against similar outbreaks in the future.

NEW DRUGS, OLD DRUGS

Our research has highlighted opportunities to develop new therapeutic approaches for a number of serious infections. By screening large libraries of off-patent medicines, we have identified a number of drugs that could be 'repurposed' to treat challenging infections such as systemic fungal disease. At the same time, our work probing the way in which the human immune system tackles bacterial infections has revealed surprising strategies that could potentially be harnessed to help treat patients with chronic lung infections.