Infectious diseases are a persistent problem across the world. As microbes evolve and become resistant to existing antimicrobial drugs, the use of state-of-the-art approaches to better develop and optimise the use of antimicrobial agents is essential.

The Antimicrobial Drug Accelerator (ADA), part of the University of Liverpool’s Antimicrobial Pharmacodynamics and Therapeutics research group, speeds up and derisks the drug development process, making effective antimicrobials available to patients at the earliest possible time.

Who do we work with?
We share our knowledge and expertise with a range of organisations, from large pharmaceutical companies to smaller, highly innovative SMEs and biotech start-ups that are increasingly the engine of drug development.

What do we do?
We offer a complete, integrated drug development package with expertise in the following areas:

Discovering: Experimental pharmacology
In addition to extensive in vivo models, we are the only academic lab in the UK to use ground-breaking cell culture models (or ‘lung in a bottle’), developed by our scientists, as well as hollow fibre models of bacteria and fungal disease. These can simulate infection in human or animal tissues and be used to characterise relationships between drug concentrations and their antimicrobial effect. These models can then predict the efficacy of drug therapies – particularly useful for understanding the prevention and treatment of antimicrobial resistance.

Our in vitro models support the principles of the 3Rs: Replacement, Refinement and Reduction of Animals in Research.

Testing: Bioanalytical services
Our new bioanalytical facility enables us to measure drug concentrations in blood and other tissues to GCP standards. We have a number of triple quadruple UPLC mass spectrometers, including Agilent and Thermo machines.

Predicting the future:
Mathematical modelling
We use a range of advanced mathematical modelling techniques to explore and define the clinical implications of experimental data. These include population pharmacokinetics, drug interaction modelling, antimicrobial resistance modelling, and Monte Carlo simulation. These skills enable us to model drug development from the bench to the bedside.
Case studies

Client: Pfizer

Challenge: Hematogenous Candida meningoencephalitis (HCME) is a serious infection that can cause death or serious neurodevelopmental abnormalities in premature babies. Existing antifungal drugs are effective in treating Candida infections in adults, but their efficacy and optimal dosage in babies is not fully known. Without this information, treating babies infected with HCME remains problematic and potentially dangerous.

Solution: Using a well-validated experimental model of HCME, the ADA team at the University of Liverpool were able to define the pharmacokinetic-pharmacodynamic (PK-PD) relationships of anidulafungin, an antifungal drug. They then created a mathematical model to describe the experimental data and bridged the results to humans, using Monte Carlo simulation to identify appropriate regimens for babies. The results suggested that higher dosages than those currently studied in clinical care are probably required to achieve maximal antifungal effect.

Impact: The project showed that anidulafungin is potentially an effective treatment for HCME and suggests optimal regimens for future clinical studies. The research enabled the risks and benefits of anidulafungin for HCME to be better defined, reducing the risks of the future clinical development programme.

Client: F2G Ltd

Challenge: Invasive pulmonary aspergillosis is a life-threatening fungal infection that affects patients with compromised immune systems, such as those undergoing organ transplants or with cancer. Existing antifungal drugs to treat the condition all have issues with safety, tolerability or resistance. F2G developed the first new class of antifungal agents in 20 years that, once its properties were understood, could potentially offer new treatments.

Solution: F2G utilised the expertise of the ADA team to help them develop the first-in-class small molecule drug, F901318, into a commercial product. Using a range of experimental and modelling techniques, the team was able to define the PK-PD drivers for the agent and determine the drug exposure necessary to achieve efficacy in humans.

Impact: The collaboration paved the way for further clinical testing and F2G has now achieved dosing levels that are suitable for humans with no adverse side effects. Introduction of this new class of drug could improve clinical treatment and potentially save lives.

“"We were delighted with the collaboration and worked seamlessly with the ADA team. Their support helped us take F901318 forward to the next phase of clinical study, and will hopefully bring long-term benefits to patients.”

Ian Nicholson, Chief Executive Officer, F2G Ltd

Why use the ADA?

• Highly specialised: We are one of a small number of groups in the world operating in this space, and use state-of-the-art equipment unique to UK labs.

• Pioneering: Our team has extensive experience of personally developed experimental and clinical techniques to characterise drug regimens, predict their effects and reduce the risks involved in clinical trials.

• Well-connected: We collaborate and network with clinicians, academics and organisations across the world, including the European Society of Clinical Microbiology and Infectious Diseases (ESCMID).

• Proven impact: Our work contributes to international pharmaceutical regulations, influencing global public health policy and helping to save lives.