
Imperial College
London
Facing infection
together.
The Institute of Infection at Imperial College London

As the world reels from the health, social and economic impacts of COVID-19, infection is consuming our collective consciousness like never before. Despite incredible progress, infectious diseases remain a devastating global challenge. Endemic and epidemic diseases such as malaria, influenza and tuberculosis continue to claim millions of lives. And COVID-19 is simply the latest in a continuing series of emerging infections, including SARS, Ebola, and Zika. On top of the looming threat of the next outbreak, the spread of drug resistance means that once-treatable infections require new solutions.

Without a doubt these challenges need tackling. The question many are asking is: 'how?'

At Imperial, we know the answer lies in interdisciplinary collaboration, and are known for applying this approach effectively to global challenges. Building on these foundations, our new Institute of Infection is uniting clinical, medical, engineering, natural science, and economic researchers to transform the way infection is studied, taught and mitigated around the world. As we launch this bold new initiative, we are calling on our friends, partners and alumni to help us realise its full, and exciting, potential.

Why interdisciplinary science?

The spark of insight has always gone hand in hand with innovation across disciplines.

In 1928, at St Mary's Hospital, now part of Imperial College Healthcare NHS Trust, Alexander Fleming famously discovered the antibiotic penicillin after he observed that mould accidentally grew on a culture plate and created a bacteria-free circle around itself. However, the technology required to isolate and produce the antibiotic was lacking at the time. Aware of its potential, Fleming continued to grow the mould – *Penicillium notatum* – and distribute it to scientists, hoping that someone could transform it into a drug for human use. Building on Fleming's work, pathologist Howard Florey and chemist Ernst Chain led a team who succeeded in producing a pure form of penicillin and investigated its properties in more detail. Additional collaborations with fermentation experts and pharmaceutical companies led to a drug that could be produced in larger quantities. Fleming, Chain and Florey shared the Nobel Prize in Physiology or Medicine in 1945 and Chain went on to found and chair Imperial's Department of Biochemistry.

Today at the College, we are actively restructuring the way we work, to foster the kind of discoveries and collaborations that were once left to chance or individual initiative. Through the Institute of Infection, we are breaking down traditional departmental silos, instead training and empowering our people to work at the interface of their fields, which is where the solutions to our current and future infection challenges lie. We are connecting and growing a powerful network operating across specialties, industries and borders to turn fundamental discoveries into interventions that will save and improve lives.

→ The Institute of Infection is an interdisciplinary collective working to turn scientific breakthroughs into interventions that save and improve lives.

Our impact

By eschewing disciplinary silos, we are bringing a diverse community together to work on shared goals. Our core priorities – to help the world better **understand**, **find**, **treat** and **prevent** infection – underpin all that we do and ensure impact across every level, from the molecular to the societal.

We will better understand infection

through fundamental scientific research. We will use cell biology, structural biology and the biology of the infectious agent to examine the ways that infections from viruses, bacteria, fungi or parasites develop, as well as the immune responses and human physiology they provoke.

We will transform the way we find infection

by harnessing Imperial's unique strengths in molecular biology, bioengineering and technology development to create faster, more sensitive and more affordable diagnostic tests for better surveillance and early intervention.

We will treat infections better

by rationalizing antibiotic use, as well as by developing new antimicrobials, antivirals, and treatments for chronic infections, improving healthcare for both individuals and populations. Strong collaborations with our partner NHS trusts underpin this, and we are currently working with Imperial College Healthcare in particular to expand capability in clinical infection research through the proposed Fleming Centre for Clinical Infection Research.

We will help prevent infection

by integrating our institutional expertise across epidemiology, molecular biology, data analytics and clinical trials to drive the discovery of new vaccine targets, technologies, manufacturing and distribution methods, for current and future disease threats.

Why Imperial?

Imperial is a world leader in interdisciplinary research and education. Each day, our staff and students work at the interface of their fields to help deliver practical and novel solutions to the toughest problems facing humanity.

We have some of the world's foremost infection specialists, with **expertise in every class of pathogen**, working together with internationally renowned epidemiologists, clinicians, engineers, computer scientists and economists to take in the full picture of infection. We host a number of high-impact networks, such as the Network of Excellence in Malaria and the Antimicrobial Research Collaborative, and are the lead university for the UK's landmark Future Vaccine Manufacturing Hub. In establishing the Institute of Infection, Imperial is one of the few universities in the world to have virology, bacteriology, parasitology and mycology in one entity, linked to expertise in medicine, physical sciences, engineering and social science.

We have **premium infrastructure** including some of the **best containment laboratories in Europe**, and a rare and **world-leading capacity for clinical trials and human challenge studies**. Imperial hosts the MRC-funded Human Challenge Consortium (HIC-Vac), an international network of researchers who are working to accelerate the development of vaccines against pathogens of high global impact. We are home to the UK's largest containment-level-3 laboratory working with COVID-19, are one of the few institutions carrying out experimental human influenza infection studies, and are the only place in the country equipped to undertake human challenge studies with the malaria parasite. The College is also leading a ground-breaking clinical trial of a protective vaccine against HIV, marking a major milestone for the European AIDS Vaccine Initiative.

Our large-scale trials and studies are made possible through our **strong healthcare connections**. Many prominent researchers in infection at Imperial are clinician scientists. The College partners with the Institute of Cancer Research and three NHS trusts to form the Department of Health and Social Care designated Imperial College Academic Health Science Centre. Through our hospital campuses and partnerships, our clinician scientists and researchers have excellent access to patients, samples and a wealth of data. This access, combined with our skills in computational analysis, technology development and clinical sciences, gives us a unique edge when it comes to pursuing new discoveries – swiftly turning them into useful therapies, treatments and clinical tools.

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Tens of thousands of mosquitoes are specially bred in Imperial's labs to help understand and prevent the spread of diseases.

CASE STUDY

Imperial and COVID-19

Imperial became a household name thanks to its leading role in the response to COVID-19. Across the College, interdisciplinary teams rapidly formed to deliver solutions with speed and efficiency.

The modelling reports from our Jameel Institute heralded a turning point in the UK's COVID-19 response and made headlines around the world. Our teams informed international policy and guidelines on coronavirus, while continuing to tackle other major crises such as Ebola, MERS and the impact of climate change on health.

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Left: Sampling for COVID-19 on the Transport For London network.
Below: Pop-up vaccination centre in South Kensington, London.

A test developed by an Imperial start-up that detects COVID-19 in just over an hour, without the need for a laboratory, is now widely used in the NHS and care homes. Our novel self-amplifying RNA (saRNA) vaccine technology offers a 'plug-and-play' platform that can rapidly produce vaccine candidates for new variants of SARS-CoV-2 and other emerging pathogens, with dosages so small that large numbers of doses can be developed and distributed with greater efficiency than ever before. Imperial researchers are tackling every aspect of the pandemic, from mapping disease hotspots through sewage analysis to leading a new consortium that is improving pandemic preparedness and accelerating responses.

Our teams could respond so quickly to this crisis because they were prepared. They recognise infection as an ever-present and evolving threat, are well versed in interdisciplinary approaches, and had already done pivotal fundamental research. When COVID-19 struck, philanthropists, companies and communities all pitched in to support Imperial, enabling us respond rapidly without waiting for traditional funding processes to catch up. The new Institute of Infection will build on these strong foundations and increase our preparedness for future challenges.

The power of philanthropy

Our vision for the Institute of Infection challenges traditional university structures and funding frameworks. It requires people who can create connections, bridge divides, integrate new approaches and teach others to do the same. It requires funding that breaks down departmental walls, facilitates open collaboration and enables chance encounters and free-flowing conversations. And it requires partnerships that support this bold new approach.

Traditional public research funding often comes with disciplinary frameworks and short timeframes, which can force researchers into silos focusing on near-term problems. Philanthropy, on the other hand, gives researchers the freedom and resources to collaborate and to pursue new and more challenging ideas across fields. By supporting interdisciplinary posts, scholarships, facilities, research centres and projects, you can help create and grow impactful teams that transform the way we understand, find, treat and prevent infection. With the world in the grip of a pandemic, endemic diseases still sweeping through nations and fears of future outbreaks rising, this work could not be more important.

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imperial.ac.uk/giving/discover/institute-of-infection