



Australia's National
Science Agency

Securing a future where antimicrobials can still save lives

With advanced manufacturing and materials research capabilities, we're supporting Australian businesses developing world-first solutions to antimicrobial resistance.



Humanity is at the precipice of a global health crisis

The efficacy of modern medicine is at risk. The innovative technologies, therapies, surgeries, and treatments developed over decades could soon cease to save lives and livelihoods as they do now.

The problem is antimicrobial resistance (AMR).

As the widespread use, overuse and misuse of anti-infective medicines drives the emergence of drug-resistant germs, infections are becoming more difficult, and more costly, to treat.

The facts

- Left unchecked, AMR is predicted to cause more than **10 million deaths** annually by 2050.
- Already, **1.27 million people** die globally from AMR each year.

As one of the world's biggest health challenges, AMR urgently calls for a new, multifaceted network of solutions that recognise its impact in healthcare and beyond, affecting the animal, plant, food and feed production, and environmental sectors.

New medicines alone do not present a viable solution. We need new antimicrobial agents, diagnostic tools, therapies, detection and monitoring technologies, and management approaches.

For the manufacturing landscape, this presents an emerging field rich in opportunities – for new products, patents, commercialisation, growth and leadership, and to help secure a brighter future for all of humanity.

Here's how we can help you get involved.



Collaborating to curb AMR

CSIRO's multi-disciplinary team has extensive expertise in antimicrobial medicines including drug discovery and antimicrobial surface technologies for use in human health, agriculture and aquaculture.

We collaborate with companies, start-ups, SMEs, universities, and research partners both nationally and internationally to develop and apply new technologies, products and processes, to explore new ideas and grow business.

Our advanced manufacturing capabilities can help you translate your ideas into market-ready products.

We can help you with new approaches to discover and/or translate:

- Antimicrobial compounds, proteins and surfaces
- Biocompatible materials resistant to biofilm formation
- Antimicrobial detection technology for diagnostics

CASE STUDY – Antimicrobial coatings

Curbing catheter-associated urinary tract infections

All medical devices are associated with infection rates, but urinary catheters have the highest incidence of infection over the lifetime of the device.

Urinary tract infections represent the most common type of healthcare-related infections, and catheter-associated urinary tract infections (CAUTIs) account for approx. 75 per cent of these. CAUTI treatment options are currently based on the use of antibiotics, and emerging antimicrobial resistance to these antibiotics is a serious concern.

Between 15–25 per cent of hospitalised patients receive urinary catheters during their hospital stay.

CSIRO scientists have developed polymer coatings that are resistant to the formation of bacterial biofilms, using novel material and surface modification approaches.

These polymer coatings are expected to find applications in urinary catheters.

CASE STUDY – Extended wear contact lenses

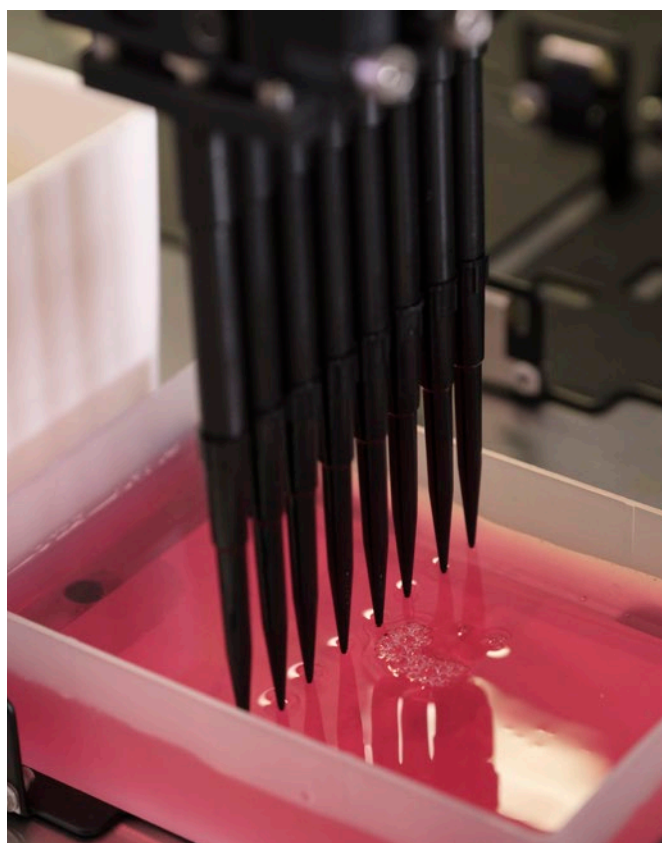
A decades-long challenge solved by CSIRO scientists

For over 30 years, consumers and industry sought soft contact lenses suitable for convenient, safe and allowed long term continuous wear.

CSIRO, along with the University of New South Wales, joined with CIBA Vision and Novartis in an international collaboration to develop materials and associated intellectual property for such a product.

The team concluded that existing hydrogels were unable to provide essential properties, such as oxygen permeability and protection from bacterial infection, required of extended wear lenses. They devised an innovative strategy to explore new polymers and surface properties.

The research, led in CSIRO, resulted in the development of CIBA Vision's Focus Night & Day® (FND) lenses. These lenses, made from a silicone hydrogel called Lotrafilcon A, are suitable for safe continuous 30 day and night wear.



How we can assist

1 Drug discovery: target validation, hit and lead generation

- Structure-based design creating hits and leads.
- Novel compound libraries which act as starting points.
- Polymer mimetics of antibacterial compounds including big data sets to aid design.
- Assay development using target proteins for testing.
- The CSIRO Compound Collection, which stores non-commercially available compounds as well as a smaller, curated commercial collection and proprietary fragment library.

2 Biocompatible materials for medical applications

- Design of novel polymers and materials.
- Surface chemistry and surface modification.
- Biocompatible solutions for medical devices and drug delivery.
- Fabrication development including excursion modelling and 3D printing.

Opportunities:

- Antimicrobial surfaces in hospital environments, ranging from frequently touched handrails to wall paints to air handling systems.
- Antimicrobial coatings for indwelling medical devices, such as urinary catheters, cardiac pacemakers and hip implants.
- Surface spray technologies developed from compounds with known antimicrobial effects.

3 Production solutions

- Production of proteins and vaccines for:
 - humans (clinical trials)
 - animals (trials).
- Production of proteins for assay and diagnostic development.
- Bespoke synthetic polymer selection, design and production.
- Development of scale up synthesis for small molecules.
- Flow chemistry expertise for small molecule production.
- Optimised phage cocktails for human and animal disease control.

CASE STUDY – Relenza

Developing the world's first anti-influenza drug

Landmark research by the CSIRO led to the development of the world's first neuraminidase inhibitors (NAIs), a class of drugs that can effectively treat all strains of influenza virus and saves millions of lives each year.

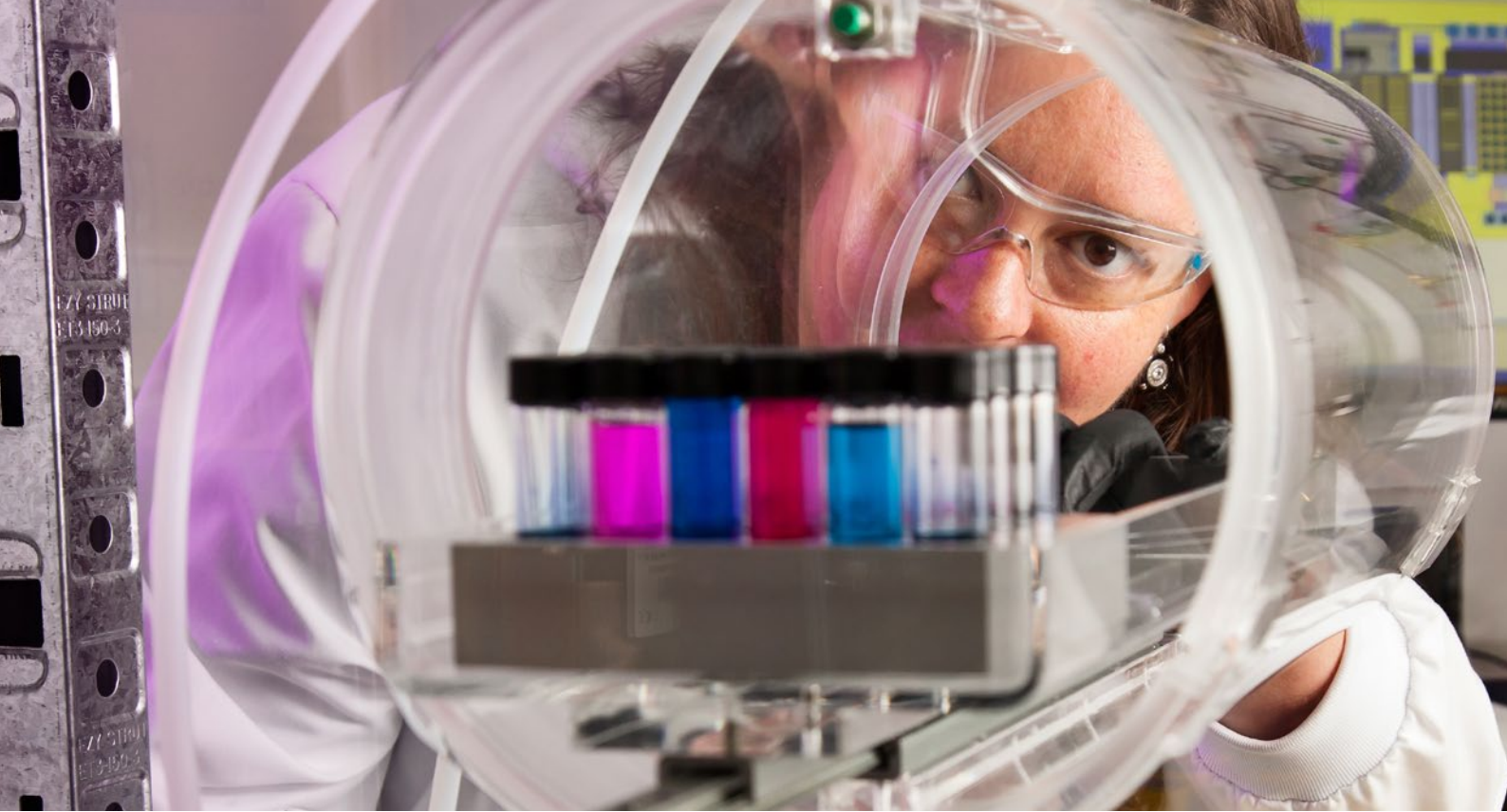
Our determination of the neuraminidase protein's three-dimensional structure enabled the development of the first-in-class drug, called zanamivir, which works to block the neuraminidase enzyme that would otherwise enable the virus to progress.

Our research, sponsored by Biota and with collaborators at the Victorian College of Pharmacy and the Australian National University, is one of the first examples of structure-based drug design.

Zanamivir was licenced by the multinational pharmaceutical company GlaxoSmithKline and made commercially available as Relenza. It is now used in 70 countries.

NAIs such as Relenza have worldwide annual sales in excess of \$3 billion.





World-class facilities

As one of the world's largest multi-disciplinary science organisations, we have world-class facilities found nowhere else in Australia.

RAFT (Reversible Addition-Fragmentation chain Transfer) polymerisation

Our RAFT polymerisation process enables the design of polymers with unprecedented control over polymer size, composition and architecture. Applications range from novel drug delivery systems to personal care products, lubricants and coatings.

Rapid Automated Materials and Processing (RAMP)

RAMP enables the high-throughput discovery of materials for use in various industries. Fast-track research with automated materials' synthesis and characterisation to discover properties defined by you.

Biomedical Materials Translational Facility (BMTF)

Our Biomedical Materials Translational Facility (BMTF) helps medtech companies turn new discoveries into market ready products. Our experienced team has the expertise and access to infrastructure needed to help medtech companies develop their product through biomaterials R&D, scale-up, prototyping, pre-clinical testing and industry evaluation.

Advanced Biologics Manufacturing (cGMP) Facility

This facility will operate using Current Good Manufacturing Practice (cGMP) enabling Australian researchers and biotech companies to progress their projects and enter overseas markets. It will also provide the capability to produce vaccines and anti-venoms for emergencies.

Centre for Industrial Flow Chemistry (FloWorks)

FloWorks develops scalable and safe chemical processes using flow chemistry, initiating lab discovery, and translating to chemical production. Our world-class flow chemistry research offers our partners a safer, more efficient, cost-saving and reliable alternative to conventional batch chemical processing.

Work with us

CSIRO was created to help Australian businesses grow. More than a hundred years on, we continue to work with businesses large and small across Australia.

Let us help your business become the next Australian research success story in AMR. Our expertise, equipment and experience can help you harness commercial opportunities and increase profits.

Flexibility is key in any good research partner. We collaborate through research partnerships, researcher placements, consultancy services and commercialisation of our intellectual property.

Contact us to see how we can help your business innovate
csiro.au/amr

As Australia's national science agency and innovation catalyst, CSIRO is solving the greatest challenges through innovative science and technology.

CSIRO. Unlocking a better future for everyone.

Contact us
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