New EU-funded Doctoral Network to sensitise critical multidrug-resistant bacteria to antibiotics

An alarming number of infections have become hard or impossible to treat. As more and more bacteria and viruses grow resistant to antimicrobial medicines, antimicrobial resistance is considered one of today's greatest health threats facing humanity.[1] With innovation in the development of new antibiotics lacking, other solutions are urgently needed. A new EU-funded research and training programme, BREAKthrough, approaches the problem from a different angle: it aims to develop a new compound that will modify bacteria in a way that makes them vulnerable to existing antibiotics.

Drug-resistant diseases are causing at least 700,000 deaths every year. It is estimated that by 2050, this number may have risen to 10 million if no action is taken.[2] Among the drug-resistant microbes, one of the most critical threats is posed by multidrug-resistant bacteria, so-called "superbugs", which have been a major cause of infections in the past years and are spreading rapidly. Due to various barriers impeding the development of new antibiotics,[3] no new antibiotic classes have been discovered in the past 35 years, further increasing the urgency of the problem.

A promising solution: breaking through superbugs' protective shell

BREAKthrough, a new Europe-wide Doctoral Network funded within the Marie Skłodowska-Curie Actions (MSCA) framework, will take on the most notorious type of superbug, Gram-negative bacteria, whose cell envelope ("walls") prevent antibiotics from entering. The research aims to damage the cell envelope so that it no longer forms an obstacle and enables antibiotics to pass through and kill the bacterial cell. To develop novel compounds that can do this, BREAKthrough brings together experts from both academia and industry, covering fields like bacterial genetics, biophysics, cell biology, organic chemistry, pharmaceutical chemistry, and biochemistry. The project's outcomes will have a significant scientific and societal impact: not only will the new compounds open up new avenues for developing new antibiotics, but they can also form new effective treatments through synergy with already existing antibiotics.

Being part of the BREAKthrough Doctoral Network, the project partners will recruit and train eleven doctoral candidates (DCs). The DCs will benefit from the international, intersectoral, and interdisciplinary nature of the BREAKthrough network through secondments at partner organisations. Acquiring an extensive set of scientific, business, and transferrable skills through the training programme, the DCs will be well-equipped to become the next generation of scientists in drug development with entrepreneurial flair and a good understanding of the challenges of drug development in an industrial context. The BREAKthrough DC job advertisements can be found on the project website and on the European Commission's EURAXESS portal.

"Working as an international team of scientists to tackle a major threat to human health and training the next generation of microbiologists is extremely stimulating."

Prof. Jean-François Collet, project coordinator BREAKthrough

Joining forces to fight antimicrobial resistance

The BREAKthrough project started on January 1, 2023, and will run for four years. It is led by Prof. Jean-François Collet from the Université catholique de Louvain in Belgium. The multidisciplinary consortium, extending across eight European countries and Australia, covers the entire chain of knowledge and innovation.

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Identified by the European Commission as one of the top three health threats that require coordination measures at the EU level,[4] antimicrobial resistance is a global emergency that demands immediate action. The new BREAKthrough project will tackle this challenge through the combination of cutting-edge research and the training of a highly competent next generation of drug developers.

To stay up to date with BREAKthrough, visit the project website breakthrough-project.eu and follow the project on Twitter and LinkedIn (@BREAKthrough_DN).

Facts and figures

Project name: Breaking the barrier - An integrated multidisciplinary approach to kill Gram-negative bacteria through existing antibiotics by making their outer membrane permeable

Funding programme: Marie Skłodowska-Curie Actions, Horizon Europe (HORIZON-MSCA-2021-DN-01)

Budget: 2.6 million euro

Duration: four years, 01-01-2023 – 31-12-2026

Network: 9 beneficiaries, 7 associated partners

Network

Beneficiaries

- Université catholique de Louvain (UCLouvain), Belgium
- Centre National de la Recherche Scientifique (CNRS), France
- Università degli Studi di Milano, Italy
- Vrije Universiteit Amsterdam, the Netherlands
- University of Ljubljana, Slovenia
- Amsterdam UMC, the Netherlands
- Institute of Chemical Research of Catalonia (ICIQ), Spain
- NAICONS Srl, Italy
- ABAC Therapeutics SL, Spain

Associated partners

- accelopment Schweiz AG, Switzerland
- Symeres Netherlands B.V., the Netherlands
- Roche Schweiz, Switzerland
- Syngulon, Belgium
- Universitat Rovira i Virgili, Spain
- University of Newcastle upon Tyne, UK
- The University of Queensland, Australia

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