Antimicrobial Resistance Initiative
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Resistance to antimicrobial agents has become a threat to public health all over the world. Microorganisms become resistant to antimicrobial agents either by mutations in specific genes or acquisition of genes encoding resistant determinants transferred from one microorganism to another. Nowadays, the use and abuse of antimicrobial agents can easily select these resistant pathogens, increasing the prevalence of multidrug resistant (MDR) microorganisms. A report published in 2016 by Lord O’Neill indicates that annually over 700,000 people die worldwide due to infections caused by MDR pathogens, and it is predicted that this number will achieve 10 millions by 2050 unless new policies and actions are implemented. A One Health approach is needed to tackle this problem, as it is not only limited to humans; antimicrobial agents are significantly used to prevent infections in the animal industry and are even used as “growth promoters” for fattening livestock in some countries, further increasing the problem of resistance.

In the last years the number of available antimicrobial agents active against resistant microorganisms has decreased, reducing the therapeutic options to treat infections due to these pathogens. Although MDR microorganisms are mainly causing infections in the hospital, the figures regarding these infections in the community are increasing. When resistance to first-line drugs appears, infections last longer and become more expensive to treat, with hospitalization required in many cases. This situation increases health costs and poses a serious risk to the progress made in global health by countries, communities and individuals in the past decades.

The World Health Organisation (WHO) warns that the world is heading for a “post-antibiotic era” unless some action is taken. More resources are needed to fight the so-called superbugs as well as an increase in awareness of the seriousness of the problem. The following specific actions need to be taken at a global scale:

- To strengthen the systems already implemented and establish new systems in low and middle-income countries (LMICs) for tracking and monitoring antimicrobial resistance.
- To promote the rational use of antimicrobial agents in both humans and animals.
- To improve the prevention and control of infections.
- To stimulate innovation, research and the development of both diagnostic tools and new drugs to fight against resistant pathogens.

In this context, the Antimicrobial Resistance Initiative aims to contribute to global research efforts on containing antimicrobial resistance and discovering novel therapies. At the heart of the Initiative's work model is the concept of knowledge translation: that is the transfer of scientific evidence into concrete actions.

In the last 30 years, only 1 new first-in-class antibiotic has been approved for human use.
Deaths Attributable to Antimicrobial Resistance Every Year by 2050

Every year, about 700,000 people die worldwide from drug resistant pathogens (including bacteria, HIV and malaria).

Globally, 480,000 people develop multi-drug resistant tuberculosis each year.

The major research activities carried out by the Antimicrobial Resistance Initiative are focused on:

- Research on the molecular bases of antimicrobial resistance and its relationship with virulence.
- New strategies to discover and develop novel antibacterial drugs.
- Design of rapid tests based on proteomic and genomic approaches to diagnose infectious diseases.

ISGlobal collaborates in the following international projects:

- **MNSIRSES** is a European exchange programme which aims to establish a long-lasting collaboration between Moroccan, South African and European research teams involved in clinical epidemiology and public health research. This effort should ultimately lead to the improvement of mother and child health and better control of sexually transmitted diseases.

- **COMBACTE-CARE** is a European network project which aims to shed new light on the best ways to understand and treat ‘carbapenem-resistant Enterobacteriaceae’ (CRE) infections. It will also run clinical trials of a novel antibiotic combination product designed to tackle a sub-type of CRE infections for which there are limited or no treatment options.

- **MagicBullet** is a European research project focused on finding the antimicrobial treatment for one of the most serious and common illnesses suffered by patients in intensive care units - ventilator-associated pneumonia (VAP) - aggravated due to the increase in multi-resistant bacteria. The multidisciplinary team is formed by intensive care specialists, infectious diseases experts, microbiologists, pharmacologists and researchers.

- **NOMORFILM** is a European project coordinated by ISGlobal which aims to identify bioactive compounds from marine microalgae that display anti-bacterial biofilm activity, and use such molecules for the manufacture of prosthetic devices. The consortium is set up by fifteen public and private institutions from nine different countries, involving more than 50 people.

Antimicrobial resistance threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi.
ISGlobal is part of an Interdisciplinary International Research Partnership (IRP) to tackle antimicrobial resistance as an evolving global health threat. The aim of this working group is to develop and implement actions in LMICs in order to generate reliable data in relation to antimicrobial resistance.

In this regard, the Initiative is working on a mapping of resistance in sub-Saharan Africa, one of the regions where information about this phenomenon is scarce. The objective is to collect data on the main challenges in the access and use of antibiotics in low-income countries.

In addition, ISGlobal is developing a knowledge network in the Mediterranean region, which includes the creation of a Health Observatory that has antimicrobial resistance among its priorities.

The annual excess healthcare costs of resistant infections in the EU have been estimated at around €1.6 billion.
Training and Education

Training of health professionals and researchers, both in Barcelona and abroad, is a key component of the Initiative’s work. Some activities already done and other planned to be developed include:

- Antimicrobial resistance workshop in Morocco, organized by the Société Marocaine de Microbiologie Médicale, in collaboration with ISGlobal, the European Society of Clinical Microbiology and Infectious Diseases (ESCMID) and the American Society of Microbiology (ASM). Addressed to microbiologists, infectious disease specialists and other professionals working in AMR field in this country.

- International Summer School, focused on the current challenges of antimicrobial resistance including the molecular bases of antimicrobial resistance, antimicrobial stewardship, research for the development of new tools (new antibiotics, vaccines, etc.), innovation, policies and strategic interventions to tackle antimicrobial resistance.

- International Symposium on “New strategies to combat bacterial resistance” focused on the state-of-the-art in terms of innovation, research for the development of new tools (new antibiotics, vaccines, etc.), as well as policies and strategic interventions to tackle antimicrobial resistance.

In the EU, antimicrobial resistance is responsible for 25,000 deaths every year
In the last 30 years, only 1 new antibiotic class has been discovered (diarylquinolines). Currently, there are barely 40 products in the pipeline (not yet approved but in clinical phases).

Source:
ISGlobal’s mission is to promote health equity through excellence in research and the translation and application of knowledge. Our vision is a world in which all people can enjoy good health.

ISGlobal Initiatives

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- Chagas Initiative
- Malaria Elimination Initiative
- Maternal, Child and Reproductive Health Initiative
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