

## APC Microbiome Ireland

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### Mobilising the Microbiome against the Coming Plague of Anti-Microbial Resistance

- Broad spectrum antibiotics damage the bacteria in our gut and can generate resistance in non-target species with significant implications for human health.
- Bacteria and viruses in the human gut are a source of new narrow spectrum antimicrobials.
- *APC Microbiome Ireland* is at the forefront in developing new treatments to replace broad spectrum antibiotics. These include narrow spectrum antimicrobials derived from bacteria and viruses in the gut, as well live bacteria, bacteriophages (viruses which kill bacteria), fungi and faecal microbiota transplants.

Resistance to antibiotics (antimicrobial resistance; AMR) is a global health threat and poses serious challenges for Irish and other national health systems. However, solutions are emerging. The SFI Research Centre *APC Microbiome Ireland*, based at University College Cork and Teagasc, is at the forefront of research using bacteria and viruses found in our gut (the microbiome) to treat serious infections. International researchers are gathering in Cork today to discuss the latest developments, particularly those focusing on mobilising the microbiome.

Each year more than 700,000 people across the world die from infections that are resistant to current antibiotics, and by 2050 drug-resistant infections will take an estimated 10 million lives per year<sup>1</sup>. The economic cost of lost global production caused by antimicrobial resistance will amount to approximately \$100 trillion between now and 2050 if it is not tackled. Ireland has a relatively high rate of antimicrobial resistance in human health compared to most European countries, and ranks above the EU average for consumption of antibiotics in the community<sup>2</sup>.

“There is about one new case of carbapenemase-producing enterobacteriaceae (CPE) found in Ireland everyday” said Martin Cormican, National Clinical Lead for Health Care Acquired Infections and Anti-Microbial Resistance and keynote speaker at the conference. “Antibiotic resistant bacteria, sometimes called superbugs, are already causing serious illness, shortening lives and increasing health care costs. If we do not manage these better than we have in the past, antibiotic resistant bacteria may undermine the sustainability of the entire healthcare system. CPE was declared a public health emergency in Ireland on 25<sup>th</sup> of October 2017 but so far, about 3 months into this emergency, we are not making progress as quickly as we need to if we are to control this.”

The increasing number of bacterial species resistant to antibiotics is both inevitable and predictable, so with increasing amounts of data we can and must start to plan for the future and to develop new strategies to prevent the spread of AMR, and alternative therapeutics to treat antimicrobial resistant infections.

“Broad spectrum antibiotics, which target a broad range of bacterial species, cause collateral damage to the gut microbiome, which is so important to health, and also generate resistance in non-target species with implications for human health” said Colin Hill, *APC*

*Microbiome Ireland*, UCC. “We are at the forefront of research mining the human microbiome to develop new narrow spectrum antimicrobials that only kill the target species. These will limit resistance in non-target species and the resulting damage to human health. We are also developing live therapeutic bacteria, bacteriophages (viruses which kill bacteria) and faecal microbiota transplants as alternative therapeutics to antibiotics.”

“The use of antibiotics in Ireland during the period 2012 to 2016 continued to rise and Ireland, along with Belgium and France, is a higher consumer of antimicrobials relative to other EU countries” said Stephen Byrne, Head of School of Pharmacy, UCC. “Irish studies have reported the overuse of antimicrobials in primary care, even when clinicians deem their use to be unnecessary, and have reported that clinicians feel pressurised by patients to prescribe antimicrobials.”

Graham Rook, University College London, pointed out the importance of hygiene as an effective anti-microbial strategy and contrary to the so-called ‘hygiene hypothesis’ he showed that ancestral microbes or ‘old friends’ are necessary for training and development of the human immune system.

“The public health message on antibiotics needs to be refined. In addition to minimising unnecessary and inappropriate use, the public needs to know that broad spectrum antibiotics damage beneficial as well as harmful bacteria. Moreover, mobilising the microbiome will have a central role in future strategies against infections” said Fergus Shanahan, Director of *APC Microbiome Ireland*, and Chief Clinical Director of the HSE South/Southwest Hospital Group.

## **ENDS**

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## **About APC Microbiome Ireland**

The SFI Research Centre *APC Microbiome Ireland* (APC; <http://apc.ucc.ie>) is a world leading research institute which was formed in 2003 with funding from Science Foundation Ireland and in conjunction with key industry partners. It represents a seamless collaboration between University College Cork and Teagasc (the Irish Agriculture and Food Development Authority). It is widely recognised that the gut microbiota plays an important role in human health and has become one of the most dynamic, complex and exciting areas of research in both food and pharmaceutical arenas. Over the last decade the APC has established itself as one of the leading global centres in gut microbiota research. The APC has made several landmark discoveries and has published over 1,700 research articles in peer-reviewed journals, generating many journal covers and associated editorials. The APC comprises over 300 individuals, from the scientific PI’s (the APC Faculty) funded by the partner Institutions, the management team, and a dedicated group of research scientists, research assistants and postgraduate students.

## References

1. *Tackling drug-resistant infections globally: Final report and recommendations*. London, UK: Wellcome Trust and UK Department of Health; 2016. *Review on Antimicrobial Resistance*.
2. *Summary of the latest data on antibiotic consumption in the European Union*. Nov 2017. [https://ecdc.europa.eu/sites/portal/files/documents/Final\\_2017\\_EAAD\\_ESAC-Net\\_Summary-edited%20-%20FINALwith%20erratum.pdf](https://ecdc.europa.eu/sites/portal/files/documents/Final_2017_EAAD_ESAC-Net_Summary-edited%20-%20FINALwith%20erratum.pdf)