



GUT REACTION | WINTER 2021

Season's Greetings! Welcome to our Christmas Newsletter edition, an opportunity for us to reflect on some of the highlights and key developments in APC Microbiome Ireland throughout 2021.

It's hard to believe that we are still embroiled in a global pandemic, but for all the hardship we as a global population have experienced since the outset of COVID-19, I am in awe of the resilience and resourcefulness demonstrated by the team at APC. Our team have pioneered a return to lab work at UCC and been instrumental in the development of UniCOV, a nationwide saliva sampling project created to optimise the health and safety of university students and staff. We have several researchers working on COVID-19 studies which are detailed further on in this newsletter.

The 4th of June was a particularly important milestone for us when both the Taoiseach (Prime Minister) Micheál Martin, and the Minister for Further and Higher Education, Research, Innovation and Science, Simon Harris, launched the new APC Strategic Vision 2021-2026. This sets out Vision and Mission for the Institute and is composed of four main pillars: People and Culture, Scientific Excellence, Partnerships and Stakeholder Engagement. We are indebted to our Governance and Scientific Advisory Boards for all the help and guidance they have given us in this process. [You can read the full document here.](#)

We have always said that our people are our strength and during the year, there have been changes to the APC team, including Prof Subrata Ghosh, a renowned Gastroenterologist, who has been appointed Deputy Director here at APC. Subrata is Chair and Head of Medicine at UCC and also one of our many new exciting PI appointments as detailed in the Newsletter. Our longtime General Manager Dr Sally Cudmore has taken up the role as Interim Director of Innovation at UCC. Sally has been an outstanding player in APC's journey to date and we are delighted that she remains so connected to the Institute in her new role. Sally has been replaced by Dr Brendan Curran as interim manager of APC. APC's PI Prof John Cryan was recently appointed as the UCC VP for Research and Innovation, we congratulate him in taking up such an important role for UCC.

This year has also seen some Microbiome-based major successes in terms of high impact publications, new industry partners and major grant success - many of which are captured here. This is a true

testament, I feel, to the resilience, ingenuity and versatility of APC staff who in many cases have found highly effective ways of working in what have been very challenging times.



1 - WATCH LAUNCH

Lastly, I wish you all a safe and happy holiday.

Prof Paul Ross

Director APC Microbiome Ireland

Focus on Industry



- APC spin-out company SeqBiome was one of 10 start-ups selected from over 200 applicants to partake in the prestigious PepsiCo's Greenhouse Accelerator program earlier this year, and the only Irish participant. [Read more about Seqbiome](#)
- Another APC spin-out company and industry partner Artugen Therapeutics, a company backed by Morningside Ventures that mines the microbiome to discover targeted, therapeutic bacteria for difficult-to-treat infectious and inflammatory diseases, is continuing its development of ART24, the company's first clinical-stage investigational agent that is currently being evaluated in a Phase 1 clinical trial for the prevention of *C. difficile* infection recurrence in patients who have completed the standard of care antibiotic treatment. [Read more about Artugen Therapeutics here](#)
- APC spin-out company Atlantia Clinical Trials hit a new milestone in October 2021 announcing that it now has over 75 employees based in its Cork and Chicago sites. [Read more about Atlantia Clinical Trials here](#)



APC In the Media

Some of our Media Highlights from 2021

- APC recruits global science star and plan to build innovation hub - [Irish Examiner](#)
- Microbiome research could help shape our future - [Sunday Business Post](#)
- Cryan Lab's Nature Aging paper 'Microbiota from young mice counteracts selective age-associated behavioral deficits' was covered in many publications including [RTÉ Drivetime](#), [Science Magazine](#), [Irish Examiner](#), [Smithsonian Magazine](#), [Late Late Show with Stephen Colbert \(@4:40\)](#), Fox News, [Express](#) and Prof Cryan wrote a background piece for [The Conversation](#).
- Microbiome research stops methane in its tracks - [Feed Navigator](#)
- Irish biotech company SeqBiome, founded by Dr Marcus Claesson was chosen for PepsiCo accelerator. - [Irish Times](#)
- The Irish Coronavirus Sequencing Consortium (ICSC) led by researchers at the Teagasc/APC Microbiome Ireland are working closely with the National Virus Reference Laboratory. - [Irish Examiner](#)
- Dr Kirsten Berding Harold on how to maintain good digestive health. - [The Irish Times](#)
- An over active immune response to Covid-19 could be part of the reasons why some people experience long COVID symptoms such as fatigue months after their infection, according to a new APC study led by Prof Liam O'Mahony. - [RTÉ Prime Time](#), [Irish Independent](#), [RTÉ Drivetime @ 1:21](#), [The Journal](#)
- Human microbiome: Diet, precision medicine and wellbeing, Dr Harriet Schell lekens - [Irish Times](#)
- Dr Ciaran Lee research on Crispr-Cas9 gene therapy. - [Irish Times](#)
- Darina Allen on World Microbiome Day - [Irish Examiner](#)

- Prof John Cryan contributes to Observer Magazine cover story '[Unlocking the gut microbiome - and its massive significance on our health](#)'.
- Prof Paul Cotter for RTÉ Brainstorm: [How can we enjoy a tasty fatty meal without weight gain?](#)
- John Leech for RTÉ Brainstorm: [If monkeys are fermenting, why aren't you?](#)
- Dr Orla O'Sullivan: The future of happiness - from mindfulness in schools to listening to your gut. - [The Journal](#)
- Can test kits of our bodies' microbiome aid in our Health? - [The Washington Post](#)

Prof Fergus Shanahan elected to the National Academy of Inventors



Prof Fergus Shanahan, Emeritus Professor of Medicine at University College Cork and founding Director of APC Microbiome Ireland, the SFI Research Centre at UCC, was elected to the academy which recognises prolific academic inventors across the globe.

Prof Shanahan is an inventor of over 20 patents in the field of microbiome science and gastroenterology. Shanahan has also published over 500 scientific papers and co-authored or edited 10 books and 80 book chapters. He is a Fellow of Royal College of Physicians in Ireland, Canada, and UK, and American College of Physicians.

His most significant patent relates to the use of a unique probiotic strain of *Bifidobacterium* targeted at people with Irritable Bowel Syndrome. This patent was licensed to industry and subsequently marketed on a global scale. Prof Shanahan is also a co-founder of three spin-out companies, PrecisionBiotics Ltd, Atlantia Food Clinical Trials Ltd and 4D Pharma Cork PLC, all of which continue to thrive in the Cork region and have created over 100 high-tech jobs.

Prof Shanahan expressed gratitude for the award but credited it to others including “*shared minds and collaboration among friends and colleagues at University College Cork and in industry*”. Prof Shanahan also emphasised the “*importance of protecting intellectual property not as a metric of personal achievement but as a means of ensuring that knowledge becomes translated in a way that benefits everyone.*”

Research Highlights



Fitzgerald BC et al (2021) Probing the “Dark Matter” of the Human Gut Phageome: Culture Assisted Metagenomics Enables Rapid Discovery and Host-Linking for Novel Bacteriophages. *Front. Cell. Infect. Microbiol.* 11: 616918. [Read paper](#)

This paper was written by Brian Fitzgerald as part of his PhD. Brian, son of recently retired APC PI Gerald, is now training to be a doctor in the graduate medicine programme. In this work Brian, Andrey Shkoporov and their colleagues showed that bacteria could be isolated from the human gut and used as sensitive hosts to propagate novel bacterial viruses (bacteriophages). This is one of the major road blocks in virome research and the paper represents a significant breakthrough in the field.

Boehme M et al (2021) Microbiota from young mice counteracts selective age-associated behavioral deficits. *Nature Aging* 1, 666–676 [Read Paper](#)

This ground-breaking study demonstrates that by transplanting microbes from young into old animals it is possible to rejuvenate aspects of brain and immune function. This opens up potentially new therapeutic avenues in the form of microbial-based interventions to slow down brain aging and associated cognitive problems. The study was led by co-first authors Dr Marcus Boehme, Dr Thomaz Bastiaanssen along with PhD student Katherine E. Guzzetta under the supervision of Prof John F. Cryan. The paper attracted huge interest from the media including the Late Show with Stephen Colbert, Fox News, The Irish Times, Irish Examiner and more.

Clooney AG et al (2021) Ranking microbiome variance in inflammatory bowel disease: a large longitudinal intercontinental study. Gut, 70, 3, 499-510 [Read paper](#)

The relationship between microbiota and development of IBD is well established, with it being known that gut microbiota diversity and stability is lower in patients with IBD. In this study, it shows that ethnicity, diet, and geographical locations need to be considered in future microbiota studies to strive in making the popular concept of precision medicine a reality for IBD patients. The study was conducted in collaboration with the University of Manitoba Inflammatory Bowel Disease Clinical & Research Centre and Section of Gastroenterology, Department of Internal Medicine, University of Manitoba, Winnipeg, Manitoba, Canada.

Barton W et al (2021) The effects of sustained fitness improvement on the gut microbiome: A longitudinal, repeated measures case-study approach. Transl Sports Med 4(2):174-192 [Read paper](#)

The objective of this study was to investigate whether sustained fitness improvement leads to pronounced alterations in the gut microbiome. This was achieved by examining the gut microbiome of two initially unfit volunteers undertaking progressive exercise training over a 6-month period. Samples were collected every two weeks, and microbiome, metabolome, diet, body composition, and cardiorespiratory fitness data were recorded. Training culminated in both participants completing their respective goals (a marathon or Olympic-distance triathlon) with improved body composition and fitness parameters. Increases in gut microbiota diversity occurred with sustained training and fluctuations occurred in response to training events (eg, injury, illness, and training peaks). These results suggest that sustained fitness improvements support alterations to gut microbiota and physiologically-relevant metabolites.

APC and COVID-19



APC has been at the forefront of the global COVID-19 research effort. We secured four project grants under the government's COVID-19 Rapid Response Funding Call.

- COVIDBIOME is a study examining changes in the gut microbiome of people who contracted COVID-19, led during COVID 19 by Prof Colin Hill and Prof Paul O'Toole.
- CORAL study - examining how COVID-19 has impacted on early life microbiome and immune development, led by Prof. Liam O'Mahony and Prof. Hourihane in the RCSI. [Read Pre-print here](#)
- The Irish Coronavirus Sequencing Consortium led by Prof Paul Cotter, which has played a large part in sequencing and tracking new COVID viral variants in Ireland and helping the national pandemic response roll out.
- Dr John MacSharry has been co-leading the nationwide project UniCoV which explores effective rapid testing and surveillance systems within third-level institutes to assist with the early identification of asymptomatic SARS-CoV-2. Findings will inform the development of early warning systems and expedite future outbreak prevention and control.



2 - PLAY ON DEMAND - LONG COVID WEBINAR

The patient-researcher-clinician partnership in reducing the long reach of COVID-19 This webinar serves to inform the general public about some of the activity taking place in clinical and research settings as well as in the Long COVID support community to address the needs of those suffering with Long COVID. It also highlights the importance of overall health and wellbeing as well as the role of your microbiome and its pertinence in relation to Long COVID.

In addition Prof. Liam O'Mahony, in collaboration with Dr. Corinna Sadlier, have been looking at the cytokine storm, or excessive inflammation, that occurs in hospitalised patients with COVID-19. They have also been examining the longer term immune consequences in Long COVID patients 6-9 months following hospitalisation. [Read Paper](#)

APC Microbiome Ireland continues to actively support research, education and interventions in people suffering from active COVID-19 disease and in those who have long term complications from the infection. We launched a survey on Long COVID recently at a public information webinar about Long COVID.

[LINK TO LONG-COVID SURVEY](#)

New to APC in 2021

PIs



FIIs



New PI Andrey Shkoporov wins a prestigious ERC Award



INTRO Prof Andrey Shkoporov is a Principal Investigator at APC and Prof of Molecular Microbial Ecology at UCC. He is a molecular microbiologist with special interest in the human gut phageome, microbiome, gut anaerobes, and beneficial microbes.

CURRENT RESEARCH Role of the human gut phageome and virome in IBD (SFI Gut Phageomics spoke). crAss-like phages and their role in the gut microbiome (funded by Wellcome Trust). Role of bacteriophages in lateral gene transfer and evolution of microbial communities (funded by ERC). Gut phage biology, diversity, and taxonomy; phage-derived therapeutic molecules (APC Microbes and Molecules theme).

BACKGROUND Prof Shkoporov transitioned to a career in microbiology after obtaining a medical degree from Russian State Medical University. He also obtained a PhD in microbiology from the same university in 2009 and worked in Russia as a post-doctoral researcher on several projects. In 2015, he joined APC as a research fellow to work on the Gut Phageomics Spoke focusing on the role of human gut phageome in IBD. In 2020 he was awarded a Wellcome Trust Career Development Fellowship and an ERC Consolidator Grant to continue his research of bacteriophage communities in the human gut. In 2021 he was appointed Prof of Molecular Microbial Ecology at UCC. He has published 51 peer-reviewed papers, including 27 as a senior author and has an h-index of 19 (Google Scholar).

SALI PROFESSORSHIP AWARDED TO NEW APC PI RUTH MASSEY



INTRO Prof. Ruth Massey is a Principal Investigator at APC and has secured a highly competitive Senior Academic Leadership Initiative (SALI) Professorship for Microbiome and Health Sciences and is bringing her microbial pathogenicity expertise to Ireland.

CURRENT RESEARCH Prof. Massey's team has developed a functional genomics approach to study microbial pathogenicity, uncovering many new aspects to the biology of organisms such as *Staphylococcus aureus* and *Streptococcus pneumoniae*. Her vision is to develop integrative approaches to defining entire colonisation to disease processes for important human infections, and by embedding her research within the APC this will enable her to characterise the impact the human microbiome makes to disease processes.

BACKGROUND Ruth has a B.A. in Natural Sciences and a Ph.D. in Molecular Microbiology from Trinity College Dublin. She worked as a postdoctoral researcher in the UK at both the University of Oxford and Bath, and it was in Oxford where her interest in Gram positive bacterial pathogen began. Ruth's first independent position was in the Zoology Dept. in Oxford, where Wellcome Trust funding allowed her to set up her first lab, which subsequently moved to Bath in 2007. In 2017 Ruth moved to the University of Bristol and in 2019 was awarded a Wellcome Trust Investigator Award and promoted to Professor of

Microbial Pathogenicity. In 2021 Ruth became the SALI Professor for Microbiome and Health Sciences at UCC.

World Microbiome Day 2021

The now annual World Microbiome Day coordinated by APC, grows year on year, and in 2021 boasted 61 events across 27 countries internationally. This year APC hosted four events:

- Webinar collaboration with Atlantia: 'How the microbiome and diet influence immunity' feat. Prof Liam O'Mahony and Gillian DunnGalvin.
- Online Children's book reading: There's a Zoo in my Poo - Felice Jacka & Rob Crow [Watch here](#)
- Podcast: Microbiome Friendly Foods & Sustainability - Darina Allen in conversation with John Leech, an APC PhD student and MASTER research officer based in Teagasc. [Listen back](#)
- Ask the Experts Online panel for the general public to learn more about the WMD 2021 theme Sustainability and Microbiomes. The APC Microbiome Ireland Post-Doctoral Association also ran an event Re-imagine your Science Career: Opportunities Outside Academia.



APC Awards

APC's annual awards recognises the achievements of the APC team and acknowledge their great work and dedication during a year made especially difficult because of the COVID-19 pandemic.

APC Excellence through Collaboration Award 2020: Project Stoolbank Ireland. Collaborators: Mark Loughrey, Dr Sally Cudmore, Prof Paul O'Toole & Prof Fergus Shanahan who collaborated with Prof Fidelma Fitzpatrick and Dr Rachel Wu both at RCSI.

APC Future Leaders Award 2020: Dr Maria Rodriguez Aburto

APC Public Engagement with Research Award 2020: Dr Julie O'Sullivan

APC Scientific Excellence Award 2020: Dr Fergal Ryan, Dr Anna Ahern, Rachel Fitzgerald

APC Student Award 2020: Julie Callanan

APC Team Member Award 2020: Saba Loftus

APC Industry & Entrepreneurship Award 2020: Michelle O'Donnell



Future Leaders Award

Winner: Dr Maria Rodriguez Aburto



Student Award

Winner: Julie Callanan



Public Engagement with Research Award

Winner: Dr Julie O'Sullivan





Team Member Award

Winner: Saba Loftus



Industry & Entrepreneurship Award

Winner: Dr Michelle O'Donnell



Excellence through Collaboration Award

Winners: Mark Loughrey, Dr Sally Cudmore, Prof Paul O'Toole & Prof Fergus Shanahan





Scientific Excellence Award

Winners: Dr Feargal Ryan, Dr Anna Ahern & Rachel Fitzgerald



APC Funding Successes.

2021 has been a rollercoaster year -- everyone has been working incredibly hard and grant activity has been high.

There have been several notable funding successes for APC. Two EU-funded PhD Innovative Training Networks (ITNs) coordinated by APC Investigators Prof. Cormac Gahan and Prof. Brendan Griffin kicked off early during the year. These exciting PhD programmes are respectively focused on bacterial colonisation resistance (the ability of healthy microbiota to prevent the growth of pathogens that are present within the body) and the first European Industrial Doctorate aiming to eliminate the use of animals from the development of oral drug formulations.

It was a busy year for our early / mid-career researchers as well -- with exchequer successes from IRC to HRB awards. A special congratulations to our Marie Skłodowska-Curie Individual fellows: Dr. Eileen Ryan and Dr. Ciaran Lee who started their projects this year, and a new researcher Dr. Natalia Rios is set to join the Hill lab in early 2022 to commence work on BIOMA (Integrated BIOeconomy solutions for the Mobilization of the Agrifood Chain). Andrey Shkoporov, newly promoted to Professor status in UCC and PI in the APC, started his ERC Consolidator in July 2021 which he will combine with his Wellcome Trust Career Development Fellowship. Dr Pauline Scanlan successfully secured a second prestigious Royal Society - SFI University Research Fellowship and we congratulate Pauline on that great achievement.

Looking forward to 2022, we have an exciting new Marie Skłodowska-Curie COFUND grant ([INSPIRE](#)) to replace our EU-funded postdoctoral fellowship programme APEX starting in 2022. INSPIRE aims to link global challenges (Antimicrobial Resistance, Non-Communicable Diseases, and UN Sustainable Development Goals) with Microbiome research. More details in the new year! Keep up the excellent grant activity and fingers crossed for those waiting for results.



Chloe Huseyin	Julie O'Sullivan
Simon Spichak	Orla O'Sullivan
Marc Tansney	Mark Tansney
Paul Cotter	Ted Chan
Yoni Horvitz	Fai Mulla
Yvonne Nolan	Nuno Pinheiro
Saba Loftus	Niall Hyland
	Colin Hill

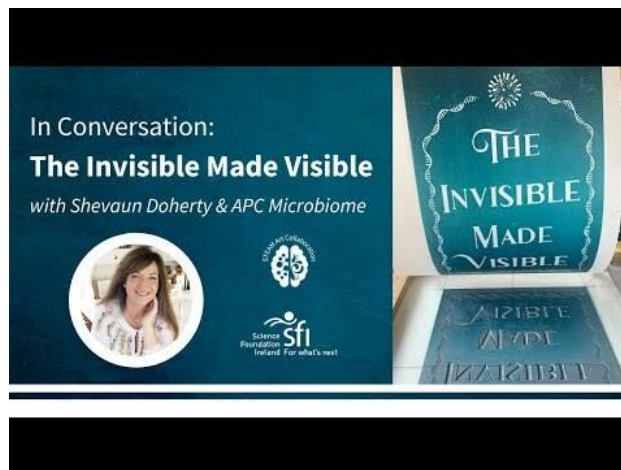
Science Foundation Ireland. This year's virtual event showcased 15 Cork-based researchers from different disciplines.

Invisible Made Visible

A unique collaboration with APC PI Prof Cormac Gahan and botanical artist, Shevaun Doherty. This STEM-Art project was part of the SFI Discover Primary Science and Maths Programme. It communicates the science of COVID-testing through the creative process of lino-printing and film. Both processes involve replication and accuracy and present a powerful visual analogy to understand PCR-testing. The project was aimed at primary school learners.



3 - Learn more about this STEAM collaboration.



4 - In Conversation: Artist Shevaun Doherty and APC PI Prof Cormac Gahan

Contact Us



APC Microbiome Ireland is a world leading SFI research centre is a community of 300 researchers, clinicians, managers and support staff based in University College Cork and Teagasc as well as partner institutions MTU, NUIG, UCD, NIBRT, UL and TCD.

To unsubscribe email APC@UCC.IE

www.apc.ucc.ie | [Overview Video](#) | [APC Strategic Vision](#) | [Twitter](#) | [Linkedin](#)
| [Facebook](#) | [Instagram](#)