

APC Microbiome Institute Press Release

Scared by Bugs: Irish Scientists Uncover a Role for the Microbiome in Regulating Fear Responses

New research has shown that the microbiome, the collective trillions of bacteria within the gastrointestinal tract, regulates fear responses and modifies the brain function of adult mice.

The research, from scientists at the Science Foundation Ireland-funded APC Microbiome Institute at University College Cork, shows at least in animal models, that major disturbances in communication between the gut microbiota and brain underlie fear memory recall and also modify molecular pathways in the amygdala, the brain region key to the expression of anxiety and social behaviours.

Using microbe-free mice, Professor John F. Cryan and Dr Gerard Clarke, along with their PhD student Alan Hoban, have shown that growing up in a germ-free bubble results in blunted fear responses. Importantly, the team were able to show that at a molecular level the amygdala of these microbiota-deficient animals was in a hyperactive state.

Fear is a normal response that allows an individual to deal with an impending threat in the environment. The neurobiology of fear is evolutionarily hardwired and tightly regulated by the amygdala. Understanding the factors that regulate fear and fear-associated memories is an important step towards developing therapies for disorders where excessive brain responses to fear memories are manifested, such as post-traumatic stress disorders (PTSD).

Over the past decade it has become increasingly clear that the microbiome plays a clear role in our health and wellbeing. Perhaps most surprising of all is the realisation that gut bacteria influence brain function and behaviour.

Although, more work is needed to advance our understanding of the mechanisms behind the relationship between the microbiota and fear responses Prof Cryan says that *“it is likely that key signals from the gut to the brain act as regulators of the fear response”*. Furthermore, he says that *“understanding what these mechanisms are may open up the use of innovative microbiome-based strategies for tackling fear-related disorders”*.

Dr Clarke acknowledges the support of the Brain and Behaviour Research Foundation in funding such important and ground-breaking research and continued that *“Our data show the microbiome is critical for normal fear responses but it is just the start; we are now searching for strategies to target the microbiome to generate novel efficacious treatments for anxiety disorders such as PTSD”*.

Translating these data from bench to bedside opens up the tantalising prospect of targeting the microbiome in order to treat fear-related disorders. Moreover, this data presented by the APC Microbiome team continues to broaden the concept that the microbiome has a remarkable influence over fundamental brain processes and may be harnessed in the future for a wide range of brain disorders.

Their research is being published in the high impact Nature Journal *Molecular Psychiatry* and was supported by Science Foundation Ireland through a Centre grant to the APC Microbiome Institute and by the Brain and Behaviour Research Foundation. The research was co-authored by APC researchers at UCC, Alan Hoban, Roman M. Stilling, Gerard Moloney, Fergus Shanahan and Timothy G. Dinan.

Full reference:

Alan E. Hoban, Roman M Stilling, Gerard Moloney, Fergus Shanahan, Timothy G. Dinan, Gerard Clarke & John F. Cryan (2017) "The Microbiome Regulates Amygdala-Dependent Fear Recall" *Molecular Psychiatry* <http://dx.doi.org/10.1038/MP.2017.100>.

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Notes for Editors:

About APC Microbiome Institute:

The APC Microbiome Institute (APC; <http://apc.ucc.ie>) 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, Teagasc (the Irish Agriculture and Food Development Authority) and Cork Institute of Technology. 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 1,000 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 postgraduates students.

About Brain & Behaviour Research Foundation:

The [Brain & Behavior Research Foundation](#) (BBRF) began as a family movement in 1981 and has since become the world's leading private funder of mental health research. Since awarding the first NARSAD Grant in 1987, the Brain & Behavior Research Foundation has awarded more than \$365 million to fund more than 5,000 grants to more than 4,000 scientists around the world. The BBRF is committed to alleviating the suffering caused by mental illness by awarding grants that will lead to advances and breakthroughs in scientific research.

About Molecular Psychiatry:

[Molecular Psychiatry](#) publishes work aimed at elucidating biological mechanisms underlying psychiatric disorders and their treatment. The emphasis is on studies at the interface of pre-clinical and clinical research, including studies at the cellular, molecular, integrative, clinical, imaging and psychopharmacology levels. *Molecular Psychiatry* has a high impact factor (13.3) published by Nature and is one of the top journals in Psychiatry.

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