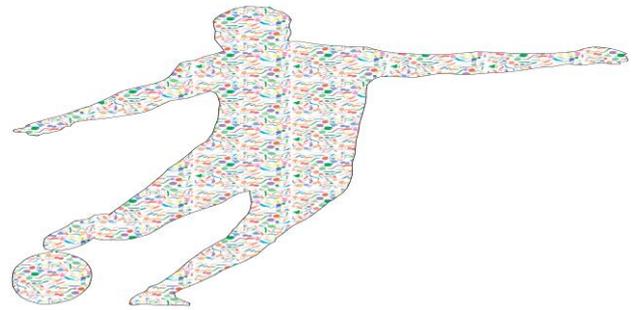


**Project number: 6664**  
**Funding source: SFI SiRG Award**

**Date: December 2018**  
**Project dates: Sept 2014 – Aug 2018**

**ExMET: Investigating the impact of exercise and/or whey protein intake on the gut microbiome.**



#### Key external stakeholders:

Dairy industry, sports nutrition market, food and nutritional beverage manufacturers, as well as athletes and the general public.

#### Practical implications for stakeholders:

With consumers increasingly focused on health and well-being, providing scientific evidence of positive health benefits from exercise and protein intake can only positively impact stakeholders.

#### Main results:

- Elite athletes have a more diverse gut microbiome compared to non-athlete controls
- This diversity is associated with fitness levels and/or dietary protein intake (whey protein)
- During an 8 week intervention no significant alterations to the gut microbiome or metabolome were observed
- Intervention groups taking a daily whey protein supplement had an altered virome profile. This was confirmed to be as a result of virus cross over from the whey protein.

#### Opportunity / Benefit:

These results demonstrate that regular exercise and increased fitness levels as well as increased protein in the diet can promote gut health.

#### Collaborating Institutions:

Teagasc, University College Cork.

**Teagasc project team:** Dr. Orla O'Sullivan(PI)  
Dr. Paul Cotter

**External collaborators:** Prof. Fergus Shanahan (UCC)

#### 1. Project background:

A healthy adult gut contains over a trillion microbes and plays an important role in human health. Almost every aspect of modern lifestyles can impact the gut microbiota; recently diet has been established as an important modulator. Undoubtedly there are other extrinsic factors which influence the intestinal community and in this respect this project plans to investigate the combined effect of diet and exercise on the gut microbiota and to associate changes with physiological readouts of human health. Ultimately we aim to identify microbiota biomarkers of human health to assist in the development of food for health products.

## 2. Questions addressed by the project:

How does the gut microbiome of an elite athlete compare to that of a non-athlete control?

Is it diet, exercise or a combination of both that drives diversity in the gut microbiome?

## 3. The experimental studies:

- Retrospective functional metagenomic analysis of elite athlete gut
- An 8 week intervention study involving 3 groups of previously sedentary adults:
  - Group 1: Exercise group
  - Group 2: Exercise plus daily whey protein supplement
  - Group 3: Whey protein supplement daily.Metagenomic and metabolic analysis was performed before and after the intervention to establish any changes to the gut microbiome.

## 4. Main results:

- Elite athletes have a more diverse gut microbiome compared to non-athlete controls
- This diversity is associated with fitness levels and/or dietary protein intake (whey protein)
- During an 8 week intervention no significant alterations to the gut microbiome or metabolome were observed
- Intervention groups taking a daily whey protein supplement had an altered virome profile. This was confirmed to be as a result of virus cross over from the whey protein.

## 5. Opportunity/Benefit:

These results demonstrate that regular exercise and increased fitness levels as well as increased protein in the diet can promote gut health.

## 6. Dissemination:

### Journal articles:

Barton, W., N. C. Penney, O. Cronin, I. Garcia-Perez, M. G. Molloy, E. Holmes, F. Shanahan, P. D. Cotter and O. O'Sullivan (2018). "The microbiome of professional athletes differs from that of more sedentary subjects in composition and particularly at the functional metabolic level." *Gut* 67(4): 625-633.

Cronin, O., W. Barton, P. Skuse, N. C. Penney, I. Garcia-Perez, E. F. Murphy, T. Woods, H. Nugent, A. Fanning, S. Melgar, E. C. Falvey, E. Holmes, P. D. Cotter, O. O'Sullivan, M. G. Molloy and F. Shanahan (2018). "A Prospective Metagenomic and Metabolomic Analysis of the Impact of Exercise and/or Whey Protein Supplementation on the Gut Microbiome of Sedentary Adults." *mSystems* 3(3).

Cronin, O., O. O'Sullivan, W. Barton, P. D. Cotter, M. G. Molloy and F. Shanahan (2017). "Gut microbiota: implications for sports and exercise medicine." *British Journal of Sports Medicine*.

Rankin, A., C. O' Donovan, S. M. Madigan, O. O'Sullivan and P. D. Cotter (2017). "'Microbes in sport' – The potential role of the gut microbiota in athlete health and performance." *British Journal of Sports Medicine* 51(9): 698-699.

O'Sullivan, O., O. Cronin, S. F. Clarke, E. F. Murphy, M. G. Molloy, F. Shanahan and P. D. Cotter (2015). "Exercise and the microbiota." *Gut Microbes* 6(2): 131-6.

### Thesis:

"The exercise and diet-microbiome paradigm: influences of physical activity and dietary nutrition on the Human gut microbiome" : Wiley Barton, September 2018.

## 7. Compiled by: Dr. Orla O'Sullivan