
FACCE-JPI is the **Joint Programming Initiative on "Agriculture, Food security and Climate change"**. It brings together 21 European and associated countries to coordinate their research capacities to address the vital challenge of ensuring sufficient production of food, as well as feed, fibres and bio-fuels, in the context of demographic growth and a changing climate.

The Multi-partner Call on Agricultural Greenhouse Gas Research, initiated by FACCE-JPI with the American National Institute of Food and Agriculture of the USDA, New Zealand's Ministry for Primary Industries and Agriculture and Agri-Food, Canada aims to bring together excellent research consortia to enhance international collaboration in the face of the global issue of climate change mitigation.

In the frame of this call, the following project has been recommended for funding:

## Basic Data

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| **Title** | **Understanding the development and control of stability in the rumen microbiome as a basis for new strategies to reduce methanogenesis** |
| **Acronym** | **RumenStability** |
| **Theme** | Study of mitigation options at the field, animal and manure management scales with quantification of their technical potential for a range of agricultural systems and regions |
| **Topic** | Greenhouse gas emissions in the agriculture sector arising from agricultural soils including crops and grasslands, domestic livestock and waste management systems |
| **Duration** | 01.01.2014 – 31.12.2017 |
| **Total cost (in €)** | 1 903 261€ |
| **Requested funding (in €)** | 1 269 142€ |

## Coordinator

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| **Organisation Name** | **Teagasc** |
| **Country** | **Ireland** |
| **First Name** | Richard |
| **Lastname** | Dewhurst |
| **E-Mail** | richard.dewhurst@teagasc.ie |
| **Phone** | +353 46 906 1100 |

## Partners

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| **Organisation Name** | **Consejo Superior de Investigaciones Científicas** |
| **Country** | Spain |

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| **Organisation Name** | **University College Dublin** |
| **Country** | Ireland |

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| **Organisation Name** | **Ghent University** |
| **Country** | Belgium |

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| Organisation Name | **Institut national de la recherche agronomique** |
| Country | France |

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| Organisation Name | **ILVO** |
| Country | Belgium |

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| Organisation Name | **Leibniz Institute for Farm Animal Biology (FBN)** |
| Country | Germany |

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| Organisation Name | **AgResearch Ltd.** |
| Country | New Zealand |

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| Organisation Name | **Aberystwyth University** |
| Country | UK |

## Summary

The project will identify and exploit long-term effects of short-duration dietary treatments on methane production, rumen function and responses to methane mitigation interventions at a later stage. There will be a focus on manipulations in early life, when the rumen community is developing, but also work on other diet transitions. The idea is to reduce the cost and effort of mitigation strategies by reducing the duration and/or quantity of treatment required and/or to increase the size of responses if treatments have to be reapplied. Whilst earlier studies with young ruminants have used potent anti-methanogenic compounds, this work focuses on the residual effects of some of the dramatic diet transitions experienced on-farm, including weaning and transitions to grazing or high-density finishing diets. This project addresses effects of management history on the interaction between the host and its microbiome and on methane production. The ability to identify differences between animals makes the work highly complementary to existing programs on the effects of host genetics/genomics on methane production. We will build on recent work showing residual anti-methanogenic effects of bromochloromethane administered to goat kids. Our primary hypothesis is that the initial microbial implantation in the rumen influences the microbial ecosystem later in life. One aspect of this is transfer of the maternal microbiome to offspring, which may contribute to stability of the rumen microbiome in later life (e.g. reversion to the original community after rumen swapping). We will extend the work on stability of the rumen microbiome to important diet transitions in growing/adult animals. We will use state-of-the-art immunology to test our second hypothesis, that differences in the rumen microbiome in early life affect the development of the host immune response to the microbiome. We will use a combination of the most current and cost-effective techniques to profile the short- and long-term responses of the rumen microbiome diversity and activity, focusing analysis where treatments have shown a clear effect on methane production. We will also address the need for biomarkers for the establishment of methanogenesis using both targeted (archaeol) and non-targeted metabolomics with faeces, rumen fluid, urine and blood. There are five components to the work:
1. New animal studies – investigating long-term effects of previous dietary treatments or anti-methanogenic additives on methane production. These will include studies around weaning, as well as in adult life - with commercially relevant treatments;
2. Additional analysis of samples from new/existing studies to help interpret responses. These may be run by the partner conducting the study or facilitated through exchange of samples.
3. Workshops and short-term visits for training in new methods and standardisation of methodology.
4. Evaluation of the economic viability of strategies identified in the project.
5. Dissemination of results and recommendations to stake-holders and policy makers.