Proceedings of the Nutrition Society (2021), **80**, 383–385 doi:10.1017/S0029665121003682
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The Nutrition Society Spring Conference 2021 was held virtually on 29–30 March 2021

Editorial

Conference on 'Gut microbiome and health'

Understanding the interplay between the gut microbiome, nutrition and health

The Spring Conference 2021 focused on the theme of the gut microbiome and health that was divided across three separate but inter-related areas from the impact of nutrition on the gut microbiome, the cause and effect of nutrition and health on the gut microbiome to the interaction between pathogens and gut microbiota. The programme was supported by two plenary lectures, the first discussed the computational methods commonly employed to examine gut microbiota and the concluding lecture presented the interaction between the gut microbiome, nutrition and health in older populations. This short report provides a summary and highlights of the conference.

In March 2021 the Nutrition Society hosted the Spring Conference as an online virtual event that focused on the gut microbiome and health. The conference marked 80 years since discussions on nutritional problems were held at the Royal Institution and convened by Sir John Boyd-Orr in 1941. Later that year, in October, the inaugural meeting of the Nutrition Society was held in Cambridge. The first meeting of the Scottish group, hosted at Dundee University, took place in January 1942. The virtual meeting that took place between the 28th and 29th March 2021 marked the 214th meeting organised by the Scottish Section. The theme of the 1½ day meeting was 'gut microbiome, nutrition and health' and attracted over 300 delegates with over 40 % attending from outside the UK.

The conference programme was divided across three separate but inter-related areas from the impact of nutrition on the gut microbiome, the cause and effect of nutrition and health on the gut microbiome, to the interaction between pathogens and gut microbiota. The programme was also supported by two plenary lectures, that discussed computational methods commonly employed to examine gut microbiota (Dr Laura Glendenning) and concluded the conference on the interaction between the gut microbiome, nutrition and health in older populations (Professor O'Toole and Jeffery[1].

Interest in the microbiome, gut and nutrition is reflected by the number of hits using the search engine, Google Scholar, when entering the search terms: microbiome, gut and nutrition (>120 000) and when using the terms gut, microbiome and health these return 298 000. Furthermore, between 1980 and 2000 just over 1000 hits are returned on the same search engine and using the search terms microbiome, gut and nutrition. Repeating the process and focusing between 2000 and 2020 there are 64 000 hits. A much larger trend is observed using the search terms gut, microbiome and health, in the year 1980 there were 1100 hits and this has increased to >230 000 between 2000 and 2020. Thus, the conference theme and content align well with the current interest in the gut microbiome, nutrition and health.

Opening the conference with her plenary lecture, Dr Glendinning *et al.*[2] (Roslin Institute, Edinburgh, UK) discussed the complexity of analysing the microbiome that requires an interdisciplinary approach utilising molecular biology and bioinformatics. Highlighting the requirements for good analytical practice, Dr Glendenning emphasised the type of data being generated, the experimental hypothesis being tested and the challenges arising in analysing the data. A key message from the plenary lecture was the importance of good communication between the wet and dry laboratory to both maximise and optimise data analysis.

The use of animal models to understand the link between the gut microbiome, nutrition and growth were presented by Dr Gillian Gardiner (Waterford Institute of Technology, Ireland) and parasitic infection and immunomodulation were discussed by Dr Lisa Reynolds (University of Victoria, Canada). Using a porcine model Dr Gardiner discussed the relationship between gut microbiota, immunomodulation, feed efficiency and growth. Dr Gardiner introduced the concept of reprogramming either the maternal or fetal microbiome on growth and feed efficiency. However, such an approach

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did not necessarily restore the feed efficiency phenotype, and in some cases led to retardation in growth. Moving to parasitic worm infection Dr Reynolds explained that helminth infection can increase the risk of general infection to the host[3]. At the same time, helminth infection was also observed to be immunosuppressive and for conditions where intestinal inflammation is a major pathology, these treatment-induced infections can alleviate symptoms. She reported that changes in isovalerate levels indicated the relationship between the local bacterial microbiota, metabolome and helminth infection.

Linking the role of the gut microbiota on the availability and activity of a range of metabolites, but principally short-chain fatty acids (SCFA), was presented by Professor Rowlands *et al.*[4] (University of Reading, UK) and followed by Professor Gary Frost (King's College, London, UK) and Dr Douglas Morrison (University of Glasgow, UK). The consequence of microbiota metabolic activity significantly enhances the hosts capacity to metabolise a wide range of dietary components that subsequently extends the range of formed metabolites. Using the example of SCFA; acetate, butyrate and propionate, Professor Rowlands demonstrated that fermentation of dietary carbohydrates by the microbiota, that increases SCFA availability, not only led to metabolite expansion but could also act as cell-signalling molecules. In support of previous evidence, Professor Frost and Dr Morrison discussed the multi-factorial effects that SCFA's play in several tissues. Focussing on propionate they presented data that utilised inulin to deliver propionate directly to the colon, and identified an effect from propionate on appetite regulation, β cell function and glucose homoeostasis.

The role of dietary fibre, gut microbiota and health was discussed by Professor Edwards *et al.*[5] (University of Glasgow, UK). A range of factors that influence the interaction between microbiota and dietary fibre was presented by Professor Edwards that included a method of presentation, dosage, the interaction between dietary fibres. Understanding the complex nature of this relationship was further illustrated by reference to barriers to dietary fibre intake, differences in gut physiology between individuals and the limitations of current models and tracers and the reporting of these studies.

Moving onto specific disease pathologies three separate talks were provided by Professor Konstatinos Gerasimidis (University of Glasgow, UK), Professor Georgina Hold (University of New South Wales, Australia) and Dr Amanda Rossiter (University of Birmingham, UK). Professor Gerasimidis addressed manipulation of the microbiota to improve gut health in individuals with Crohn's disease (CD). Providing evidence on paediatric patients the use of enteral nutrition was found to reduce the biomarkers of gut inflammation during an 8-week period by alteration of the gut microbiota. Professor Gerasimidis highlighted the limitations to this approach in relation to the volume of enteral nutrition required (120L/week) and that following the cessation of treatment the symptoms had returned. Professor Hold presented data indicating that while the rate of inflammatory bowel disease (IBD) appears to be low (0·3 % prevalence) the rates continue to increase and that 16S protein expression is highly linked to classifying disease status. She expanded on the genetic link with IBD and indicating that metagenomics appears to be the best method to identify treatment response. Furthermore, Professor Hold stressed that a holistic understanding of the intestinal microbiota is essential if we are to comprehend the composition, function and metabolic capacity that can affect disease treatment. The final presentation on disease pathology centred on the upper GI tract where Dr Rossiter discussed the link between the bacterium, *Helicobacter pylori* (*H. pylori*), and gastric cancer and the relationship with other bacterial species and concluded that these relationships are not fully understood. Furthermore, experimental results on *H. pylori* growth in a polymicrobial environment suggest that *Actinomyces oris* completely inhibits *H. pylori* growth. However, Dr Rossiter also indicated that co-infection with *H. pylori* and *Actinomyces* spp. led to an increase in IL8 expression in a gastric cell carcinoma model that could possibly exacerbate the inflammatory response and concluded that a clearer understanding of the gastric microbiota is essential if we are to understand the mechanism between upper GI bacterial populations and gastric carcinogenesis.

The meeting was brought to a conclusion with the second plenary lecture (Professor O'Toole [1]University College Cork, Ireland) that discussed the diet–microbiome and health axis from the perspective of the ageing population. Professor O'Toole described how the gut microbiome in an aged population differs significantly from a young population and that these differences could be due to several factors and that included a reduction in diet diversity. Data were presented indicating that changes in dietary habits correlate with increasing frailty and independence of residence. Furthermore, changes in dietary intake, either by the use of probiotics or the adoption of a Mediterranean diet result in measurable changes in microbiota profile in human subjects. In addition, he reported a positive relationship between the adoption of a Mediterranean diet and a delay in the onset of ageing-related health loss, and the health status of the senior population. Collectively, the conference discussed a wide array of approaches to understanding the role of the gut microbiota on health and the influence that dietary intake plays in this role. Advances in the application of bioinformatics permit a greater degree of complexity in data analysis of the microbiome but stressed the need from nutrition practitioners to formulate the appropriate question(s).

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Acknowledgements

The authors wish to acknowledge the support of Carollina Fernandes in the organisation and running of the Spring Conference.

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Financial Support

None.

Conflict of Interests

None.

Authorship

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Proceedings of the Nutrition Society

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