

## **Message from the Theme Editors**

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“If you get the inside right, the outside will fall into place” - Eckhart Tolle

While the role of gut flora in the development of diabetes is currently being researched, results thus far have showed there is a gut flora change in those with diabetes. The purpose of this issue is to explore one facet of this interrelationship, namely the gut microbiome, and its interplay in chronic disease, particularly diabetes. Obesity, a common feature of type 2 diabetes (T2DM), is associated with low-grade inflammation. This inflammation can change the makeup and types of gut flora found in these individuals. Gut microbiota can have the capacity to increase the energy taken from the diet, leading to more fat storage. In addition, there are associated changes in gut microbiota as demonstrated by an increase in the capacity of fermenting and absorption of nondigested carbohydrates. Nutrients with prebiotic properties, both carbohydrate and non-carbohydrate sources, can change the gut flora and possibly reduce the probability of developing T2DM.

Contributing authors featured in this issue of *On the Cutting Edge*, “Gut Microbiome and Diabetes,” were selected for their topical knowledge and experience. This issue explores the relationship of gut microbiome in the prevention and management of diabetes. It is divided into two key tracts of articles: those that describe the role of the microbiota in the pathogenesis of both type 1 and type 2 diabetes through chronic inflammation, changes in gut epithelial and alterations of the immune system; and those which cast a concentrated focus on the impact of factors such as medications, dietary composition and probiotic/prebiotic treatment on the microbiome.

Kim Kelly, PharmD, BCPS, FCCP, CDTC, CPC, CEC, and Patricia Davidson, DCN, RDN, CDE, LDN, FAND set the stage for this issue in the opening article’s microbiome primer. To understand the concepts presented in this issue, we as co-editors of this edition first provide an overview of the gut microbiome in its structure and functions. “Microbiome Basics” presents structural terminology and corresponding definitions that are essential for your understanding of the potential role of gut microbiome, and further offers information regarding contributing factors

to influencing the gut integrity chronic disease development, such as diet and medications. It is highly recommended to review and refer back to this article.

Kim Kelly, PharmD, BCPS, FCCP, CDTC, CPC, CEC presents the current thinking on the microbiome influence on the immune system and how genetic predisposition affects this process in type 1 diabetes development. Also discussed is the interplay of the gut microbiome and the immune system, specifically its development and reactivity, how it affects the pancreatic beta cells with the phases of diabetes development. This article will further examine the interaction between genetic predisposition and precipitating factors leading to type 1 diabetes, such as disruption in the microbiome, viral implications, decreased microbiota diversity and the “hygiene hypothesis.”

Alessandra Sarcona, EdD, RDN, CSSD and Patricia Davidson, DCN, RDN, CDE, LDN, FAND describe the interface between the microbiome and how the endothelium of the gut is weakened to provide a more “leaky gut” which ultimately leads to inflammation multiple changes across insulin sensitivity, insulin release and the various effects of other interacting hormones and tissues triggering the classical course of hyperinsulinemia, hyperglycemia and the loss of beta cell mass occurring in type 2 diabetes. This article helps the RDN understand the influence of gut-derived metabolites on microbes, including lipopolysaccharides and short chain fatty acids, and specifically how they are diet effected and influence metabolic pathways, such as insulin signaling, appetite regulation, incretin production and inflammation. The authors discuss how gut dysbiosis can be attenuated through dietary modifications such as pro- and prebiotics which cause positive changes in gut integrity, increased satiety, and improved insulin sensitivity.

Samuel Grossman, BS Pharm, PharmD, RPh, CDE and Sarah Elizabeth Padilla, BSc describe how medications affect the composition of the gut flora and how the gut flora can affect the actions of medications. Both diabetes related, and non-diabetes related medications have the potential to manipulate the gut microbiome, subsequently influencing the metabolic aspects associated with diabetes, including increasing inflammation, insulin sensitivity and glucose tolerance. The authors will describe how gut microbiota can alter the effectiveness of medications. This article will help the RDN understand the importance of medications’ potential for altering microbiota and how this specific alteration plays a role in the prevention and progression of diabetes.

Amir Golmohamadi, PhD, Janet Lacey, DrPH, MS, MEd, RDN, LDN and Tonya Haderthauer, BSc investigate the potential influences pre- and probiotics have on the modulation of energy utilization and glucose regulation They additionally describe how food processing, such as microencapsulation, can maintain probiotics viability and

utilization as these “friendly bacteria” navigate the challenging acidic environment of the digestive tract. The aim of this article is to assist clinical professionals in dietetics in their understanding of the limitations of pre-, pro- and symbiotic supplementation for enhancing the microbiome relationship with diabetes related systems.

Meghan Jardine, MS, MBA, RDN, LD, CDE presents how nutrition and dietary patterns play prominent roles in stimulating a healthy gut for diabetes prevention and the improvement of diabetes metabolic outcomes. This article will explore plant-based dietary interventions and other lifestyle factors such as exercise and stress effects on the microbiota. The author emphasizes the importance of Registered Dietitian Nutritionists (RDN) role in translating the science in order to educate the public on the benefits of gut microbiota.

This issue ends with a “Food for Thought” emphasizing the importance of understanding the microbiome by Kathy Warwick, RD, CDE. This article summarizes what RDNs need to know about the gut microbiota and why this information is particularly useful in the clinical management of persons at risk for developing diabetes or those who currently have diabetes. She summarizes the key dietary and lifestyle attributes influencing the microbiome and why it is imperative that RDNs stay well informed so that they can make recommendations regarding diabetes prevention and diabetes self-management.

The editors for this issue of *On The Cutting Edge* would be remiss if we did not recognize and thank those who made this issue possible. It is important to acknowledge and thank the authors, reviewers and editorial team for their time, expertise, constructive input, and patience. Finally, we thank Mary Austin, RDN, MA, CDE, FAADE, not only for providing us the opportunity to serve as co-theme editors, but also for her support and guidance. To all our readers, thank you for all you do to better the lives of those with diabetes.