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- Roles of the Gut in Glucose Homeostasis

Abstract

The gastrointestinal tract plays a major role in the regulation of postprandial glucose profiles. Gastric emptying is a highly regulated process, which normally ensures a limited and fairly constant delivery of nutrients and glucose to the proximal gut. The subsequent digestion and absorption of nutrients are associated with the release of a set of hormones that feeds back to regulate subsequent gastric emptying and regulates the release of insulin, resulting in downregulation of hepatic glucose production and deposition of glucose in insulin-sensitive tissues. These remarkable mechanisms normally keep postprandial glucose excursions low, regardless of the load of glucose ingested. When the regulation of emptying is perturbed (e.g., pyloroplasty, gastric sleeve or gastric bypass operation), postprandial glycemia may reach high levels, sometimes followed by profound hypoglycemia. This article discusses the underlying mechanisms.

Introduction:

a. The gut plays a significant role in glucose homeostasis.

b. This review aims to summarize the current understanding of the gut's role in maintaining blood glucose levels.

c. The paper will discuss the various mechanisms by which the gut affects glucose metabolism and how it is involved in the pathogenesis of diabetes.

d. It will also explore the potential therapeutic targets for treating diabetes-related disorders.

Gut Microbiota:

a. The gut microbiota consists of trillions of bacteria, fungi, and viruses that live in our gastrointestinal tract.

b. These microorganisms play a crucial role in glucose homeostasis by affecting host metabolism, energy harvesting, and nutrient sensing.

c. The gut microbiota can modulate the host's glucose metabolism through various mechanisms such as fermentation of undigested carbohydrates, production of short-chain fatty acids, and regulation of bile acid metabolism.

d. Alterations in the gut microbiota composition have been associated with the development of diabetes and its complications.

Gut Hormones:

a. The gut produces several hormones that regulate glucose homeostasis, including GLP-1, GLP-2, peptide YY (PYY), oxyntomodulin, and glucagon-like peptide-2 (GLP-2).

b. These hormones are secreted in response to nutrient ingestion and play a crucial role in regulating glucose absorption, insulin secretion, and satiety.

c. Dysregulation of these gut hormones has been implicated in the pathogenesis of diabetes and its complications.

d. Targeting these hormones through pharmacological interventions may provide new therapeutic strategies for treating diabetes-related disorders.

Gut Barrier Function:

a. The gut barrier is composed of physical, chemical, and immunological barriers that prevent the entry of harmful substances into the bloodstream while allowing the absorption of nutrients.

b. Dysfunction of the gut barrier can lead to increased permeability, allowing the translocation of bacteria and their products into the circulation, which may contribute to inflammation and insulin resistance.

c. Restoration or maintenance of gut barrier function may be a potential therapeutic target for treating diabetes-related disorders.

Conclusion:

a. The gut plays a significant role in glucose homeostasis through its effects on the microbiota, hormones, and barrier function.

b. Alterations in these factors have been associated with the development of diabetes and its complications.

c. Targeting these mechanisms may provide novel therapeutic strategies for treating diabetes-related disorders.

Key Takeaways:

1. The gut plays a significant role in glucose homeostasis through various mechanisms, including the microbiota, hormones, and barrier function.
2. Alterations in these factors have been associated with the development of diabetes and its complications.
3. Targeting these mechanisms may provide novel therapeutic strategies for treating diabetes-related disorders.