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Host energy regulation by gut microbial metabolites

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Metabolic disorders, such as obesity and diabetes, arise from disrupted energy homeostasis that depends upon the equilibrium between energy intake and expenditure. Gut microbiota has emerged as a pivotal, multifactorial mediator in these disorders as it remarkably regulates host energy acquisition and metabolism while being modified by diet. Short-chain fatty acids (SCFAs), which primarily include acetate, butyrate, and propionate, represent an essential subset of gut microbial metabolites derived from the fermentation of the otherwise indigestible dietary fiber. We previously reported that SCFAs play an important role in the regulation of energy homeostasis via specific receptors (e.g., GPR41 and GPR43) that are present in host tissues. Specifically, GPR41 mediates sympathetic activity and GPR43 is primarily involved in the adipose-insulin signaling. Recent evidence suggests that dietary fiber and the gut microbial-derived SCFAs exert multiple beneficial effects on host energy metabolism not only by improving the intestinal environment, but also by directly affecting various host peripheral tissues. In the light of such regulatory role of SCFAs, we further examined the influence of maternal-fetal transmission of microbial metabolites on embryonic development and its implication in early-onset obesity. The roles of the gut microbiota-derived exopolysaccharides (EPS) in host energy metabolism will also be examined to provide insight into the development of new drugs and functional foods that are effective against the energy metabolism-associated disorders. We believe that these studies will provide valuable insights into therapeutic targets for treating metabolic disorder such as obesity and diabetes, and the use of prebiotics to control gut microbiota.