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## Switching on the heat: endogenous and exogenous inducers of brown adipose tissue

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The global surge in obesity presents a serious public health challenge, driving researchers to identify newer strategies for increasing energy expenditure. Among these, activating Brown Adipose Tissue (BAT), a specialized organ critical for thermogenesis, has emerged as a promising factor. While the role of sympathetic stimulation in BAT activation is well established, recent studies have unveiled a diverse array of endogenous and exogenous factors capable of modulating its thermogenic function. Understanding these pathways is crucial for developing effective anti-obesity therapies. In this review, we discuss the most common pathways that turn on BAT with a focus on recently reported thermogenic compounds and their mode of action. We reiterate the importance of evaluating the relationship between gut microbes, prebiotics and their effect on BAT function and summarize the existing literature about the prebiotic potential of thermogenic compounds. Further, we explore the Gut microflora-BAT axis asking a very relevant and less explored connection between the two important parts that control energy metabolism in the body. By exploring the relatively under-studied connection between gut microflora and BAT, this review presents a fresh perspective on how these two systems could work together to regulate energy metabolism in the body. Given the global obesity epidemic, investigating this novel connection offers valuable insights that could pave the way for targeted, interventions to improve metabolic health and combat obesity more effectively.

**Keywords:** Obesity, Thermogenesis, Gut microbiota, Gut-BAT axis, Prebiotics