

Investigating the factors contributing to the metabolic regulation of onset of puberty

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Abstract:

Puberty, typically occurring between 8-13 years in girls and 9-14 years in boys, is a dynamic process that leads to reproductive maturity. Central precocious puberty (CPP) arises from premature re-activation of the hypothalamic pituitary gonadal (HPG) axis, resulting in early GnRH secretion. Notably, ~90% of CPP cases are idiopathic with a female-to-male ratio of 10:1, highlighting the need to understand the mechanisms underlying its onset. The timing and progression of puberty are influenced by multiple factors, including nutrition, genetics, prenatal conditions, endocrine disruptors, and epigenetic regulation. Adequate energy stores and body fat are critical for reproductive function, with metabolic signals such as kisspeptin, leptin, ghrelin, and ceramides linking nutritional status to pubertal initiation. The increasing prevalence of childhood obesity, particularly after the COVID-19 pandemic, underscores the importance of studying metabolic contributions to puberty. This study aims to investigate the metabolic factors responsible for CPP in lean and overweight/obese conditions. By establishing and characterizing lean and obese rodent models of CPP, we aim to gain insights into the underlying mechanisms by which metabolic signals influence the onset and progression of puberty. Understanding these mechanisms will provide valuable insights for improving strategies for early detection and management of CPP, particularly in the context of the increasing prevalence of childhood obesity.