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Modeling of the Growth Hormone Network

Hormone secretion patterns are determined by the frequency of secretion events, the amount secreted, and the length of time the secretion event lasts. They encode messages for the target cells that control vital physiological processes, and an alteration of a secretion pattern may impede one or more of these processes. Understanding hormone secretion and developing the capability to recognize both normal and pathological patterns of hormone production is of utmost importance for establishing medical diagnoses, initiating treatment, and assessing the effects of treatment. It is generally impossible to collect data directly from the endocrine glands, where the hormones are secreted. Secretion patterns have to be inferred from hormone concentration in the blood where distortions, due to binding, excretion and/or biotransformation, begin immediately after the hormones enter the bloodstream. Thus, mathematical models of the hormone network interactions and control mechanisms play a critical role in the understanding of endocrine oscillations. The talk will outline a model of the growth hormone network and a related undergraduate project appropriate for use in calculus-based courses.