Mechanism of seasonal testicular regression in quail

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Many temperate zone organisms adjust their breeding seasons to a period with abundant food for their offspring's survival. Birds, especially the Japanese quail, have revealed the mechanisms underlying this seasonal regulation. Previous studies have revealed that the activation of thyroid hormone (TH) in the hypothalamus induces seasonal gonadal development, while the full details for the mechanisms of seasonal gonadal regression remain unclear. It is known that testicular regression in quail requires short day/low temperature (SL) stimuli. We found that drastic testicular regression was induced by the apoptosis of germ cells following an increase in serum T_3 (activated TH) levels during SL condition. It is well established that TH is involved in amphibian metamorphosis by inducing apoptosis, e.g., in the tail. Sequential gene expression analysis also indicated the upregulation of T_3-related genes during testicular regression. Furthermore, the effects of the daily intraperitoneal administration of T_3 on gene expression, apoptosis, and testicular mass resembled those of SL stimulation. Although contradictory effects of TH on seasonal breeding have been reported, we revealed the role of TH in seasonal reproduction; it is involved in seasonal testicular development in the central tissue and in seasonal testicular regression in the peripheral tissue.