

# Increased Reproductive Output and Telomere Shortening Following Calcium Supplementation in a Wild Songbird

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March 13, 2024

## Abstract

Life history theory predicts increased parental investment comes with fitness costs, often expressed as negative effects on survival and future reproduction. Though annual telomere shortening has been shown to increase with higher reproductive output, we use calcium supplementation as a novel approach to experimentally alter overall reproductive investment and measure telomere shortening exclusively linked to the breeding season. Calcium is a nutrient critical to avian reproduction as the intake of natural calcium is needed for egg production, embryo development, and nestling growth. Altering the amount of calcium availability during the breeding season allows us to examine the individual biological response to the experimental modification of reproduction, and allows us to account for the reproductive costs associated with egg production and laying of the entire clutch. We used calcium supplementation in nesting *Tachycineta bicolor* (tree swallow) and measured telomere length before and after breeding to better understand the costs of reproduction and life history trade-offs. Measuring telomere length at the beginning and end of each breeding season facilitated evaluation of telomere shortening occurring only during the breeding period of this species. We found that mothers supplemented with calcium had higher reproductive success and greater telomere shortening, though their offspring had longer telomeres at 12 days old. Here we show tree swallow mothers supplemented with calcium had higher reproductive output and offspring with longer telomeres, yet these mothers suffered the cost of shorter expected lifespan, as indicated by relatively more shortening of their telomeres during the reproductive season. Our results provide clear support for previous work on trade-offs between reproduction and longevity and challenge previous calcium supplementation studies that suggest excess calcium reduces the cost of reproduction thereby improving fitness in calcium supplemented parents.

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