

PRIMATE ORAL ADAPTATIONS TO STARCH AS A RESPONSE TO RESOURCE SCARCITY.

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Theorized to have played a significant role in the evolution of the catarrhine parvorder, leaves are an important dietary component for many living primates. Early in catarrhine evolution, a diet composed of items relatively high in starch, including leaves, underground storage organs, grasses, unripe fruits and seeds, may have favored the expression of salivary amylase. Upon AMY1 fixation, two different mechanisms evolved within primates for salivary amylase production: In *Homo* and *Pongo* we observe increased copy number of AMY1, whereas in cercopithecines we also observe increased expression, although the regulatory mechanism remains unknown. To further understand the evolutionary significance of varied amylase expression, we quantified the starch content of food items consumed by gorillas, chimpanzees, and orangutans, as well as the associated salivary amylase levels. In both humans and orangutans, increased AMY1 copy numbers and measurably higher salivary amylase, correlate with starchy fallback foods eaten by these species, including tubers (*Homo*), bark, pith, and vegetation (*Pongo*). From these data, we conclude that the starch component of tropical leaves and fruits average 10%, compared to fallback foods that have average starch component greater than 30%. Many primate feeding adaptations have been linked to feeding on hard and tough fallback foods, and salivary amylase appears to be a key adaptation to maximize starch digestibility of such resources. Thus, while a primarily folivorous diet of early stem catarrhines may have driven the evolution of salivary amylase, reliance on starchy fallback foods appears to have favored high copy number variation in humans and orangutans.

Keywords: starch, amylase, fallback, diet.