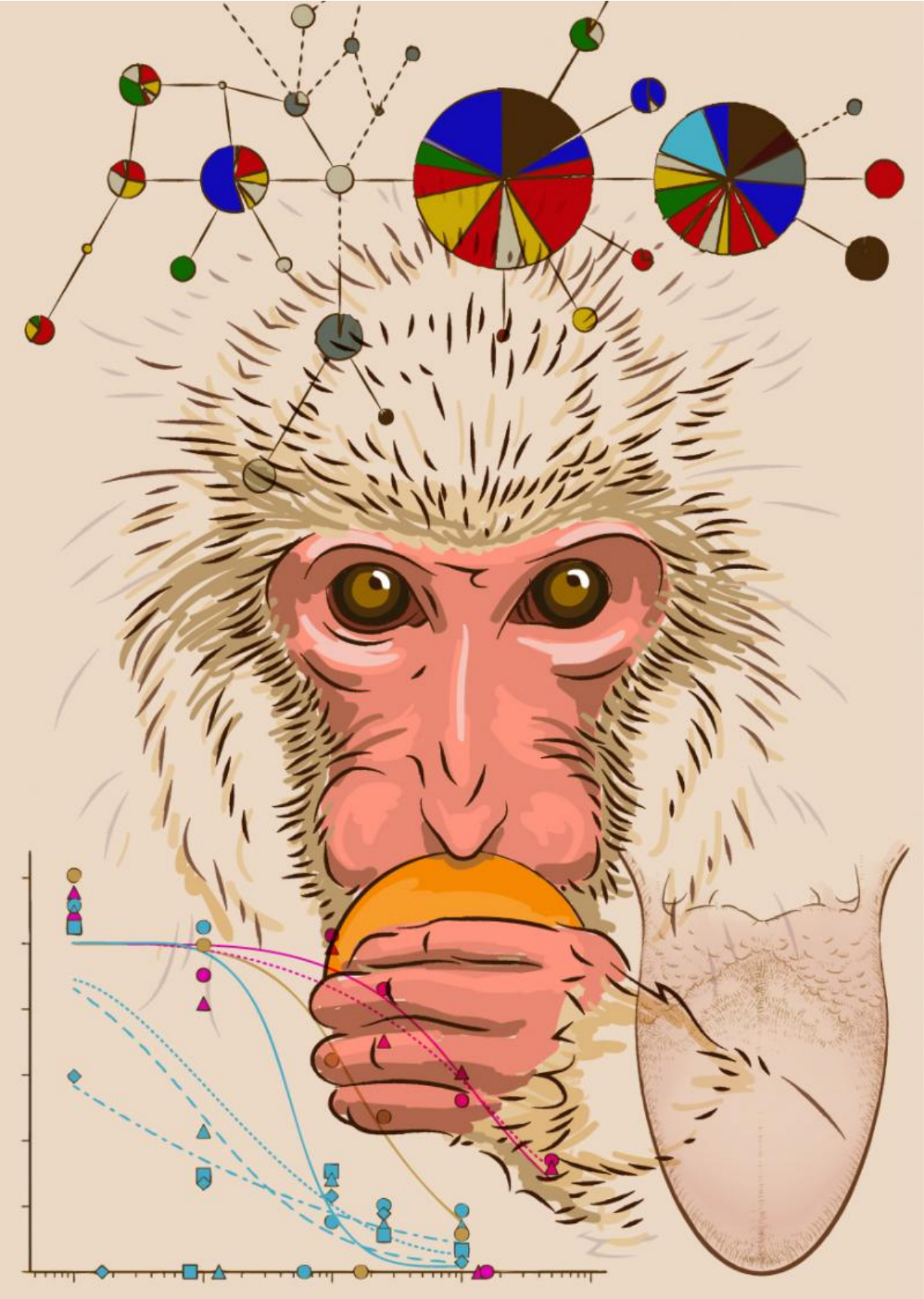


Savoring a bitter bite: Japanese monkeys drop their guard to survive

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An inability to taste bitterness was once thought to be an undesired trait, but Kyoto University researchers have shown that Japanese macaque monkeys have an evolutionary advantage if they cannot taste bitter fruit. Credit: Kyoto University

Most poisons taste bitter: being able to tell typically leads to longer life.

Species lacking an ability to taste bitterness are usually thought to be at a disadvantage—that is until now. Researchers at Kyoto University have recently discovered that a genetic mutation in a population of monkeys has caused a loss in their ability to taste [bitter foods](#), resulting in increasing their chances to survive.

This higher tolerance to bitter foods may actually be beneficial, reversing a common belief that the inability to taste bitterness is a negative trait.

Mammals experience the five [taste sensations](#) of sweet, sour, salty, umami, and bitterness—the last being the least desired. This natural reaction is essential to avoid ingestion of toxins in food. In mammals, bitter tastes are detected mainly through a receptor in the [taste buds](#) known as TAS2Rs. "TAS2R38", one of TAS2Rs, recognizes synthetic bitter compounds such as phenylthiocarbamide and propylthiouracil, and natural bitter compounds like glucosinolates and limonin, which are found in cruciferous and citrus plants, respectively.

The Kyoto team, led by Hiroo Imai conducted genetic analysis of almost 600 macaques throughout Japan. "Using cellular and behavioral experiments, we found that a large number of Kii monkeys, through

adaptive evolution, have lost TAS2R38 function, leading to the inability to taste bitterness," first-author Nami Suzuki-Hashido explains. "This finding may explain the change in fitness related to feeding habit specificity."

Study results showed that bitterness "non-tasters" were more common than could be explained demographically, suggesting that the inability to [taste](#) bitterness led to an evolutionary edge. Notably, *Citrus tachibana*, bitter citrus fruit native to Japan, was the first citrus to grow in Japan, and as it originates in the Kii region, a link can be seen to why the Kii macaque developed this trait.

"We can postulate that wild mammals adapt to various environments by altered molecular mechanisms, as well as by learning," Imai says.

"Agriculture over the past several hundred years has rapidly expanded the distribution of cruciferous plants such as cabbage and radish, along with [citrus](#) plants. This may relate to the rapid expansion of non-tasters for [bitterness](#) among Japanese macaques."

More information: Nami Suzuki-Hashido, Takashi Hayakawa, Atsushi Matsui, Yasuhiro Go, Yoshiro Ishimaru, Takumi Misaka, Keiko Abe, Hirohisa Hirai, Yoko Satta, Hiroo Imai "Rapid Expansion of Phenylthiocarbamide Non-Tasters among Japanese Macaques" *PLOS ONE* 10(7): e0132016, Published: 22 July 2015
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