

# Researchers Find 'Key Ingredient' That Regulates Termite Caste System

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(PhysOrg.com) -- A North Carolina State University entomologist has for the first time shown which specific chemicals are used by some termite queens to prevent other termites in the colony from becoming mummies like themselves.

In a study published online this week in [Proceedings of the National Academy of Sciences](#), NC State's Dr. Ed Vargo and colleagues from Japan and Switzerland show that a combination of two chemical compounds in a pheromone perfume emitted by egg-laying females known as secondary queens can inhibit other termites from developing into new queens. Moreover, the study shows that termite eggs also produce the caste-altering chemicals.

“This study opens up a whole new world into the mechanisms behind the ways colonies of termites and other social insects regulate themselves,” Vargo says. “With this long missing key ingredient now in hand, I expect we’ll see rapid progress in understanding how reproductive and nonreproductive termite castes develop.”

Secondary queens don't prevent other termites in the colony from becoming mummies out of spite, Vargo says. It's more a case of keeping the colony balanced with the correct numbers of caste members. Colonies need the proper proportion of workers who forage for food and take care of [larvae](#), soldiers who defend the colony, and secondary queens who lay eggs to increase a colony's numbers. The wrong balance could spell doom for the colony.

Termites molt frequently throughout their lives and can change castes depending on conditions in the colony. In the study, the scientists exposed different castes of termites that have the capacity to become secondary queens to both the actual pheromone perfume elicited from secondary queens and a synthetic version of the perfume. Both treatments prevented termites from becoming secondary queens.

Scientists have long believed that queen pheromones regulate caste development in [social insects](#), but this finding is only the second such discovery in the past 50 years - when the term pheromone was coined by scientists. This is partly due, Vargo says, to scientists looking for the wrong types of chemicals.

“The pheromone - a combination of two chemicals called n-butyl-n-butyrate and 2-methyl-1-butanol - is a low-weight, volatile blend that acts directly on developing [termites](#),” he says. That is in contrast to queen honey bees, for example, whose [pheromone](#) acts indirectly by regulating the queen-rearing behavior of worker bees.

**More information:** “Identification of a pheromone regulating caste differentiation in termites” Kenji Matasuura et al. Published: The week of July 5, 2010, in Proceedings of the National Academy of Sciences

Provided by North Carolina State University

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