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Queens close sperm-gates of eggs for asexual reproduction in termites

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The near-ubiquity of sexual reproduction in animal species despite the two-fold cost of sex has long been an enigma. In the evolution of parthenogenesis (female reproduction without male fertilization), males and females may be in conflict over genetic transmission to the next generation because parthenogenetic reproduction enhances female's reproductive outputs but completely deprives of male's genetic contribution. For these males, any trait coercing these females into sexual reproduction should increase their fitness and should be under positive selection. In the termite *Reticulitermes speratus*, however, queens produce their replacements (neotenic queens) parthenogenetically while using normal sexual reproduction by mating with kings to produce other colony members. Here, we report that queens of this termite species produce parthenogenetic offspring in the presence of kings by closing micropyles (sperm-gates, tiny openings for sperm entry) of unfertilized eggs. Our field survey demonstrated that there is a large variation in the number of micropyles in the eggs, and that some of the eggs have no micropyle. Microsatellite DNA analysis indicated that micropyleless eggs develope parthenogenetically without fertilization, whereas eggs with micropyles get fertilized and develope sexually. Comparison of the number of micropyles between the eggs laid by old- and young-queens showed that only old-queens produce micropyleless eggs. Moreover, sampling of the field colonies revealed that most of the micropyleless eggs are produced in early egg-laying season. Our results demonstrate that the queens control egg fertilization without interference from the kings and produce their replacements parthenogenetically as needed. This suggests that parthenogenesis can evolve in favour of the females' own interests independently of males' interests. Furthermore, the maintenance of sexual reproduction even under the strong control of egg-fertilization by the queens may be explained by the importance of genetic diversity among colony members in social insects.