Cells die so defensive organs can live

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Researchers demonstrate for the first time that programmed cell death - a process by which cells deliberately destroy themselves - is involved in mandibular regression in termites. And it appears this regression may be the price to pay for the formation of termites' defensive organs, according to Kouhei Toga and Kiyoto Maekawa from the University of Toyama, and Shinichi Yoda from the University of Tokyo, in Japan. Their findings have just been published online in Springer's journal *Naturwissenschaften – The Science of Nature*.

As termites molt from workers, to presoldiers and finally soldiers under the effect of juvenile hormones, their body form and structure change, including the exaggeration and regression of certain organs. In particular, termite soldiers from the subfamily Nasutitermitinae possess a horn-like frontal tube (the nasus) which projects defensive chemicals, as well as regressed mouth parts (mandibles).

Juvenile hormones play a central role in caste differentiation - a two molt process for termite soldiers during which dramatic morphological changes occur. Until now, the mechanisms regulating mandibular regression in termites were unknown.

Toga and colleagues collected nests of N. takasagoensis termites from the Yaeyama Islands in Japan. They artificially induced presoldier differentiation by using a juvenile hormone, which works as an insect-growth regulator, and observed the shape and structure of the right mandibles throughout the differentiation process i.e. in minor workers, presoldiers and soldiers. The authors also looked for evidence of

possible programmed cell death.

Their observations showed that mandibular teeth were lost during soldier differentiation. In particular, mandibular size reduced dramatically during differentiation, and substantial regression occurred during the presoldier molt. The most significant finding was evidence of programmed cell death in the regressing mandibles of presoldiers.

The authors conclude: "Our results prove that programmed cell death is responsible for the regression of mouth parts in termite soldiers, and hence social caste differentiation in this species. The exaggerated nasus and frontal glands develop as the mandibles regress. Programmed cell death could therefore be a regulatory mechanism of trade-off for the production of defensive organs."

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