Animal without synapses feeds by external digestion using global, local cellular control

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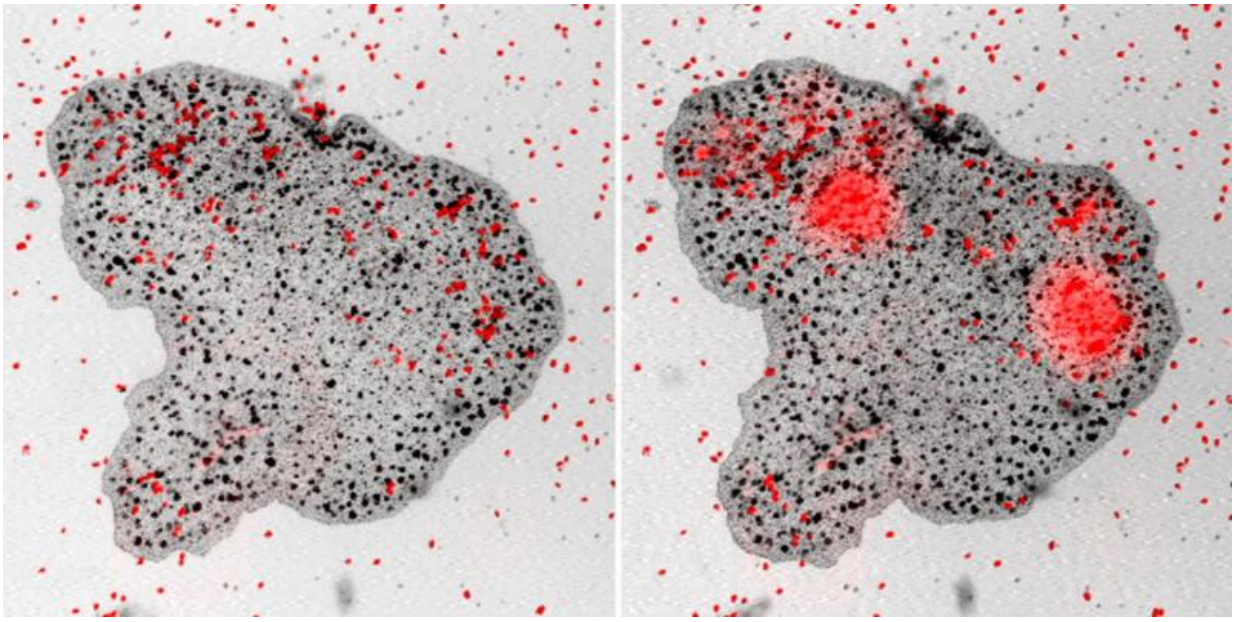

Trichoplax fed on microalgae (red specks). Credit: Carolyn Smith

A multicellular marine animal without organs, *Trichoplax*'s feeding behavior may include cellular coordination, resulting in external food digestion, according to a study published September 2, 2015 in the open-access journal *PLOS ONE* by Carolyn Smith and colleagues from the National Institute of Health in Bethesda, MD.

Trichoplax is a small, disk-shaped marine metazoan animal without

recognizable neurons and muscles that moves using hair-like cilia. Despite having only six cell types, whereas humans have about 200, and no nervous system, *Trichoplax* appears to coordinate a complex sequence of behaviors culminating in external digestion of algae. The authors of this study combined live cell imaging with electron microscopy to observe *Trichoplax* feeding behavior at scales ranging from the whole animal to subcellular.

They observed that when *Trichoplax* glides over a patch of algae, its cilia stop beating and it ceases moving, which indicates its ability to control its the entire body. The authors then found that cells of a certain cell type, called lipophils, simultaneously secretes granules whose contents rapidly break down the algae. This secretion appears to be targeted, indicating that the organism has local control, as only lipophils near algae released the granules. *Trichoplax* also appeared to pause while the algal content was ingested, and then resumed gliding.

Global control of gliding seemed to be coordinated with precise local control of lipophil secretion, which the authors suggest indicates the presence of mechanisms for cellular communication and integration. The authors conclude that this level of mechanistic understanding of external digestion in a modern animal may provide a window to understanding the early evolution of digestion and the systems controlling it.

More information: *PLOS ONE*, dx.plos.org/10.1371/journal.pone.0136098

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