Seeing without eyes: Hydra stinging cells respond to light

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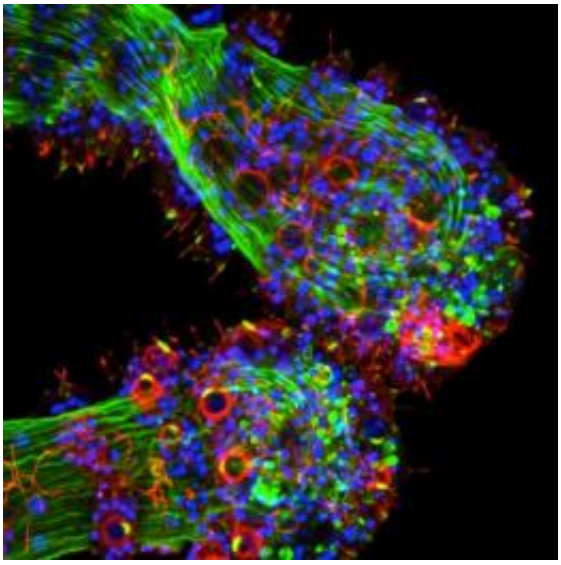

Hydra magnipapillata tentacleopsin is shown in blue, cnidocytes and neurons shown in red. Credit: Dr. David Plachetzki, University of California

In the absence of eyes, the fresh water polyp, *Hydra magnipapillata*, nevertheless reacts to light. They are diurnal, hunting during the day, and are known to move, looping end over end, or contract, in response to light. New research published in BioMed Central's open access journal *BMC Biology* shows that stinging cells (cnidocytes) in hydra tentacles, which the animals use for self protection and to catch prey, are linked via a simple nervous system to primitive light responsive cells that co-ordinate the animals' feeding behavior.

Hydra are members of a family of radially symmetric animals (Cnidaria), all of which use specialized cnidocytes to catch prey. This family also includes well-known creatures such as jellyfish and corals, which, like other cnidarians, have the simple design of a mouth surrounded by tentacles. Hydra tentacles contain barbed, poison containing cnidocytes that they use to stun animals like the water flea, Daphnia, before eating them alive, and to protect themselves from attack by other animals.

Researchers from the University of California lead by Dr David Plachetzki have discovered that the light sensitive protein opsin found in sensory cells is able to regulate the firing of harpoon-like cnidocytes. These light sensitive neurons are found integrated into arsenals that include the stinging cnidocytes as well as desmoneme cnidocytes, used to grasp prey, and sticky isorhiza, which help the hydra to summersault at 10cm a day.

This is the fresh water polyp, *Hydra magnipapillata*. Credit: Dr. David Plachetzki, University of California

The linking of opsin to cnidocytes explains how hydra are able to respond to light even though they do not have eyes. Dr Plachetzki described how other proteins necessary for phototransduction are also present in the sensory cells. "Not only did we find opsin in the sensory neurons that connect to cnidocytes in the hydra, but we also found other components of phototransduction in these cells. These included cyclic nucleotide gated ion channels (CNG) required to transfer the signal and a hydra version of arrestin, which wipes the phototransduction slate clean for a second signal."

Dr Plachetzki continued, "We were also able to demonstrate that cnidocyte firing itself is effected by the light environment and that these effects are reversed when components of the phototransduction cascade are turned off."

Cnidarians have been around for over 600 million years. However the hydra's simple approach to using light, to aid survival and increase their chances of catching prey, uses the same visual pathway as humans and hints at a common ancestor.

More information: Cnidocyte discharge is regulated by light and opsin-mediated phototransduction, David C Plachetzki, Caitlin R Fong and Todd H Oakley, *BMC Biology* (in press)

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