

Novel hormone discovery provides new insight into the evolution of plant structure

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Marchantia polymorpha. Credit: Fuchs (1542).

An international study co-led by the Monash University School of

Biological Sciences has discovered a stem-cell promoting hormone in the liverwort *Marchantia polymorpha*.

The discovery, published today in *Current Biology*, provides a new understanding of the evolution of plant morphology.

Marchantia, a common liverwort, is a representative of an ancient lineage of [plants](#). Their evolutionary history presents researchers with an excellent opportunity to explore the fundamental insights into how genes and hormones have evolved in plants.

"All land plants have meristems, which are pools of stem cells, from which the bodies of the plants are ultimately derived. Our study found that the number of stem cells in *Marchantia* is regulated by a peptide [hormone](#) called CLAVATA," explains lead Australian study author Professor John Bowman, from the Monash University School of Biological Sciences.

The research team, which involved several collaborators from Japan, including Assistant Professor Yuki Hirakawa of Gakushuin University (a former Monash postdoctoral researcher), added a chemically synthesized MpCLE2 peptide to the growth medium of *Marchantia*.

"When an excess amount of CLAVATA peptide hormone accumulates, the number of stem cells is increased, which then leads to the formation of multiple branches," added Assistant Professor Hirakawa.

"In flowering plants, whose evolutionary lineage diverged from *Marchantia* more than 400 million years ago, CLAVATA is known to act as a negative regulator of stem cell population that prevents their over proliferation. Our study found the same [peptide hormone](#) functions in stem cell regulation in both *Marchantia* and flowering plants—although it had the opposite effect."

The finding suggests that cell-to-cell communication by CLAVATA is a fundamental mechanism for growth regulation of all [land plants](#) and provides an important clue to understanding the morphological evolution of the plants, which emerged on land around 470 million years ago.

A feature of plant growth is that they keep meristems at the tip in which cell division continues throughout the life. A small number of stem [cells](#) reside in the meristem, which acts as the ultimate source of plant organs, such as leaves, flowers, fruits and wood.

More information: Yuki Hirakawa et al. Induction of Multichotomous Branching by CLAVATA Peptide in *Marchantia polymorpha*, *Current Biology* (2020). [DOI: 10.1016/j.cub.2020.07.016](https://doi.org/10.1016/j.cub.2020.07.016)

Provided by Monash University

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