The team hypothesized that the formation of this pattern, might be controlled by variations in the eggshell contours. To test this, they applied a more sophisticated "phase-field" mathematical model that could more precisely account for the actual egg shape measured from worms. This new model successfully reproduced the previous findings and now also accounts for the unexplained T-reverse arrangement. The findings show for the first time that the previously ignored local contours of the egg affect the cell patterns.

In the new way of looking at the embryo, it turns out that it is actually the "space inside the egg" that is a key factor driving the cell patterns. To test this concept further, the researchers examined the eggs...
of worms that were genetically modified to allow more space for the cells inside. With extra room, the first four cells preferred to spread out in a line rather than bunching up.

Seirin-Lee said, "Worm eggshells are often treated as a simple oval shape but the actual shape may be closer to a capsule in some cases. We now understand how important geometric constraints and space are for directing cells, and this concept also applies to human cells. We hope this work will lead us to a better handle on artificially controlling cell differentiation and extend the capabilities of stem cell techniques."

The paper "The extra-embryonic space and the local contour are critical geometric constraints regulating cell arrangement" was published on 12 May, 2022 in the journal Development.

More information: Sungrim Seirin-Lee et al, The extra-embryonic space and the local contour are crucial geometric constraints regulating cell arrangement, Development (2022). DOI: 10.1242/dev.200401

Provided by Kyoto University

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.