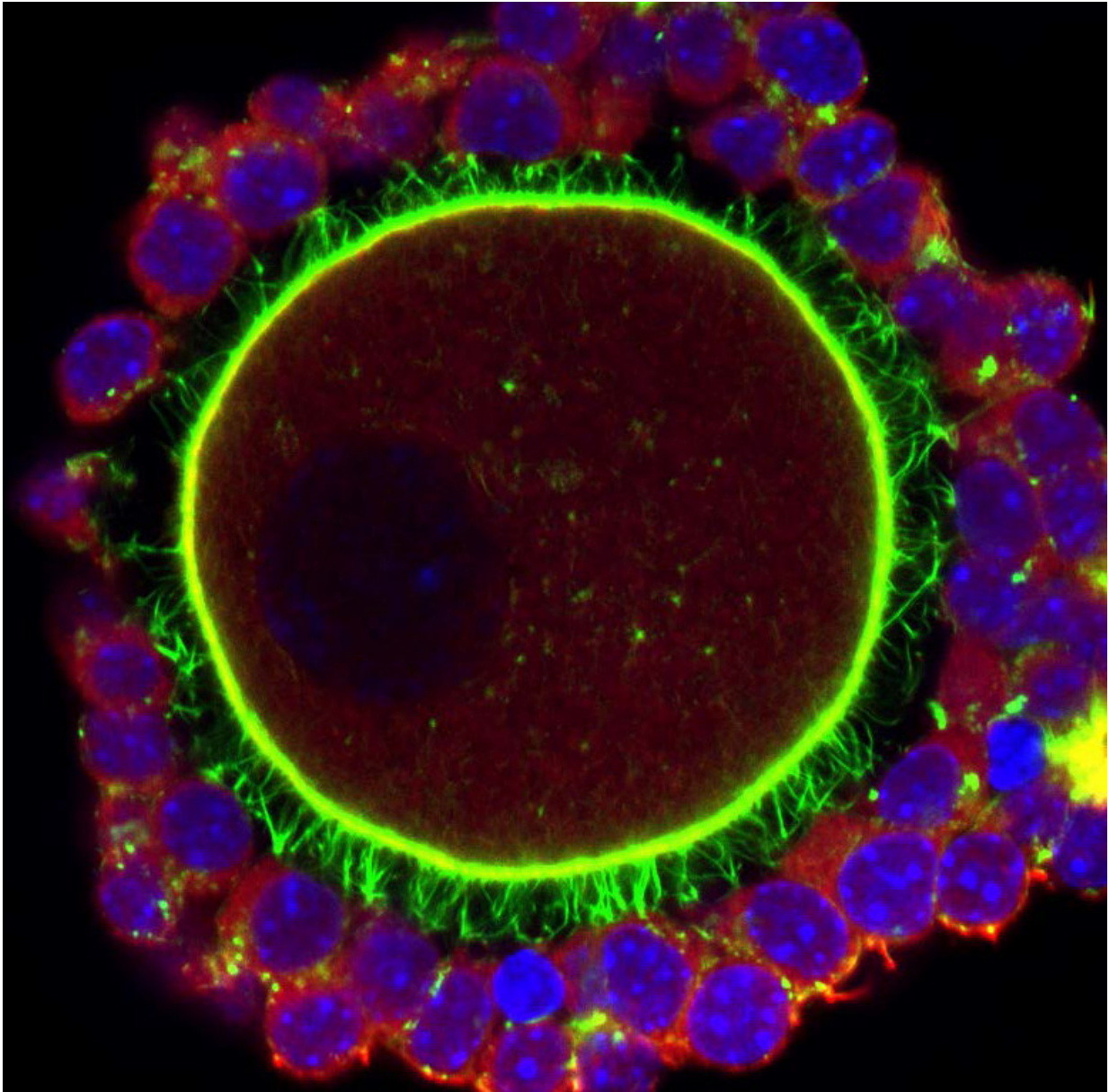


Like babies, eggs send signals when 'hungry'

April 9 2018



A growing oocyte in the middle, which is very large with a bright green rim,

surrounded by many small red follicle cells whose nuclei are stained blue. The thin bright-green hair-like structures between them are the feeding tubes, which grow out from the follicle cells when they receive signals from the oocyte. This image was captured by using confocal microscopy at the Imaging Platform of the Research Institute of the McGill University Health Centre, Montreal, Canada. Credit: Dr. Qin Yang, Research Associate, Research Institute of the McGill University Health Centre

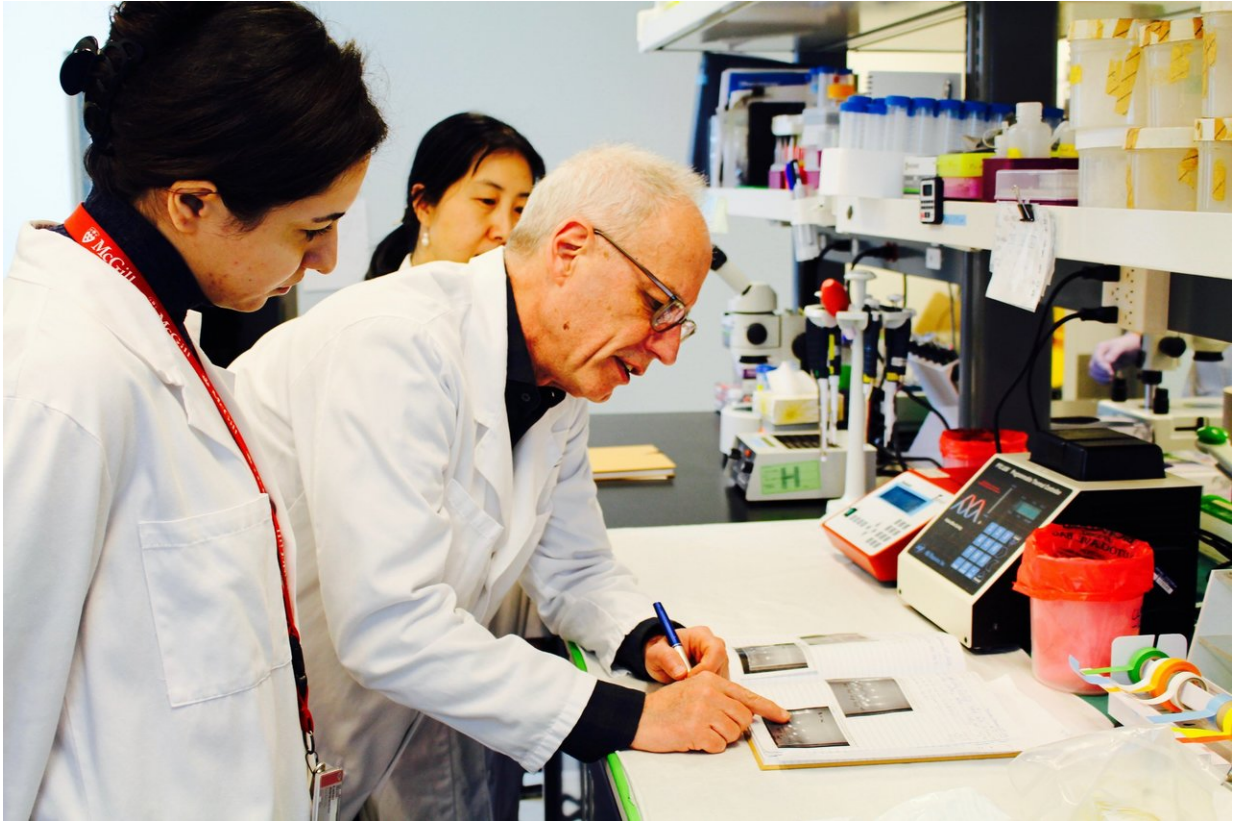
In humans and other mammals, the female reproductive cells - the eggs or oocytes - need nourishment in order to grow and remain fertile. It is known that the egg gets its food from little arm-like feeding tubes (called filopodia) that jut out from tiny cells surrounding the egg and must poke through a thick wall coating the egg in order to feed it. Until recently, scientists did not really understand when and how those feeding tubes were constructed.

Now, a team at the Research Institute of the McGill University Health Centre (RI-MUHC) led by scientist Dr. Hugh Clarke has found out who calls the shots when it is mealtime for the growing egg, how that cell-to-cell message is communicated and how the feeding tubes themselves are generated. It turns out the egg is in charge and its communication skills are highly sophisticated. When it's time to get food, the egg sends signals to the tiny surrounding cells to make the feeding tubes, and as it grows and needs more nourishment, it signals them to make even more tubes.

These findings, which push the scope of our understanding of female fertility, were published in the April 2 print edition of *Current Biology*.

The study revealed that growth factors - especially one known as growth differentiation factor 9 - coming from the eggs drove the feeding tube multiplication and growth process, acting directly upon the genetic machinery of the follicle cells surrounding the egg. These discoveries put

the spotlight directly on the egg itself, says Dr. Clarke.



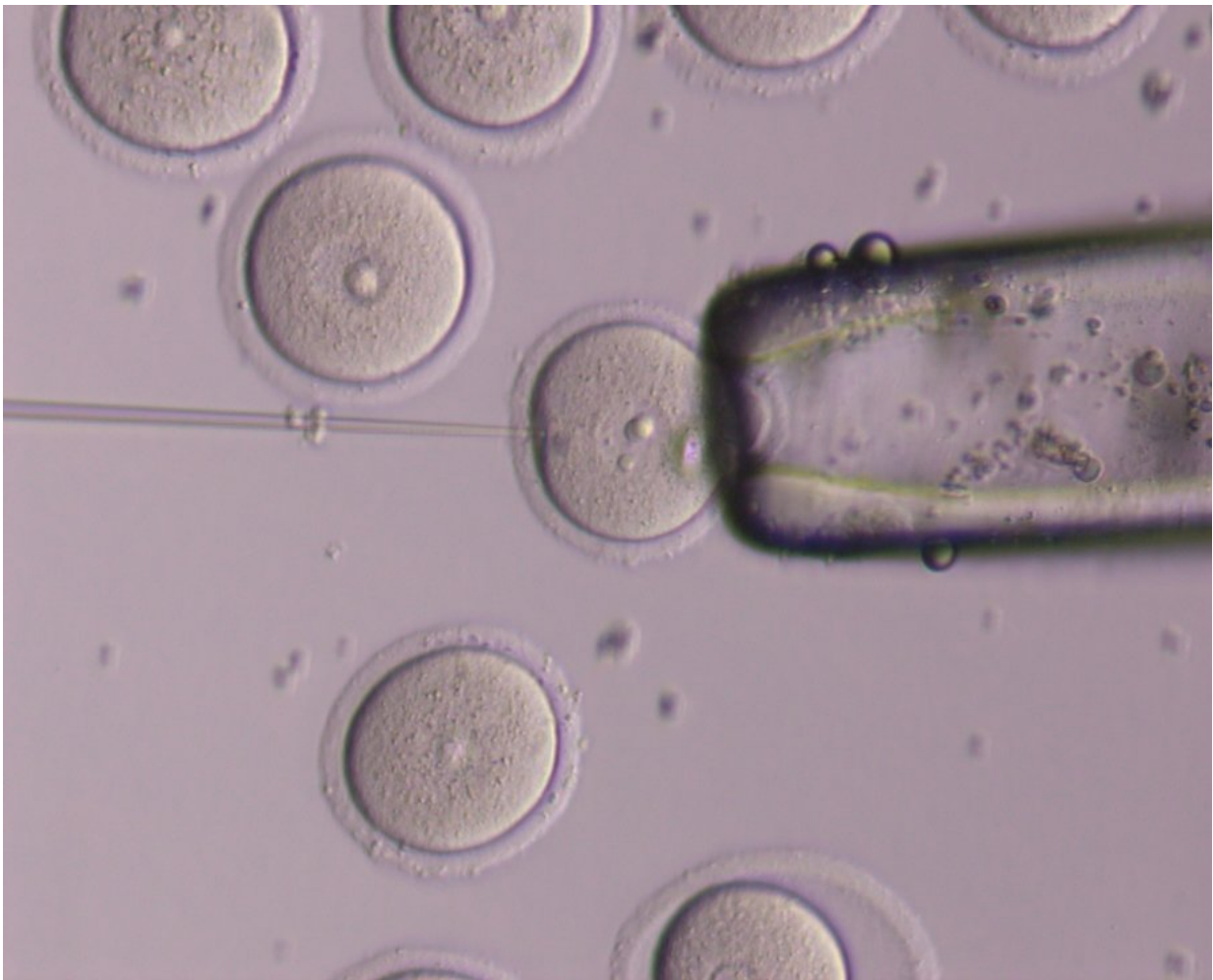
Dr. Hugh Clarke looking at lab results with two of the study co-authors, Laleh Abbassi (front) and Qin Yang (back). Credit: McGill University Health Centre

"It shows that the egg is playing an active role in creating the microenvironment that it needs to continue its development," says Dr. Clarke, lead study author, who is also a senior scientist from the Child Health and Human Development Program at the RI-MUHC and a professor and research director of the Department of Obstetrics and Gynecology at McGill University.

"We observed that the whole process of [egg development](#) and its

interaction with its environment is not static. It's very dynamic," adds first study author Stephany El-Hayek, who was a PhD student in Dr. Clarke's lab at Glen site of the RI-MUHC at the time.

The team also found that in older mice, the cells surrounding the egg produced fewer feeding tubes. Scientists know that the eggs of older women are less successful in producing healthy babies, but they don't know the reason why. Dr. Clarke's research offers a new possible explanation.



An egg being immobilized using a holding pipette on the right, while an injection

pipette carrying the solution to be injected into the egg is pushed in from the left. The egg is surrounded by a thick wall. The feeding tubes growing out from the follicle cells have to punch their way through the wall to reach the egg.

Credit: Dr. Hugh Clarke's lab at the Research Institute of the McGill University Health Centre

Might it be because the [cells](#) surrounding the egg are not good at making enough feeding tubes as the egg grows older? The answer to that question, which Dr. Clarke's team is now investigating, could one day lead to the possibility of increasing fertility or even retaining fertility longer into older age, says the researcher.

"Understanding how the egg interacts with its environment will allow us to ensure that growing eggs retain their fertility," says Dr. Clarke. "But it could also lead to developing techniques to grow healthy [eggs](#) in the laboratory in an effort to preserve fertility in women who have cancer," says Dr. Clarke.

More information: Stephany El-Hayek et al, Mammalian Oocytes Locally Remodel Follicular Architecture to Provide the Foundation for Germline-Soma Communication, *Current Biology* (2018). [DOI: 10.1016/j.cub.2018.02.039](#)

Provided by McGill University Health Centre

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