European researchers crack embryonic stem cells mystery

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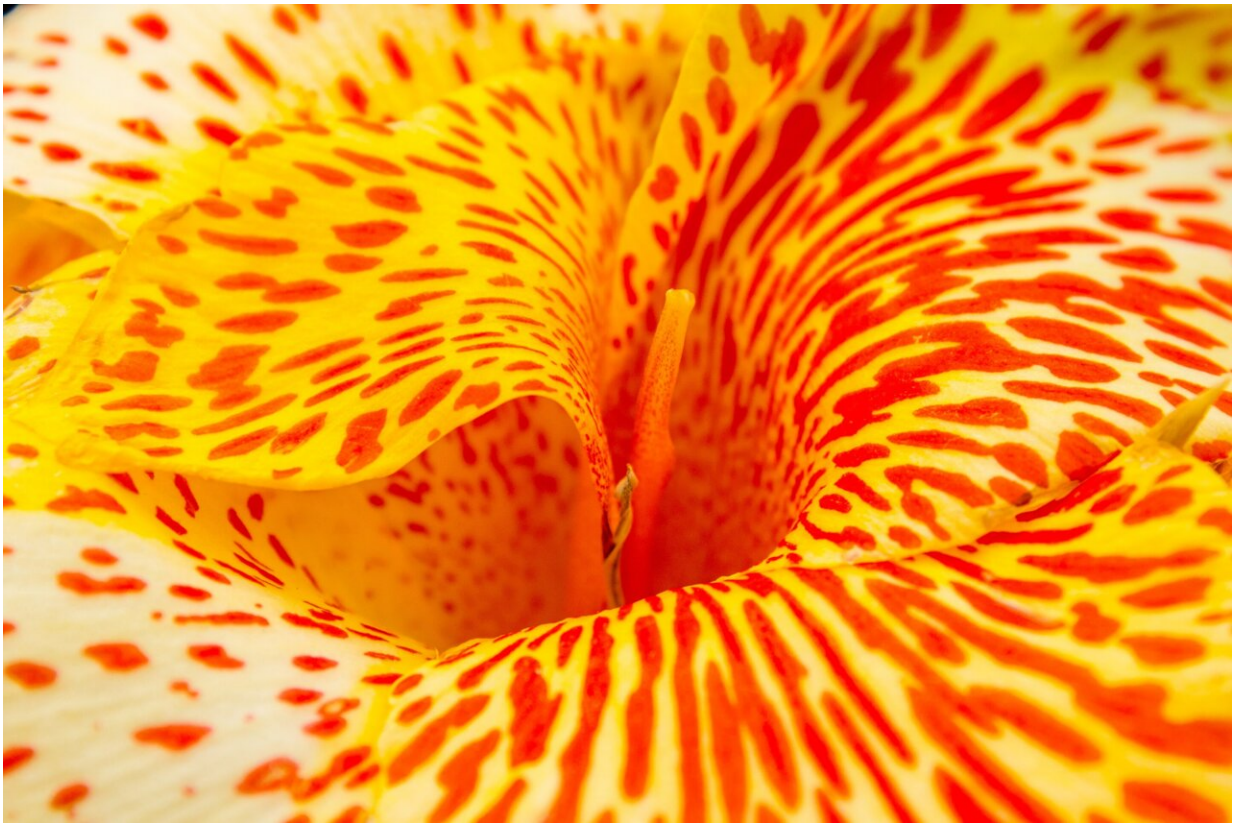

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European researchers discover that embryonic stem cell properties are impacted by the laboratory conditions used to grow them.

In their groundbreaking study, a European team of researchers evaluated embryonic stem cells grown in a pure undifferentiated state. The use of next generation sequencing technology enabled them to analyse gene expression (i.e. transcriptome) and chromatin modifications (i.e. epigenome). The study is presented in the journal *Cell*. The results pinpoint key differences between pure stem cells and embryonic stem cells grown in laboratory settings.

What allows embryonic stem cells to stay pluripotent? Researchers have been investigating this mystery for some time. Now a team of researchers from Germany, the Netherlands and the United Kingdom provide key answers, giving us information we need to know about how cells are controlled and what is the optimal way to grow them. The findings overturn previous reports suggesting that embryonic stem cells are both unstable and primed to differentiate. This information could help lead to the development of new and effective treatments.

Researchers from Nijmegen Centre for Molecular Life Sciences (NCMLS) and Radboud University in the Netherlands, as well as the Wellcome Trust Centre for Stem Cell Research, Stem Cell Institute and the University of Cambridge in the United Kingdom, and Technische Universität Dresden in Germany confirmed that transcriptome analysis allows scientists to identify which genes are turned on or off inside the cells. The gene's level of activity is also calculated through this method. Meanwhile, epigenome analysis provides researchers insight into how genes are controlled. This study went a step further by unlocking the mystery of how embryonic stem cells maintain their pluripotency, which experts describe as the capacity to make various cell types.

Through this study, researchers obtained key reference information in their quest to create a novel kind of human pluripotent stem cell equivalent to mouse embryonic stem cells. According to the team, the data represents the ground state of pluripotency.

Commenting on the results of the study, EUROSYSTEM ('European consortium for systematic stem cell biology') coordinator Austin Smith said: "These findings show how much we are still learning about stem cells. They also point to an underlying difference between true embryonic stem cells isolated from mice and the currently available human stem cells which are less pure and more variable."

More information: Marks, H., et al. 'The Transcriptional and Epigenomic Foundations of Ground State Pluripotency', Cell, 2012, 149(3), 590-604. doi:10.1016/j.cell.2012.03.026

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