

Researchers report findings about the control of cell division

December 13 2017

Experts from the University of Seville and the Andalusian Centre for Molecular Biology and Regenerative Medicine (Cabimer) have published a new study on the mechanisms that regulate cell division and guarantee the correct distribution of chromosomes. In particular, they especially highlight the fundamental role that an organelle, the nucleolus, plays in the coordination of these processes.

The nucleolus stores hijacked proteins that are key to the regulation of the cell cycle. These are only released when it is necessary for them to carry out their function. The peculiar structure of the nucleolus is, however, inconvenient for the cells. So once the genome is copied for distribution between [daughter cells](#) during cell division, unions generated between the chromosomes can interfere with their correct distribution during mitosis. In order to eliminate these unions, the cells promote DNA condensation, which leads to the compaction of the DNA before its distribution.

"Our study has demonstrated that precise temporal control of rDNA compaction is necessary to allow equal distribution of the chromosomes during mitosis without interfering with the correct progression of the cell cycle. Additionally, our results suggest that cells can use the degree of compaction of the nucleolus as a mechanism for stopping the progression of the [cell cycle](#) in adverse conditions, such as a lack of nutrients," explains the project director, Fernando Monje.

When the cells acquire an incorrect number of chromosomes, which is

called aneuploidy, cellular tumours can appear. It is estimated that more than 90 percent of all solid tumours in humans are caused by aneuploidy. For that reason, understanding the mechanisms that guarantee the fidelity of genome transmission during cell division is of enormous importance for understanding how errors in this process can cause the appearance of tumours.

"These advances in basic science open the door to future research that could clarify the mechanisms by which human [cells](#) guarantee the correct distribution of [chromosomes](#) during [cell division](#). This will be of enormous help for understanding how errors in the functioning of these mechanisms can lead to the start of tumour growth," the researcher adds.

The experts at Cabimer are continuing to work to see how to stop cell proliferation in adverse conditions. This will allow for the identification of new factors that are involved in the appearance of diseases like cancer.

More information: Ana Isabel de los Santos-Velázquez et al, Late rDNA Condensation Ensures Timely Cdc14 Release and Coordination of Mitotic Exit Signaling with Nucleolar Segregation, *Current Biology* (2017). [DOI: 10.1016/j.cub.2017.09.028](https://doi.org/10.1016/j.cub.2017.09.028)

Provided by University of Seville

Citation: Researchers report findings about the control of cell division (2017, December 13) retrieved 3 July 2024 from <https://phys.org/news/2017-12-cell-division.html>

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