Genome research shows that the body controls the integrity of heritable genomes

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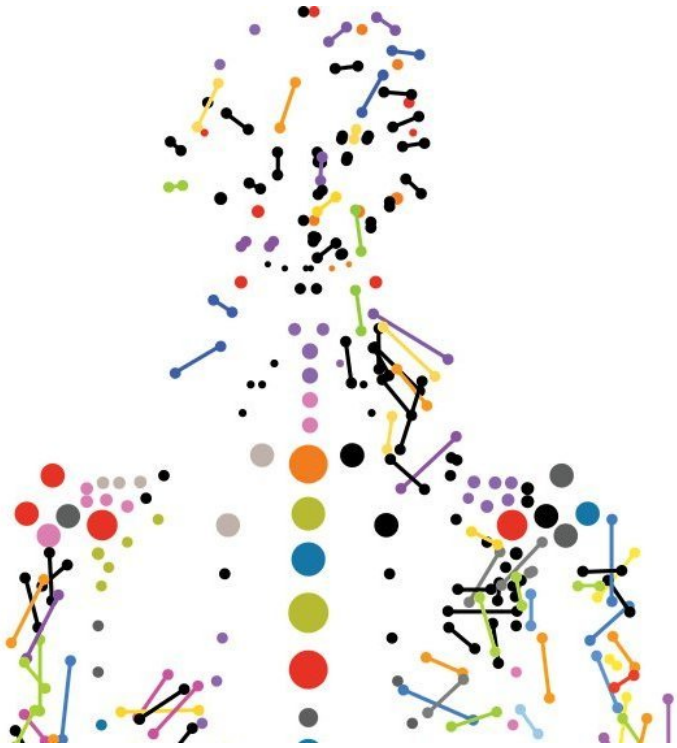

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Scientists at the CECAD Cluster of Excellence in Aging Research of the University of Cologne have discovered that body cells which are in direct contact with the germ cells in the nematode Caenorhabditis elegans are responsible for controlling the stability of the genome in primordial germ cells (PGCs). All germ cells, including sperm and eggs,

originate from primordial germ cells that form during early embryo development. Professor Dr. Björn Schumacher and his team at the UoC's Institute for Genome Stability in Aging and at CECAD discovered that somatic niche cells that surround the PGCs control their response to DNA damage. The study "Somatic niche cells regulate the CEP-1/p53-mediated DNA damage response in primordial germ cells," has now been published in *Developmental Cell*.

For more than a hundred years, inheritance of genetic information was thought to be autonomously controlled by the germ cells, explaining why acquired traits cannot be genetically inherited. Scientists believed that mutations occurring only in germ cells were responsible for any heritable genetic changes—be it during evolution or as cause of genetic disorders. Schumacher and his team now challenge this assertion.

The DNA of an organism constantly gets damaged. Not only environmental influences, but also by-products of the body's energy metabolism damage the molecular structure of the genome in every cell. The scientists investigated how the genome integrity of PGCs is controlled. PGCs need to survey their genomes particularly rigorously because they give rise to all sperm or eggs of the organism. Damaged PGCs are particularly dangerous because they are hereditary and can lead to serious genetic disorders. PGCs thus need to stop dividing when their genomes are damaged until the DNA is repaired. Special niche cells are responsible for signalling to the PGCs that they need to stop dividing and repair before generating further germ cells. If they fail to do so, the PGCs might pass on dangerous mutations to the next generation.

To fulfil this important function, the niche cells are in intimate contact with the PGCs and instruct them whether to divide and generate germ cells or whether to stay inactive. "This means that the body is responsible for controlling the integrity of heritable genomes," Schumacher

remarked. "The parental body thus has somatic control over the integrity of PGC genomes, controlling the quality of the heritable genetic information." Since studying PGCs in mammals is a complicated endeavour, Schumacher's team used *C. elegans* as a simple animal model to shed new light on to how PGCs control the integrity of the genomes they will pass on to their offspring.

These new insights open up new perspectives for understanding inheritance and causes of infertility.

More information: Hui-Ling Ou et al, Somatic Niche Cells Regulate the CEP-1/p53-Mediated DNA Damage Response in Primordial Germ Cells, *Developmental Cell* (2019). DOI: 10.1016/j.devcel.2019.06.012

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