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GREEK MINISTRY OF EDUCATION, RESEARCH AND RELIGIOUS AFFAIRS.
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FORTH
FOUNDATION FOR RESEARCH AND TECHNOLOGY-HELLAS
INSTITUTE OF MOLECULAR BIOLOGY AND BIOTECHNOLOGY

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PRESS RELEASE

IMBB researchers uncover a link between mitochondrial maturation and germ cell differentiation

Unlike somatic cells, gametes are virtually immortal and fulfill the pivotal task of protecting and faithfully transferring genetic material across generations. A recent study published in the premier international scientific journal *Cell Death and Differentiation* (Nature Press), reveals that mitochondrial maturation and function is linked with germ cell differentiation in the nematode *Caenorhabditis elegans*. Mitochondria are cellular organelles of prokaryotic origin which execute numerous functions in eukaryotic cells, with ATP production being the most prominent one.

IMBB researchers Dr. Nikolaos Charmpilas and Dr. Nektarios Tavernarakis (Professor at the Medical School, University of Crete, and Chairman of the Board at FORTH) demonstrated that inhibition of mitochondrial genome (mtDNA) transcription leads to germline tumor formation in nematodes, due to impaired differentiation and oocyte production. Thorough monitoring of germline mitochondria highlighted that they transition from a globular to a tubular shape during differentiation. Elongated organelles, in contrast with globular mitochondria of undifferentiated germ cells, exhibit various signs of functional maturation, such as, increased ATP production and elevated membrane potential, as well as, enhanced production of reactive oxygen species (ROS). This mitochondrial maturation process is tightly controlled by sperm-originating (MSP) signals, which are known to promote oogenesis and ovulation.

These findings integrate mitochondria and their homeostasis in the developmental modules which shape the *C. elegans* germline. Moreover, establish enhanced mitochondrial maturation as a prerequisite for stem cell differentiation in diverse model organisms, and further implicate augmented mitochondrial activity in tumorigenesis.

More info:

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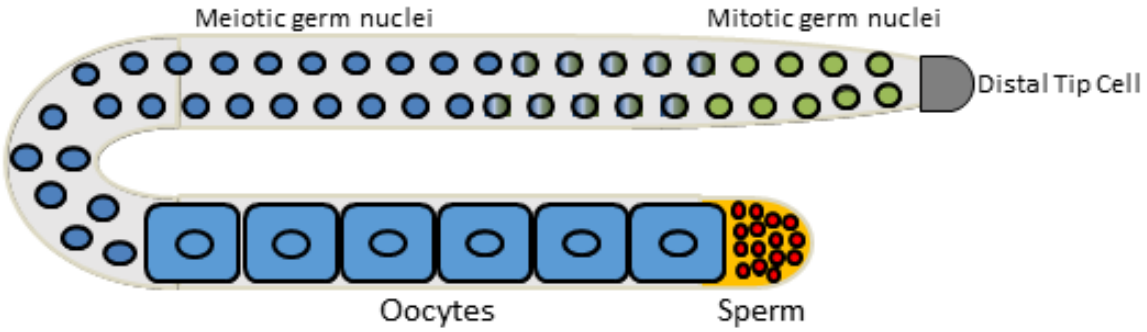
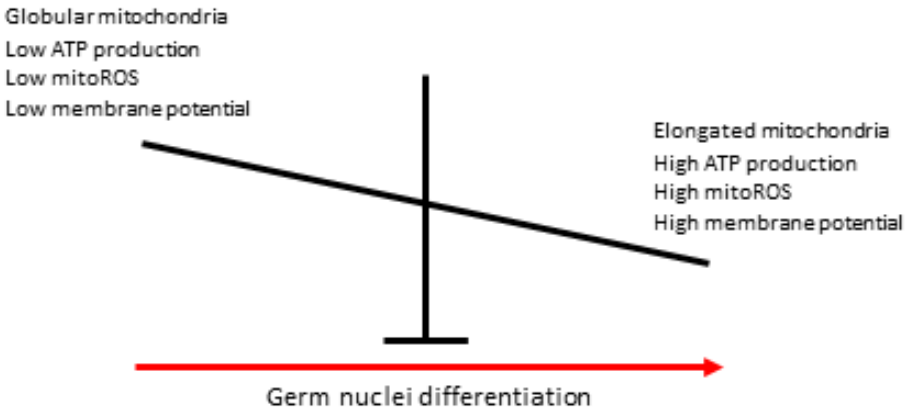
Relevant links:

www.elegans.gr
https://www.nature.com/cdd/
https://www.nature.com/articles/s41418-019-0375-9


Meiotic germ nuclei
Mitotic germ nuclei
Distal Tip Cell
Oocytes
Sperm


Globular mitochondria
Low ATP production
Low mitoROS
Low membrane potential
Elongated mitochondria
High ATP production
High mitoROS
High membrane potential
Germ nuclei differentiation