

2nd International Congress on**EPIGENETICS & CHROMATIN**

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Epigenetics, a sculptor of evolution**Arsene Cosmin**

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Statement of the Problem: More and more evidence indicates that the nature of inheritance is more complex than what was believed a few years ago. The genome is just a piece of the machinery involved in the transmission of information from one generation to another. Most of the mechanisms that contribute to this type of inheritance are only partially understood or unidentified. To identify some of these mysterious mechanisms, the researchers are focusing on how the epigenetic marks are gained or erased in the sperm of the fathers, as the mothers can transfer to the fetus during pregnancy, the signals received from the environmental exposures.

Theoretical Orientation: The first question is: How the effects of the exosomes are inserted in the germ cells? The second question: How these epigenetic marks are evading the erasure-reset process, to be passed to the next generation? The third question: What epigenetic modifications impact the fitness?

Findings: A number of experiments revealed that epigenetic transgenerational inheritance is present in plants, insects, animals and humans. Some of these epigenetic tags that are acquired due to environmental exposures and control gene expression, can last for many generations, even when the environmental factor is no longer present. A recent study on *Caenorhabditis elegans*, reports a temperature-induced epigenetic change, that can be inherited for at least 14 generations, this, being one of the best examples of long-lasting epigenetic memory of environmental change. Given the short life span of this organism, these type of inheritance is a good tool for a fast and efficient adaptation for the next generations.

Conclusion & Significance: The importance of epigenetic inheritance in natural selection and evolution has a long way before it will be fully understood, and only few studies tackled the epigenetically-inherited modified phenotypes, as these studies are requiring more resources, and the experiments take a considerable amount of time to filter and gather the information from multiple generations. Genetic and epigenetic mechanisms seem to be intertwined in the process of evolution and susceptibility for disease. The genetic background can lead to a predisposition for epigenetic instability, and an epigenetic instability in the germline, can promote genetic mutations that are inherited. Transposable and repeat elements, along with the epigenetic marks can be key elements in this process. Deciphering the mechanisms involved in the transgenerational epigenetic inheritance, will provide not only a wider image of the evolution processes, but will also help understand how to prevent and predict some diseases.

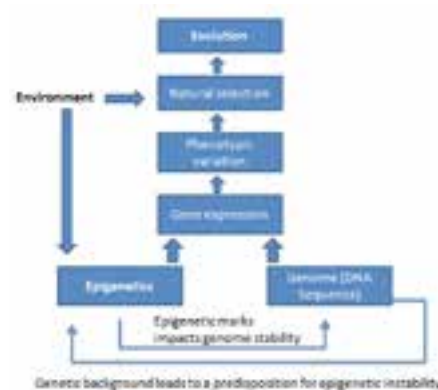


Figure 1: Conceptual scheme of how environments, epigenetic and genetic factors, are interconnected in the processes of evolution.

Recent Publications

1. Burggren W (2016) Epigenetic Inheritance and its role in evolutionary biology: re-evaluation and new perspectives. *Biology* 5(2):24.
2. Wei Y, Yang C R, Wei Y P, Zhao Z A, Hou Y, Schatten H and Sun Q Y (2014) Paternally induced transgenerational inheritance of susceptibility to diabetes in mammals. *Proc. Natl Acad. Sci.* 111(5): 1873–1878.
3. Skinner M K, Guerrero-Bosagna C and Haque M M (2015) Environmentally induced epigenetic transgenerational inheritance of sperm epi-mutations promote genetic mutations. *Epigenetics* 10(8):762-771.
4. Pembrey M, Saffery R and Bygren L O (2014) Human transgenerational responses to early-life experience: potential impact on development, health and biomedical research. *J Med Genet*, 51:563-572.

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5. Klosin A, Casas E, Hidalgo-Carcedo C, Vavouri T and Lehner B (2017) Transgenerational transmission of environmental information in *C. elegans*. *Science* 356(6335):320-323.

Biography

Arsene Cosmin has his expertise in Research and Molecular Diagnostics. He is also a member of Epigenetics and Metabolomics Association, and one of the few fellows in Romania advocating the importance of epigenetics in his country. Recently, he was selected as an Expert-Evaluator (Genetics, Epigenetics) in H2020 at the European Commission, Research Executive Agency.

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