



PROJECT

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1) Project title

Role of epigenetics in drug addiction.

2) Abstract (max 500 words)

An emerging field of interest in forensic genetics is the study of the potential role of epigenetics in various drugs-related diseases. DNA has long been regarded as the sole custodian of hereditary traits. Today, however, we are beginning to decipher a different and more flexible repertoire of information, hidden within the chromosomes. In recent decades, research in biology has shown how important not only genes, in which information for protein synthesis are encoded, but also the mechanisms that regulate gene expression, are important for the life of an organism, activating or silencing them. In fact, there is a separate code, written with chemical characters that are found outside the DNA sequence, and which, in turn, has very important effects on the state of health and in general on the phenotype of an individual. This code is the "epigenetic code" and its role in the etiopathogenesis and clinical course of many diseases is currently being studied.

To date, the term epigenetics refers to a series of biochemical mechanisms by which one is able to modify gene expression throughout the life cycle of an organism without altering the gene sequence contained in the DNA. Countless studies conducted in recent years show that epigenetic modifications are critical factors in regulating gene expression and also represent the key mechanism by which environmental factors are able to influence the activity of genes and ultimately behavior. Epigenetic mechanisms include changes in the histone tail, which regulate chromatin structure; the phenomenon of DNA methylation at the level of the cytosine base and the production of small non-coding RNAs for protein, the so-called MicroRNAs (miRNAs) able to bind in a complementary manner to mRNAs, preventing their translation. Among the epigenetic modifications that have been most correlated to the etiopathology and the clinical response of neurological and psychiatric pathologies, a very important role is certainly played by the methylation of the promoter of the gene that codes for BDNF ("Brain Derived Neurotrophic Factor") and the expression of some specific miRNAs, in particular the MicroRNA-124.

The objectives of the present research are summarized in the following points.

- 1) The identification of potential biomarkers for the identification of prognosis and risk of relapse in patients with drug addiction to be applied in clinical settings.
- 2) The improvement and translational understanding of the drug addiction pathogenesis at epigenetic level that could pave the way for further studies on similar drugs inducing addiction i.e. benzodiazepines, ethanol, etc.
- 3) Identification of new and selected treatment approaches in the frame of an even more personalised-medicine and cost-effective public health policy.

