

# The Era of Epigenetics: Therapy Influencing Gene Expression

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The Knowledge of Epigenetic mechanism significantly enlightens the dilemma 'nature or nurture' and constitutes a very important component for the outcome of psychotherapeutic relationship with patients or clients who report traumatic memories and had experienced negligence or maltreatment. The story starts from the beginning in the early 19<sup>th</sup> Century, when Lamarck argued that organisms can acquire characteristics and properties through their interaction and adaptation to the environment [1]. These new 'personality traits' can become lifelong stable and can be inherited by the next generation [2]. The term 'epigenetics' which derived from Greek, was given to this organismic property. It means "above genetics".

There are two main mechanisms involved in epigenetics: DNA methylation and histone modification. A third mechanism concerning non coding RNA (ncRNA) needs to be more elucidated [3].

DNA methylation occurs when one methyl group (CH<sub>3</sub>) is added on the amino acid cytosine. This is completed through the action of a methyltransferase only when cytosine is followed by guanine, and results in long term silencing of the expression of the specific gene. It is important to note that gene methylation is a multi-step procedure, while demethylation is performed through one single step [4].

These facts are highly important for the personality changes during psychotherapeutic interventions and psychiatry, since they show very high potential and flexibility on the multitude of lived experiences and they have a determining role in neuroplastic functions like learning, memorising and adaptive behaviour.

The second mechanism concerns histone modification. Histones are proteins positively charged. Unused DNA which remains unneeded carries a negative charge and, through attraction, it is packaged around an octamer of histones [2]. Histone molecules are subjected to methylation, acetylation or phosphorylation and can repress the genes expression by increasing the electrostatic load and tightening the coils, thus silencing DNA expression. Histone modification is transient resulting in less permanent changes than DNA methylation