

Theme:
Shaping the future of Epigenetics and Genome Biology



EPIGENETICS AND ORAL HEALTH

Dr Sirma Todorova Angelova, DMD, PhD
Chief Assistant at the Department of Pediatric Dentistry
Faculty of Dental Medicine,
Medical University-Varna, Bulgaria

Overview

The avant-garde scientific scope of epigenetics is characterized with extremely intensive rate of development, corresponding to the dynamic, multi-dimensional interactions between the environmental factors and style of life of the individual and society as a whole. Epigenetics attracts scientists' interest and investigations of researchers towards reliable mechanisms of genetic expression, modified by multi-aspect social, behavioral, biological and other traits and specifics of the surrounding medium. Today pyelonephritis and nephrotic syndrome take the second position back to respiratory tract disorders, concerning distribution of diseases in the different periods of childhood. Nephrological noxae exert impact upon individual organs and systems. Hard teeth structures and soft tissues are also afflicted in condition of renal disorders. On the other hand, tooth decay, characterized as a multi-etiology and multi-pathology related process of destruction of dental tissues, is considered as an outstanding problem with explicit social significance. Caries is marked with a wide range of complicated long-term effects upon oral cavity tissues, regarding functionality, prophylaxis and esthetics. A great variety of epigenetic codes serve in the context of precise interpretation of fluctuations of phenotype expression, manifested as consequence of mutual influences between human genome and environment in state of health and disease.

Key words: epigenetics, behavior, tooth decay, environmental factors;

INTRODUCTION

Although there have been carried out a great variety of improvements and innovations in the scope of standards for proper oral health, the burden of oral diseases persists in its tendency of increasing in international scales. [1] Globally, tooth decay, periodontal diseases, loss of teeth, oral mucosa lesions and traumatic injuries on teeth and jaws are characterized with the urgent necessity of more efficient control and optimized management. [2] These oral health disorders make negative impact upon daily life and welfare on individual and social level, especially among people of low social-economic status. [1] Investigations about the implementation of the postulates of epigenetics in the sphere of dental medicine are on their early stage of performance. A large number of epigenetic mechanisms regulate the expression of genes which have the potential to influence the progression of these oral diseases. Among most essential issues discussed is the role of epigenetic factors for genes' activation and phenotype expression reflecting the progression of oral diseases during definite stages of the dynamics of teeth development. [3]

AIM

The aim of this study is to accentuate on the interrelations between clinical, genetic, environmental and behavioral factors exercising influence upon the dynamics, intensity and distribution of oral diseases in the context of epigenetic interpretation.

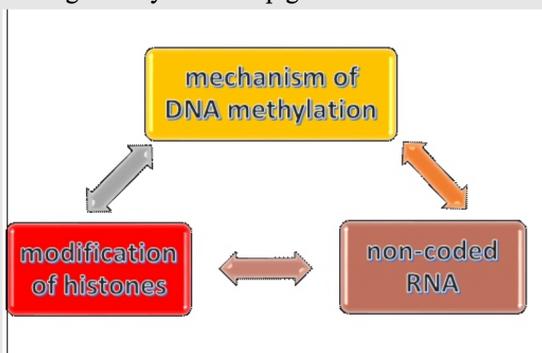
METHODS

A variety of literature sources from PubMed, SCOPUS, Science Direct have been investigated for the purpose of the study.

RESULTS

- Based on scientific literature sources, the variations of epigenetic factors are reversible and transitional. Stress-related environmental factors act as epigenetic modifiers. [4] These modulate the gene expression and make impact upon genetic functions.
- The prevalence of predisposing factors, inadequate access to preventive and therapeutic cares, deficiency of planning and investigations about specifics of the health care system serve as certain barriers against compensation of complex health care needs on individual and social level. [5]
- Initiation and maintenance of epigenetic modifications are related to the simultaneous activity of minimum three systems. Figure 1 illustrates these systems. [6, 7, 8, 9]

Figure 1 Systems of epigenetic modifications



MECHANISM OF DNA METHYLATION

Figure 2, figure 3 and figure 4 represent the mechanism of DNA methylation. [10, 11, 12, 13, 14, 15]

Figure 2 Model of DNA methylation

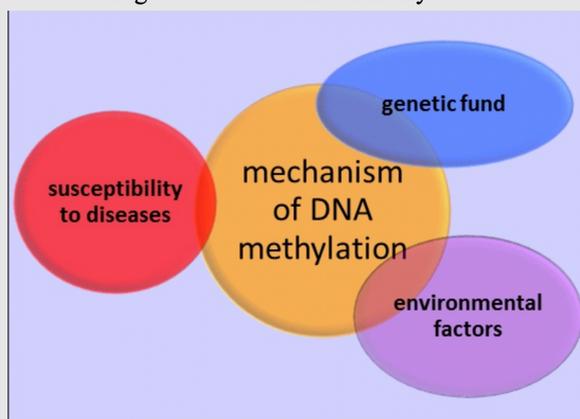


Figure 3 Dynamics of DNA methylation

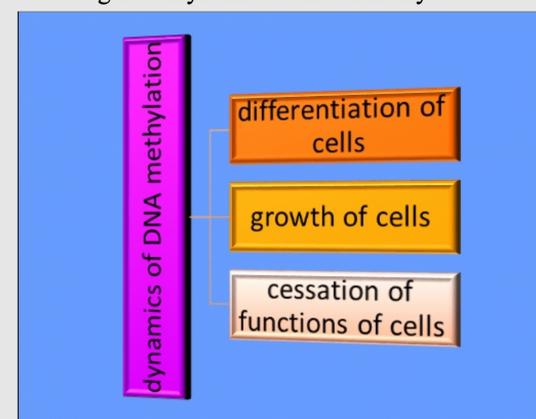
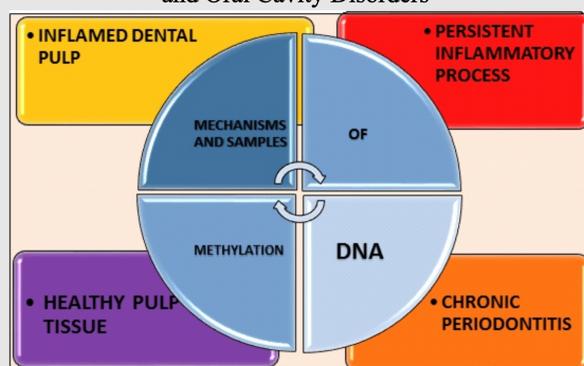


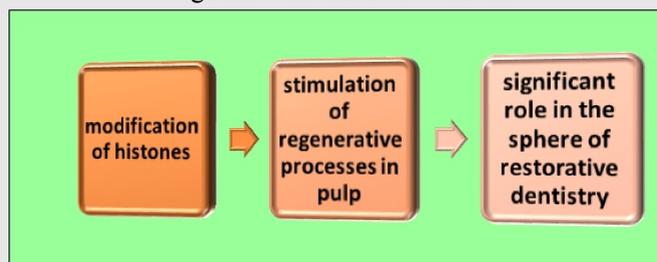
Figure 4 Association between DNA Methylation and Oral Cavity Disorders



MODIFICATION OF HISTONES

Genes' expression can be regulated by the means of the reliable epigenetic mechanism of modification of histones, namely by alteration of chromatin through acetylation and methylation. Modification of histones can serve as a promoter for differentiation and mineralization of stem cells of dental pulp. [16, 17] Figure 5 accentuates on the effects of modification of histones.

Figure 5 Modification of histones



NON-CODED RNA

Non-coded RNA is related to specific syndromes and disorders which afflict the structures of oral cavity, including oral immunity mechanisms. Profound investigations ascertain that miRNAs facilitate the process of proper differentiation of odontoblasts. [18, 19]

Figure 6 Factors associated to epigenetic alterations

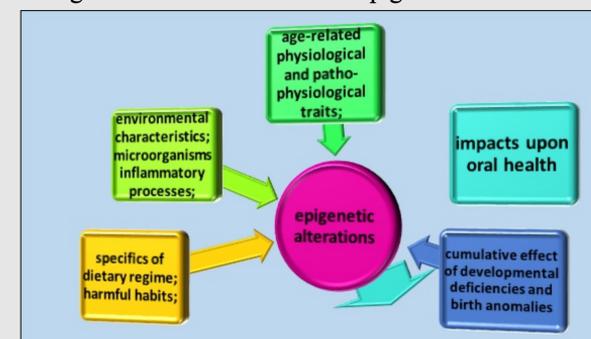


Figure 6 describes factors related to initiation of epigenetic alterations. The last are provoking considerable impact on local and systemic level of the organism. [20, 21]

CONCLUSION

The multi-aspect, adequate interpretation of the significance of epigenetic factors ensures and provides favorable conditions for implementation of avant-garde therapeutic methods and principles for performance of efficient primary, secondary and tertiary prophylactic cares, corresponding to the needs of the individual in the context of personalized medicine.

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