EVOLUTIONARY GENETIC APPROACHES TO STUDY THE PROBLEM OF DENTAL CARIES

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ABSTRACT
Introduction: This work has outlined biological aspect in dental caries. Previous research conducted during the XXth century in this direction related to genetic susceptibility of people to tooth caries and gave a positive result. The modern studies on this topic have shown if not impossibility, but the great complexity of genetic factor managing in tooth caries.

The aim of the study is to analyze the occurrence of dental caries in an evolutionary aspect and to determine the possibility of using the biological scientific methods for finding the essence of caries phenomenon.

Materials and methods: The material was literary sources with information about caries, which can be used in biological methods of study. The method is the analysis of knowledge from them and their integration with other biological disciplines.

Conclusions: on the basis of the analysis, in which caries was considered for a long period of human evolution, the possibility of managing the carious process, as well as the directions, that would enable a more thorough understanding of the carious phenomenon, were shown.

KEY WORDS: dental caries, biology, genetics

INTRODUCTION
A most problematic place among the modern diseases is occupied by the tooth caries. According to epidemiology reports, almost all living people on our Earth are suffering from dental caries [1], but there are no report of mortality. These circumstances give caries mixed social significance [2]. Therefore, in addition to researchers of this pathology in medicine, many professionals from other fields are working on it as well. For example, archaeologists and anthropologists are engaged in the study of hard tissue biological material (including jaws and teeth) [3, 4]. Some of the obtained knowledges of modern medicine cannot theoretically justified. And because these phenomena have no clinical significance, they are referred to a sort of curiosities. However, the fact that these “curiosities” change over time in the human population, makes us to take them seriously as well as processes involved in studying [5, 6].

Medicine refers to the biological sciences. Biologists noted that “… One of the most important conditions for enhancing the scientific level of the students’ knowledge and the effectiveness of the educational process is the didactic integration of knowledge. Relevance of rational directions of integration of Medical Biology with theoretical and clinical disciplines combines with integration processes that occur in Western Europe in recent years” [7].

However, the “biological” knowledge that tooth caries is caused by bacteria or disease manifestation depends on genetics, food consumption and other risk factors is not sufficient to give a good understanding of the pathology and combating dental disease. More over that cariesology itself, having a huge baggage of information being explored, clearly cannot put it into practice: caries treatment is carried out in a way that exists about two thousand years such as replacing lost tooth tissues by restorative material [8].

Allowing for the situation, researchers of caries pathology believe that failure to resolve the problem of tooth caries is at the conceptual level [9]. Therefore, it is more appropriate and relevant is the situation that integration is not only in the didactics as well as in the study of caries phenomenon involving biological scientific methods.

THE AIM
The aim of the study: to determine the possibility of using biological scientific methods for finding the essence of caries phenomenon.

MATERIALS AND METHODS
The literary sources are materials for study of the subject. Analysis of these literary sources and integration of knowledge serves as a method of research.

REVIEW AND DISCUSSION
Cariesology has the knowledges obtained in the study of dental caries by means of twin method. On this issue, a variety of views have been expressed in Russian-speaking literature, the most fully in the work of G. Pakhomova and co-authors. The measure of influence of genetic factors on
the occurrence of disease is considered to be the ratio of the frequency of its occurrence in pairs of homozygous twins and the same indicator from heterozygous twins. Matching cases of illness (so-called concordance trait) among homozygous twins is 100% for genetic pathologies, whereas heterozygous concordance virtually zero.

For diseases caused by external (damaging) factors correlation proves otherwise: in all cases equally concordance is low, regardless of twin zygocity. Between these poles of endo- and exogenous diseases are all known nosologic forms. They differ on the basis of genetic determinism, ranging from nonexistent to absolute predestination.

Findings regarding tooth caries on the basis of these methodologies are unambiguous: tooth caries is largely genetically predetermined. Significant is the fact that the work of G. Pakhomova was presented as the first message. Further development of the ideas contained in it, and not followed [9].

There is just a limited number of studies of the researches about clinical and pathogenetic mechanisms of development of caries in children with Psychoneurological disorders (PND) presented in medical literature [10]. A study of dental status of children with PND and medico-social data passports allowed E. Denisova in 2011 year to identify the managed and unmanaged risk factors that contribute to the development of caries and periodontal disease. Managed risk factors of development of caries in children with PND author characterised as a high activity of caries microflora, increased rate of formation of tooth plaque, low resistance of tooth enamel against relatively low remineralization ability of saliva.

The most important unmanaged risk of caries and periodontal disease were identified as particular somatic status of a child, socio-economic factors (e.g., low standard of living of families) and genetic factors [11].

In 2012, A. Artemyev was defended thesis for the degree of Candidate of Medical Sciences on the theme «The evolutionary features of development of caries in humans.» There are 499 researches of dental caries in ancient people (from the Copper Age to the Middle Ages) served as background materials. The remains were found as a result of the protective archaeological excavations on the territory of Ukraine. On the basis of the data obtained, the comparative multifactorial mathematical analysis (method of pointed graphs) of pathology were completed using odontological fossil and subfossil materials [12].

According to these studies were drawn graphics. Of particular interest are the following cases: Figure 1 presents the changes in the intensity of caries from Copper Age to predict for future periods. Figure 2 presents the changes in the prevalence of caries from Copper Age to predict for future periods.

The evolution of tooth caries has been evident in the graphs. We see that carious process during its evolution in
the selected range of human population has made major quantitative and qualitative changes.

One can see in the Figure 1 a surge of intensity of caries process from XVII to XXI century, and then it ascent became slow. The intensity of the caries process shows the reactions of the human body.

Figure 2 is very similar to Figure 1 but there are differences: in the Middle Ages the rise of the incidence of dental caries is not so dramatically, rather than its intensity. But from XXI century the rise in prevalence was also slower than the rise of intensity. The prevalence of caries process shows the reactions of the human population.

Two graphics indicate another interesting thing - to the XVII century caries was a real dental caries. But from XXI century it is another qualitative phenomenon which has already found a title - carious disease.

**CONCLUSIONS**

Drawing a conclusion, we would like to highlight the following point:

1. The statement about caries determinism has been well documented.
2. This direction in cariesology is not developed to the full extent.
3. It is likely that this situation is linked with the inability of genetic factors.
4. Changing of the caries process in the evolution of the human population indicates the ability to control, including at the genetic level.

The fact that tooth caries is associated with human genetics, referred to the possibility of research using biological methods. These methods apply to both organismal and population levels. Inaccessibility, but the ability to control tooth caries at these levels are not well known and are under discussion. The development of the given direction will be associated primarily with the measurement of tooth caries.

A proven genetic determinism of tooth caries is proved. The ability to manage of caries process is proposed at the genetic level.

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**Authors’ contributions:**

According to the order of the Authorship.

**Conflict of interest:**

The Authors declare no conflict of interest.