

THE BIOTRANSFORMATION OF XENOBIOTICS IN THE ORGANISM OF CHILDREN WITH CARIES

***Luchinskyi M.A., Luchynskyi V.M., Luchinska Yu.I.**

I.Ya. Horbachevsky Ternopil State Medical University, Department of Therapeutic Dentistry,
m.Voli, 1, Ternopil, Ukraine, 46001

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***Correspondence for**

Author:

Dr. Luchinskyi M.A.,

I.Ya. Horbachevsky Ternopil
State Medical University,
Department of Therapeutic
Dentistry, m.Voli, 1, Ternopil,
Ukraine.

ABSTRACT

The article presents data that show that children living in ecologically unfavorable areas manifest more severe course ekopatolohiyi which is reflected in an increase in the prevalence, intensity and activity of dental diseases. Reduced activity of enzymes detoxifying observed in children of the main group, confirms the deterioration of the efficiency of neutralization of xenobiotics in the first and second phases of biotransformation responsible for the conversion of lipophilic compounds in the hydrophilic reaction - capable of metabolites and prepare them for subsequent conjugation.

Keywords: children, dental caries, genetic markers, ecodetermined diseases.

INTRODUCTION

One of the priority ways of the medical service's activity is the study, estimation and prognosis of health indexes of the population. Children with underdeveloped endocrine, immunocompetent and other systems have the decreased adaptation features, which contribute to their vulnerability to many factors of the environmental pollution. Such condition is also increased by some other factors of poor social and economic standard of living, quality of life and the technogenic influence of the environment. All these factors are accumulated. Today, the number of children and teenagers suffer from functional disorders and chronic diseases [1, 2, 9, 10, 11].

Most xenobiotics penetrating into the organism don't produce various biological effect and undergo various transformations i.e. biotransformations. In the most common variant the protective system against various xenobiotics is represented in three-staged process including activation, detoxication and removal. The genetically programmed system of the biotransformation slows down every individual's adaptation features i.e. resistance and vulnerability to the harmful factors [3, 4, 5, 7, 13].

The number of factors which influence on the health of the population, including children's state of health has significant influence on the dental health too. The influence of harmful environmental factors causing the underdeveloped structure of the hard dental tissues and the pathological changes in the tissues of the parodontium was investigated[6, 8, 12, 14].

The aim of investigation. To study the action of enzyme's activity of alkoholgehydrogenaze in children with caries under the influence of factors of the environmental pollution.

MATERIALS AND METHODS

32 children living in the region of high influence of radiation (the 1st basis group) and 33 children living in chemically polluted region (the 2nd group) were examined. The comparative group included 30 children from so-called clean region. The age groups of the investigated children was from 5 to 15 years. All examined children didn't have the somatic abnormalities.

The analysis of alkoholhydrogenase enzyme taking part in the phase-1 of the xenobiotics' biotransformation was carried out by Mezey method. The base of the method is the ethanol oxidation reaction in the presence of alkoholdehydrogenase with the temperature of 30⁰C. The enzyme activity is defined:

$$EA = \frac{\text{the average measurement of the optic density (EMOD)}}{\text{the quantity of mikrogram of protein in 0,1 ml of serum} \times 160}$$

EMOD – the average measurement of the optic density;

EA – the enzyme activity per minute.

RESULTS

In the investigated groups caries was spread approximately 83,5±1,12% in caries filling removal (CFR) =5,3±1,16 of carious tooth and in the comparative group this index equals 70,5±1,18% in CFR=4,2±1,21.

According to the average indexes the alcoholdehydrogenase activity in group 1 of children was more decreased than in the comparative group: ($0,0052 \pm 0,001$ mkat/l) against ($0,0166 \pm 0,0005$ mkat/l), $p < 0,1$. In group 2 of children with chemical pollution the average activity of alcoholdehydrogenase was $0,0092 \pm 0,003$ mkat/l and didn't differ from the control group ($p > 0,05$) (See. 1).

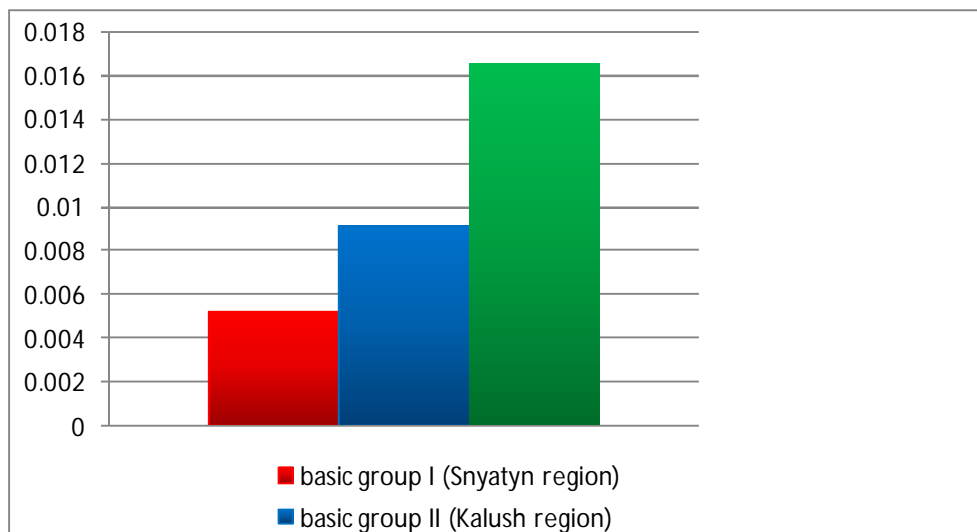


Fig. 1 The activity of alcoholdehydrogenase in the investigated groups

In children of basis group 1 (see. 1) in all levels of caries intensity the indexes of alcoholdehydrogenase were lower as in the comparative group ($p < 0,05$) and the indexes of basis group 2 ($p_i < 0,05$). Though in basis groups 1 and 2 the index of alcoholdehydrogenase decreases much in the increase of caries intensity which indicates the mechanisms' exhaustion in the enzyme production under the action of genotoxic factors. In the comparative group the process of alcoholdehydrogenase decrease was more reasonable.

Table 1. The division of children with various caries intensity and the indexes of alcoholdehydrogenase in the observed groups

Caries intensity level	Indexes of alcoholdehydrogenase		
	Basis group I	Basis group II	Comparative group
Very low (0-1,1)	$0,008 \pm 0,010$ p, p_1	$0,120 \pm 0,005$	$0,020 \pm 0,010$
Low (1,2-2,6)	$0,007 \pm 0,010$ p, p_1	$0,010 \pm 0,004$ p	$0,019 \pm 0,010$
Medium (2,7-4,4)	$0,005 \pm 0,002$ p, p_1	$0,009 \pm 0,005$ p	$0,017 \pm 0,010$
High (4,5-6,5)	$0,004 \pm 0,001$ p, p_1	$0,008 \pm 0,002$ p	$0,014 \pm 0,004$
Very high >6,6	$0,002 \pm 0,001$ p, p_1	$0,007 \pm 0,001$ p	$0,013 \pm 0,001$

$p < 0,05$ – reliable indexes of comparative groups.

$P_i < 0,05$ - $p_1 < 0,05$ – reliable indexes of basis group II.

Taking into account the obtained data the cohort of the examined children depending on the level of enzyme activity was evolved: $< 0,010$ mkat/l – low; $0,010 - 0,020$ mkat/l – medium $> 0,020$ mkat/l – high.

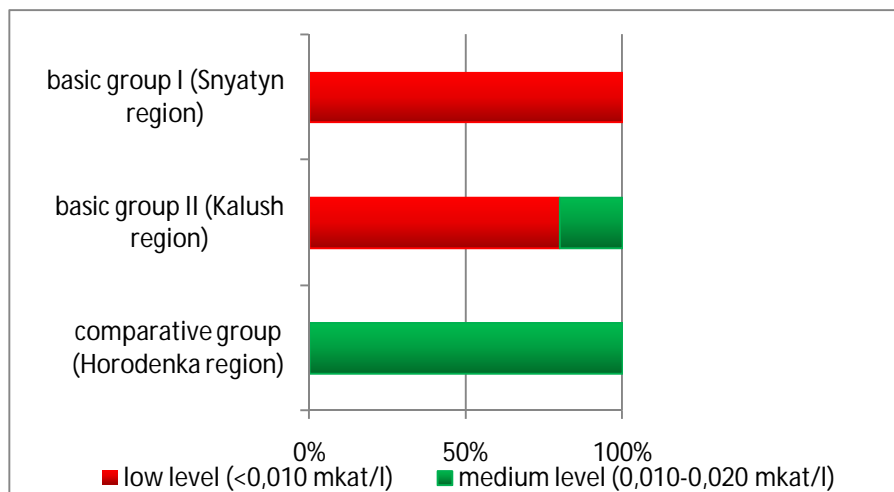


Fig. 2 The activity of alkoholdehydrogenase in the investigated group of children with various level of caries intensity

In children of basis group I (see 2) from Snyatyn region with radioactive pollution in 100 % of cases the levels from “very low” to “very high” of caries intensity showed the low level of alkoholdehydrogenase activity – $< 0,01$ mkat/l. In basis group II from chemically polluted Kalush region 26 children (79%) with medium and very high level of caries intensity showed the low level of alkoholdehydrogenase activity and 7 children (21%) showed the medium level of the enzyme’s activity in the low level of caries intensity. In comparative group all examined children with levels of caries intensity showed the medium level of alkoholdehydrogenase activity, in the spectrum of $0,020 - 0,013$ mkat/l.

CONCLUSIONS

Thus, the decrease of alkoholdehydrogenase activity in basic groups of children showed the deterioration of the efficacy of the xenobiotics’ destruction in phase 1 of the biotransformation, which was responsible for the change of the lipophilic compounds into hydrophilic reactive metabolites and their preparation for the following conjugation. Taking into account the immune changes in children of the given cohort the ecopathological influence took place. This influence had a widespread caries intensity in children of the radioactive and chemically polluted regions. However, the lower indexes of

alkoholdehydrogenase in children of Snyatyn region showed more vulnerability to the enzymes of phase I of the biotransformation under the influence of the radioactive pollution.

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