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TABLE OF CONTENTS

AGRICULTURAL SCIENCES		
1.	Бутенко А.О., Місюрів О.В., Кравець В.В., Бережна Ю.С., Бендяк М.В. ПРИНЦИПИ СТВОРЕННЯ ПРОДУКТИВНИХ ОДНОРІЧНИХ ТРАВСУМІШОК	15
ARCHITECTURE, CONSTRUCTION		
2.	Кисельова Г.В., Бабенцова О.С., Вербовета В.В., Курілович К.В., Сліпченко В.Р. РЕЦИКЛІНГ БУДІВЕЛЬНИХ ВІДХОДІВ	19
ART HISTORY		
3.	Засипкіна Л., Гаврилюк О., Твердохліб Н. ІНФОРМАЦІЙНА КОМПЕТЕНТНІСТЬ МАЙБУТНІХ ФАХІВЦІВ ДОШКІЛЬНОЇ ОСВІТИ ТА МУЗИЧНОГО МИСТЕЦТВА У МУЗИЧНОМУ ВИХОВАННІ ДІТЕЙ ПЕРЕДШКІЛЬНОГО ТА МОЛОДШОГО ШКІЛЬНОГО ВІКУ	28
4.	Ло С. "ПОЯС І ДОРОГА" І РОЗВИТОК МИСТЕЦТВА	32
5.	Чегусова З.А. ПРОФЕСІЙНЕ ДЕКОРАТИВНЕ МИСТЕЦТВО ЯК ВАЖЛИВИЙ ЧИННИК НАЦІОНАЛЬНОЇ ІДЕНТИЧНОСТІ В КУЛЬТУРІ УКРАЇНИ ДОБИ ГЛОБАЛІЗАЦІЇ	34
6.	Шмегельська Ю.В., Павлишина Я.І. ЗНАЧЕМІСТЬ МЕТОДІВ ТВОРЧОГО ПОШУКУ ПРИ ПОБУДОВІ ЗАЧІСОК БІОНІЧНОГО ХАРАКТЕРУ	41
CHEMISTRY		
7.	Зульфiгаров А., Худайкулова О., Зульфiгаров О., Калашніков А., Курдiль Н. ВИКОРИСТАННЯ ІНСТРУМЕНТАЛЬНИХ МЕТОДІВ АНАЛІЗУ ДЛЯ ДОСЛІДЖЕННЯ ВМІСТУ БІОЛОГІЧНО АКТИВНИХ РЕЧОВИН НАПРАВЛЕНОЇ АДАПТОГЕННОЇ ДІЇ У СКЛАДІ РОСЛИННОЇ СИРОВИНИ ТА ВІДХОДІВ ЇЇ ВИРОБНИЦТВА	45

37.	Шнайдер А.О. ПЕРЕВАГИ СІМЕЙНОЇ МЕДІАЦІЇ НАД СУДОВОЮ ФОРМОЮ ВИРІШЕННЯ СПОРІВ	188
MANAGEMENT, MARKETING		
38.	Khmelnitskiy A. MANAGEMENT ACTIVITY TECHNIQUES FOR CREATING AN ANTI-CRISIS MANAGEMENT SYSTEM OF AN EDUCATIONAL INSTITUTION	193
39.	Voronina A., Hanzhuk S., Hanzhuk K. IMPROVEMENT OF THE PROCESS OF MANAGEMENT OF ENTERPRISE ASSETS	196
40.	Василиха Н.В., Тороній Л.І., Боїшко Б.Ю. УПРАВЛІННЯ ЛЮДСЬКИМИ РЕСУРСАМИ – ОСНОВА КОНКУРЕНТОСПРОМОЖНОСТІ ПІДПРИЄМСТВА	201
41.	Заболотна О.С. СУТНІСТЬ КАДРОВОГО ПОТЕНЦІАЛУ ЯК ІНСТРУМЕНТ ВПЛИВУ НА ЕФЕКТИВНІСТЬ ЙОГО ВИКОРИСТАННЯ	204
42.	Микитенко Н.В. СФЕРА РИТЕЙЛУ В УКРАЇНІ: ВОЄННІ РЕАЛІЇ ТА ПЕРСПЕКТИВИ	207
43.	Рябенська М.О., Цимбалюк К.В. АКТУАЛЬНІ ПРОБЛЕМИ ПІДБОРУ КАДРІВ ЯК ВАЖЛИВОГО ФАКТОРУ УПРАВЛІННЯ ПЕРСОНАЛОМ НА ПІДПРИЄМСТВАХ ГОТЕЛЬНОГО ТА РЕСТОРАННОГО БІЗНЕСУ	211
MEDICINE		
44.	Baieva O., Baiev V. THE ESSENCE AND ORIGIN OF MEDICAL INSURANCE	215
45.	Hnidoi I., Hnida N. THE STATE OF PROOXIDANT-ANTIOXIDANT HOMEOSTASIS IN CHILDREN WITH DIFFERENT LEVELS OF LEAD IN THE BLOOD	222

THE STATE OF PROOXIDANT-ANTIOXIDANT HOMEOSTASIS IN CHILDREN WITH DIFFERENT LEVELS OF LEAD IN THE BLOOD

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Lead is an environmental toxicant that can induce oxidative stress (OS) via reactive oxygen species (ROS) generation, which has been reported as an important mechanism underlying lead toxicity [1]. To install biochemical mechanisms of these disorders, the state of prooxidant-antioxidant homeostasis in children with different levels of lead in the blood was studied.

100 children of a random sample aged from 4 to 15 years were examined (average age 11.5 years). Determination of lead was carried out in heparinized venous blood by the method of atomic absorption spectrometry with electrothermal atomization.

The activity of lipid peroxidation processes (LPO) was estimated by accumulation of primary (diene conjugates - DK) and final (malonic dialdehyde - MDA) products of lipoperoxidation in the blood. The state of the antioxidant system was evaluated by glutathione peroxidase (GPO) activity and by the content of sulfhydryl and thiol-disulfide groups of blood.

To determine the dependence of LPO-AOS indicators on the level of lead in the blood, children were divided into 4 groups: 1) group with lead content up to 69 $\mu\text{g/l}$, $n = 84$; 2) group with a marginal level, within 70-99 $\mu\text{g/l}$, $n = 29$; 3) group with an elevated level, 100-149 $\mu\text{g/l}$, $n = 11$; 4) group with a sharply increased level, more than 150 $\mu\text{g/l}$, $n = 6$.

The results are in table.1. The lowest values of pro-oxidant indicators were in group of children with the lowest levels of lead in the blood, up to 69 $\mu\text{g/l}$. With promotion accumulation of lead, DK values increased. Similarly, MDA values also increased. In parallel, the indicators of the thiol-disulfide system of antioxidant protection also increased - obviously, to repair the balance prooxidants and antioxidants.

Table 1.
Indicators of the LPO-AOS system in children of different groups

Indicators	Groups of children			
	1	2	3	4
DK, $\mu\text{mol/l}$	22.18 $\pm$ 1.50	31.38 $\pm$ 3.29	46.13 $\pm$ 5.99*	55.94 $\pm$ 5.75*
MDA, $\mu\text{mol/l}$	182.11 $\pm$ 5.11	184.61 $\pm$ 12.91	233.07 $\pm$ 17.23*	266.51 $\pm$ 26.63*
GPO, $\mu\text{mol/l/sec}$	8.38 $\pm$ 0.50	8.54 $\pm$ 0.82	8.83 $\pm$ 1.06	7.90 $\pm$ 1.86
SH-groups, $\mu\text{mol/l}$	1.11 $\pm$ 0.08	1.47 $\pm$ 0.24	2.24 $\pm$ 0.25*	1.96 $\pm$ 0.27*
S-S-links, $\mu\text{mol/l}$	0.45 $\pm$ 0.06	0.64 $\pm$ 0.21	1.57 $\pm$ 0.24*	1.13 $\pm$ 0.32*
SH/SS index	2.50	2.29	1.42	1.74

Note. * - The difference is significant ($p < 0.05$) with the indicators of the first group.

But a compensatory increase in the indicators of AOS was revealed, presumably, is not enough. Because the SH/SS ratio decreased while the LPO indicators increased, and the level of lead increased in the blood.

This assumption was confirmed by antioxidant activity enzyme glutathione-peroxidase, which had no significant changes, despite for activation in the chain of prooxidants.

Thus, when the content of lead in the blood of children was increased, the activity of LPO also was increased. Stabilization of redox balance in children with lead levels above the norm occurred no longer at a minimum level, as in control, but at a higher level. It led to a certain exhaustion antioxidant reserve of the body. This is consistent with scientific data that OS occurs when the generation of ROS exceeds the antioxidant system's ability to defend cells against oxidized molecules [1].

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