SESSION 3
TRACE ELEMENTS, MINERALS, REPRODUCTIVE HEALTH AND PEDIATRICS

CLINICO-LABORATORY CORRELATIONS OF TRACE ELEMENTS AND MINERALS CONTENT IN HAIR OF CHILDREN WITH EPILEPTIC SEIZURES, WHO HAD PERINATAL DAMAGE OF CENTRAL NERVOUS SYSTEM

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AIM: Investigation of the content of trace elements and minerals in hair of children with different types of epileptic seizures, who had perinatal damage of the central nervous system (CNS). Detection of clinical laboratory correlations. MATERIALS AND METHODS: 40 children were examined (27 boys and 13 girls, aged 3 months to 17.5 years). The first group consisted of 19 subjects with epileptic seizures relieved as of the date of examination. The second group — 10 subjects with persisting epileptic seizures. The control group was made up of 11 apparently healthy children. Employed were the methods of ICP-AES and ICP-MS on Optima 2000DV and ELAN 9000 (CBM, Moscow). The content of 25 chemical elements was determined. RESULTS: Disorders of elemental status in all patients were observed. Pb excess (chi-square estimation) was revealed significantly much more often, in 50% of cases, in the second group as compared to the first group and to the control group. The correlation analysis by the Spearman's method of rank correlation revealed significant positive correlation between the clinical signs (intensity of the epileptic syndrome resistance to therapy, severity of microcephaly, hydrocephaly, virility) and Pb, Cd, Li, Ca, Fe, Mn, Na concentrations in hair (rs of 0.43 to 0.64). Significant negative correlation was observed between the child's age and Pb, Li, Fe, Mn content in hair (rs of -0.60 to -0.43). The largest number of clinical laboratory correlations was observed for Ca, Mn and Li. CONCLUSIONS: The increase of Pb concentration in hair was significantly more often observed in children with epileptic seizures, who had perinatal damage of the CNS resistant to the administered therapy. Significant correlations were observed between the intensity of the epileptic syndrome resistance to the therapy, severity of neurological symptomatology and concentrations of Pb, Cd, Li, Ca, Fe, Mn, Na in hair.

MINERAL STATUS IN CHILDREN LIVING IN VLADIKAVKAZ

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Recent studies have demonstrated increasing unfavourable tendencies in the health state of children in the Russian Federation. Mineral metabolism impairment due to changing mineral levels and mineral ratios in the environment is considered an important factor contributing to its deterioration. The aim of the present study was to evaluate mineral levels in the hair of children living in Vladikavkaz. Forty one children were screened for mineral metabolism impairment. Hair samples were assayed for 25 minerals using inductively coupled argon plasma atomic emission spectrometry. Deficits of various essential elements were found with variable frequency. Mineral imbalances detected in the majority of children included deficiency of copper (80.9%), iodine (76.2%), and cobalt (76.2%). Regarding the remaining trace elements, they were distributed as follows: chromium deficiency in 61.9%, and manganese deficiency in 52.4%. Iodine levels differed from reference values most prominently (-3.3 [-3.3; -1.4]). Together with considerable prevalence of iodine deficiency among children (76.2%), these findings agree well with the previous data demonstrating strongly pronounced deficit of this mineral in the North-Caucasian region. Decreased levels of copper, cobalt, chromium, and manganese were within the negative interval of 1.1 to 2.0 deviations from reference values, allowing their classification as latent (early phase) mineral imbalances. The presence of immunotoxic trace elements, such as barium, vanadium, nickel, lithium, arsenic, and tin, was clearly revealed through hair tissue mineral analysis, their levels, however, were not beyond reference intervals. In conclusion, hair tissue analysis for minerals and trace elements identified iodine deficiency as the major mineral metabolic disorder in children living in Vladikavkaz.

TRACE ELEMENTS IN LOCALLY-PREPARED FOOD MIXTURES FOR REHABILITATION OF MALNOURISHED CHILDREN IN BRAZILIAN COMMUNITY SETTINGS

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In Brazil, a long-term approach of developing nutritious multi-mixes of locally available foods designed to complement and mutually reinforce one another, is being applied efficiently in managing malnourished children in poor community settings. Some of the ingredients, particularly brans, have high contents of phytic acid, a strong chelating agent that can sequester metal ions to form insoluble complexes affecting the bioavailability of minerals in the multi-mix. This study intended to evaluate nutritional trace elements and phytic acid in multi-mixes and their ingredients. Multi-mix samples with different composition in terms of the ingredients cassava leaves, seeds of watermelon, melon and pumpkin, egg shell, rice and wheat bran were collected in community settings of Piracicaba, São Paulo State. The chemical elements Br, Ca, Co, Cs, Fe, K, Na, Rb, Sc, Se and Zn were determined by instrumental neutron activation analysis (INAA). The determination of phytic acid was based on digestion of the sample with subsequent retention in anion-exchange resin and spectrophotometric detection. The egg shell presented the highest content of Ca among the ingredients analyzed. Cassava leaves showed high contents of all elements determined, except for Na. Brans and seeds had the highest contents of Fe and Zn. The multi-mix samples have shown low contents of Ca and Na, indicating that more egg shell could be added to enrich the formulation. High contents of Fe and Zn were found in the multi-mix samples, in such a way that a portion of 30 g would correspond to 50% of the daily requirement for Fe and 35% of the daily requirement for Zn to children under 6 years of age. The content of phytic acid in the multi-mix varied between 6.55 and 20.7 mg/g thereby can affect the bioavailability of Fe and Zn. It could be concluded that the nutritional value of the locally-prepared food mixtures is comparable to those of formulations commercially available in the market.

MERCURY IN HAIR AND EATING HABITS: A CASE STUDY IN CHILDREN FROM CUBATAO, SAO PAULO, BRAZIL

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Mercury levels in human hair are directly related to eating habits. This is especially true in coastal populations which consume high amounts of fish. In this study total Hg levels were assessed in five of the most consumed fish species and in children's hair (aged 7 to 14) from two different public elementary schools (ES_1 and ES_2) in Cubatao city, Sao Paulo state, Brazil, an important industrial complex. Mercury determination was performed using Cold Vapour Atomic Absorption Spectrometry (CV AAS) and the methodology validation by means of reference materials analyses. The results obtained (median and range) for total Hg levels in 91 hair samples of children were: 0.27 mg/kg (0.02 to 0.74 mg/kg) and 0.32 mg/kg (< 0.01 to 1.86 mg/kg) for ES_1 and ES_2, respectively. The concentrations obtained were below the level set by WHO for an adult population not exposed to Hg (2.0 mg/kg). However, since there are no reference values for total Hg in hair of children, these results can be used as a contribution to establish reference values in hair for Brazilian coastal populations. For Hg distribution studies, 58 muscle samples from predatory and omnivorous species were determined and discussed: *Sardella braziliensis* (Sardine), *Macrodon ancylodon* (King weakfish), *Mugil liza* (Mullet), *Menticirrhus americanus* (Southern king croaker) and *Micropogonias furnieri* (Whitemouth croaker). The muscle-total Hg concentration variation was: (0.01 to 0.04 mg/kg) — Sardine; (0.01 to 0.06 mg/kg) — King Weakfish; (< 0.010 to 0.023 mg/kg) — Mullet; (0.04 to 0.18 mg/kg) — Southern king croaker, and (0.04 to 0.35 mg/kg) — Whitemouth croaker. These species presented Hg levels lower than the limit established by Brazilian legislation (0.5 (non-carnivorous) and 1.0 mg/kg (carnivorous), respectively). The results of a non-parametric test was used to evaluate if a significant statistical difference existed between the total Hg content median in hair samples and fish species studied.

ELEMENTAL STATUS OF CHILDREN WITH RENAL MALFORMATIONS

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BACKGROUND: In the Russian Federation, the rate of renal pathology in children is progressively rising during last decades. Renal malformations in 0.5—7.5 per 1000 newborns occur. AIM: To investigate possible connection between elemental status of children and renal malformation occurrence. METHODS: On the basis of ultrasonic investigation of 8500 children 0—18 y.o., living in the Chuvash republic of Russia, in 161 cases of 1000 the different anomalies of kidney were revealed. 31 of those children, aged 7—12 (9.6 ± 0.3) y.o., and 29 of healthy control were clinically observed and subjected to laboratory investigation and multielement analysis of biosubstrates. There were no clinical manifestations in children with renal malformations. Hair and urine samples were collected and analysed by ICP-MS method in ANO «Centre for Biotic Medicine» (Moscow, Russia) following the observation and after 5 years (20 cases). RESULTS: Elevated Cd, Sn, Ni, Pb and reduced Zn hair levels in children with renal malformations (CRM) were found. 61.3% of them have decreased hair Zn as compared to 31% in control. Hydronephrosis correlated with decreased hair Mg and increased B, Cr levels; agenesia and duplication of kidneys were associated with elevated hair Cd, B. After 5 years of life, Al, As, Cd, Pb, V hair levels were decreased, but Si level was increased, and Zn stayed lower. Also in urine in 25% of cases Zn urinary excretion was elevated, that explains low Zn status in CRM group. CONCLUSION: Accumulation of toxic metals and elevated urinary loss of Zn are typical for children with renal malformations. This is why the laboratory determination of macro and trace elements on biosubstrates and further correction of mineral balance, especially depletion of Zn, are useful in rehabilitation of CRMs. ACKNOWLEDGEMENT: This work was supported by RUSTEM.

ELEMENTAL STATUS OF KHANTY IN CONNECTION WITH CHEMISTRY OF DRINKING WATER

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OBJECTIVE: Mineral content of drinking water and elemental status of children Khanty in the Khanty-Mansiysk autonomous region was concurrently investigated. Casual connections between element contents of external and internal environment of human organism were also studied in the particular biogeochemical area. METHODS: There were investigated hair of 100 children Khanty aged 11.2 ± 4.3 years, 103 tests of surface water and 97 tests of underground water by ICP-MS and ISP-OES have been provided. RESULTS: In the region studied, both underground and surface water was rich in Fe, Mn and poor in Ca, Mg. It was demonstrated that hardness and salinity of drinking water are determinative factors for elemental homeostasis. Hair of investigated children was found to content of Fe in 68% Khanty, Mn — in 76% and poor Ca in 66% and Mg — in 54%. In all drinking water sources, concentration of toxic elements including heavy metals was below MAC limit. However in children, especially boys, high body burden of Hg (in 74% — 7.34 ± 0.74), Pb (in 28% — 2.68 ± 0.62), Cd (in 15% — 0.19 ± 0.07) was found. Content of some essential elements such as Cu, Co, I and Se in children Khanty was within normal range though tended to decline relative to average Russian values, thus possibly evidencing development of a trace element imbalance.

INDISPENSABLE AMINO ACIDS OF THE BLOOD SERUM AND THEIR RELATIONSHIP WITH MACRO- AND MICROELEMENTS IN ANAEMIC NEWBORN IN CONDITIONS OF AN INDUSTRIAL CITY

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Anaemia of the newborn is undoubtedly an actual problem in paediatrics. An important role in its pathogenesis is played by the imbalance between amino acids and biologically active macro- and microelements participating in hemopoietic and Fe metabolism; therefore knowledge of amino acid metabolism in the newborn helps to gain insight into pathogenetic mechanisms and to choose the right therapy. 127 newborn were inspected in the maternity hospital № 1 in Yekaterinburg. The investigation of blood indices and ferrokinetics revealed an average magnitude of 6.0 ± 0.44 on Apgar scale. The anaemic newborn exhibited lower contents of ferritin (26.0 ± 3.1 ng/ml) and iron (11.8 ± 3.1 μmol/ml) in the serum, transferrin saturation with iron was below 28% — that evidence of lower erythropoietic efficiency ($p<0,05$). The arising foetal hyposyderemia attributed to the pathogenesis of its prenatal hypotrophy. A direct correlation in the serum Fe content was revealed between mother and her newborn body mass ($r = 0.74$, $p < 0.05$). In the blood serum of anaemic newborn there was a direct relationship between Fe and lysine contents ($r = 0.67$, $p < 0.05$), reverse relationships between Fe and histidine contents ($r = -0.47$, $p < 0.05$), Fe and tryptophan ($r = -0.47$, $p < 0.05$). Besides, there were correlations between Cu and amino acids levels — methionine and histidine ($r = 0.34$ and $r = 0.91$ correspondingly, $p < 0.05$). The revealed correlations between the levels in the blood of indispensable amino acids, protein fractions, macro- and microelements, haemoglobin and erythrocytes support the conclusion that metabolic changes in amino acids, proteins and microelements are interrelated in the anaemic newborn. The experience and results of investigations support the necessity of preventive estimation of the content of macro- and microelements and indispensable amino acids in the blood serum of newborn to correct metabolic disturbances.

TOXIC AND ESSENTIAL TRACE ELEMENTS IN HUMAN MILK FROM MOROCCAN LACTATING WOMEN: ASSOCIATION WITH DIETARY HABITS AND OTHER FACTORS

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The aim of this study was to determine the concentration of some essential and toxic metals in the colostrum and transitory human milk in conjunction with various factors that may influence their concentrations, place of residence, smoking, as well as socioeconomic and somatometric characteristics. Toxic and essential trace elements (Lead, Cadmium, Copper and Zinc) contents were determined in individual milk samples from 342 healthy women, 16—36 years old age, living in fours quarters old town new town, Sidi Moussa (rural quarter and El Azzouzia a polluted quarter (wastewater spreading field). Atomic absorption spectrophotometer with Zeeman background composition was used for such analysis. The mean concentrations of 342 milk samples were; 5.8 ± 2.5 μgPb/l; 4.5 ± 1,8 mgZn/l; 0.46 ± 0.12 mgCu/l and 0.5 ± 0.2 μgZn/l. These values are higher than those in milk control women's (2.5 ± 0.6 μgPb/l; 2.7 ± 1.1 mgZn/l; 0.3 ± 0.1 mgCu/l and 0.2 ± 0.1 μg/l). Hence, human milk can be able very good metallic pollution indicator. Human milk was fractionated and the trace elements content of the different fractions was compared to results from cow's milk. The casein fraction in cow's milk contains a large proportion of the total amounts of the elements cited above (Cu 27%, Zn 64%, Pb 18% and Cd 22%), whereas human casein only binds minor amounts (Cu 10%, Zn 16%, Pb 6% and Cd 12%). The present results point out, that there are high risks for the sucking babies, especially for Pb. But there is no risk for, Cd, Zn and Cu however a negative competition is observed between Pb and zinc levels. Infect, theses trace elements, detected in baby hair (0.32 ± 0.1 μgPb/g; 25 ± 2.9 mgZn/g; 3.1 ± 0.4 mgCu/g; and 0.2 ± 0.1μg/g) confirm this conclusion. The metallic pollution sources in this area are very various, but the food product in this zone is the principal source for pollution especially for Cd and Pb.

ROLE OF MACRO- AND TRACE ELEMENTS IMBALANCES IN ALCOHOLIC AND FETAL ALCOHOL SPECTRUM DISORDERS

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BACKGROUND: During 1983—1992 the numerous data, suggesting an important role of Cu, Zn, Li, Fe imbalances in pathogenesis of alcoholism related disturbances, including foetal alcohol spectrum disorders (FASD) in humans and experimental animals by A.V.Skalny and co-workers were obtained. The aim of recent study was to compare the elemental profiles of alcoholic exposed (AE) and alcoholic unexposed (AU) pregnant women and their newborns. METHODS: The 20 AU (control group) and 20 AE aborigine pregnant women, living constantly in Yakutsk (North Eastern Siberia), and their newborns were clinically investigated. Hair (MH), whole blood (WB), plasma (PB) samples of women in 1st and 3rd trimester of pregnancy and hair (NH), foetal cord blood (FCB) of newborns by ICP-AES/ICP-MS in laboratory of Centre for Biotic Medicine (Moscow) were analyzed. RESULTS: AE group in 1st trimester showed only the tendency to the decreased BP Zn ($p < 0.1$), the significant lack of WB Mn and tendency to elevated Cd content of pregnant women biosamples and only elevated MH Sn levels ($p < 0.05$) were obtained. As compared to AU group in delivery (3rd trimester) the AE group had decreased Zn, Cu, Se BP concentration ($p < 0.01$, $p < 0.05$, $p < 0.1$) and elevated Pb ($p < 0.1$) level, there was only the tendency to elevated Cd WB content. In AE group the elevated NH Zn ($p < 0.07$), Fe ($p < 0.09$), Ni ($p < 0.1$) and decreased Li ($p < 0.1$), and decreased FCB Mn ($p < 0.01$), Ca ($p < 0.05$), Na ($p < 0.1$) concentrations were observed. CONCLUSION: Alcohol exposure before and during pregnancy the macro- and trace elements metabolism disturbances, which can influenced negatively on mothers and newborns health, concerning. Obtained data in general suggests the results of A.V.Skalny group investigations the important role of Zn/Cu imbalance and Ca, Fe metabolism disturbances and Cd, Pb, Sn accumulation in FASD pathogenesis. So, the normalization of TE metabolism can be very useful in FASD prevention and treatment.

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MICROELEMENTS IN THE MEDIA OF THE «MOTHER-PLACENTA-NEWBORN» SYSTEM IN AN INDUSTRIAL CITY

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During the last years ecologically dependent pathology cases, including pregnant and newborn, have increased in industrial countries. The problem of embryo and foetal toxicity is becoming more important because the number of megapolis-dwelling women is growing and they are subject to technogenic effects of various combinations of essential (Fe, Mg, Ca, Mn, Cu, Zn) and toxic (Cd, Pb) micro- and macroelements which are involved in the pregnancy process. In a heavily technogenically polluted city increased levels of Cu, Cd, Pb are marked in the blood serum of somatically healthy mothers and higher levels of Cu and Pb — in their newborn. Higher levels of Cu, Zn, Ca, Cr, Cd, Pb are recorded in the mothers placenta tissues against the background of the deficiency of essential macroelements (Mn, Mg, Fe). Transplacental penetration of toxic Pb is marked. Placenta reduced the penetration of Cd into the foetal organism by reducing its content in the umbilical cord blood of the newborn (compared to its content in the mothers' blood). The deficiency of essential microelements (Cu, Fe, Zn, Ca, Mg) and accumulation of xenobiotics (Cd and Pb) in the blood evidently form the basis of the reproductive system pathogenesis. In cases of Fe-deficient anaemia, placenta with high levels of Cd and Pb promote penetration of the toxic metals to the newborns organism; the early adaptation is upset and the newborns health is disturbed. Due to the connection between the content of ecotoxic microelements and the physiological processes in the organisms of pregnant women the inhabitants of an industrial centre during gestation period are the group of risk of obstetric complications and their newborn are the group of risk of pathological conditions as a result of the imbalance in the macro- and microelement metabolism.

REGIONAL PECULIARITIES OF THE INDISPENSABLE AMINO-ACID SPECTRUM IN PHYSIOLOGICAL PREGNANCY OF WOMEN

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World Health Organization notes the growing number of ecologically dependent pathologies under the combined effect of toxic pollutants — a situation typical of an urban environment. As the surplus of toxic microelements in tissues may cause poisoning accompanied by lower activity and enzyme biosynthesis, the reactive participation of the amino acid pool in the detoxification processes is the decisive factor for the correction of microelementary status of an organism. We inspected a group of 78 industrial cities — dwelling women having physiological pregnancy and confinement (group 1). They were compared with a group of 45 newly — made mothers with physiological pregnancy, constantly dwelling in ecologically favourable areas in Sverdlovsk region (group 2). Somatically healthy pregnant women from both groups had a constant quantitative composition of the amino-acid spectrum (20 free amino acids). However, the volume of free amino acids in the blood plasma was 15% higher in group 1 ($p < 0.05$). This provided pregnant organisms with an adequate substratum support of regeneration and detoxification processes. In the increasing amin0-acid pool the level of indispensable amino acids decreased 10,2% while that of replaceable amino acids increased 39,8% — an evidence of the disturbance of nitrogen metabolism in group 1 ($p < 0.05$). The predominating trend towards the lower coefficient of indispensable and replaceable amino acids, (up to 0.7) observed in group 1 showed metabolic reorganization connected with protein deficiency and the imbalance of metabolic processes. The coefficient of the indispensable and replaceable amino acids of 1.02 (standard 0.98—1.2) was observed in group 2. The levels in the blood of amino acids participating in detoxification of heavy metals (Cu, Zn, Pb, Cd) was higher in group 1: cystine — 26%; isoleucine — 10.7%; lysine — 30.4%; valine — 24.4%; arginine — 29%. Prior to oxidation indispensable amino acids have an important regulatory function for the maintenance and growth of an organism.

VITAMINS AND MICROELEMENTS DEFICIENCY IN CHILDREN WITH COELIAC DISEASE

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Coeliac disease in Europe is a very common disorder with the prevalence of 1:100 and the ratio of diagnosed to undiagnosed cases around 1:5 to 1:13. Pathologic immune reaction to gluten proteins leads to the development of villous atrophy in the small bowel and as a result to malabsorbtion that defines clinical picture of the disease. But in some patients typical symptoms (diarrhoea, abdominal pain, malnutrition, weight loss) may be absent for a long time. In such cases clinical signs of micro- and macronutrient deficiency may remain the only presentation of coeliac condition. The prevalence of anaemia in coeliac disease varies greatly according to different reports and has been found in 12—69% of newly diagnosed patients. Among all cases iron-deficiency anaemia has been reported in up to 46% of patients with subclinical coeliac disease, with a higher prevalence in adults than children. The prevalence of coeliac disease among patients with refractory to treatment iron-deficiency anaemia can be as high as 20%. The anaemia seen in coeliac disease can also result from malabsorption of other micronutrients necessary for normal haematopoiesis. It has been found that iron deficiency can be associated with copper and zinc deficiency, and there is correlation between the extent of villous atrophy and serum level of minerals. Recent studies suggested that 8% to 41% of previously untreated subjects with coeliac disease were deficient in vitamin B_{12}, and most of patients, especially from children's population, can present low serum levels of folic acid. According to our data the prevalence of anaemia in children with coeliac disease has been around 23%, 13.6% of all cases have been characterized by hypochromia. In 40—50% cases patients with coeliac disease present hypocalcaemia, that can be caused either by malabsorbtion of calcium or vitamin D. Selenium and magnesium deficiency can also take part in bone metabolism disorders. About 30% of coeliac patients present deficiency of vitamin K — dependent coagulation factors, that can result in an abnormal bleeding tendency. Most of mentioned deficiency states can be successfully treated with gluten free diet, but there are still cases when diet can't provide a patient with necessary amount of all micronutrients. That can determine the necessity of timely prevention and adequate correction of possible deficiency conditions in coeliac patients.

VITAMIN D METABOLISM IN CHILDREN WITH RICKETS

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Studies on cholecalciferol metabolism have changed the common attitude to rickets as just vitamin D — deficit state. Recent data suggest that disease can develop even when the concentration of 25 (OH) D_3 is within normal levels. With the aim to investigate possible factors that can influence pathogenesis of rickets, we examined 30 children aged 2—21 months with typical clinical symptoms of the disease including skeletal deformations and extraskeletal manifestations. Among all children 7 (23.3%) were breast fed without additional supplementation of vitamin D. In other 23 (76.7%) cases rickets has developed in spite of preventive measures including supplementation of vitamin D either with medicine or with formulas, containing cholecalciferol. Among all children only 11 (36.7 ± 8.8%) had decreased level of 25 (OH) D_3 less than 25 ng/ml. 3 infants with hypovitaminosis D were exclusively breast fed without additional vitamin D supplementation, other 8 children, who had received vitamin D either with medicine or with formulas were diagnosed to have pathology that could influence cholecalciferol metabolism. Those children who had normal circulating level of 25-hydroxyvitamin D were also diagnosed to have possible risk factors predisposing them to the development of rickets such as prematurity, hypotrophy, accelerated rate of growth, kidney and gastrointestinal tract pathology. 9 children with normal levels of 25 (OH) D_3 had severe hypocalcaemia (lower than 1 mmol/l) with the significant correlation between the level of Ca and both active metabolites of vitamin D (25 (OH) D_3 and 1,25 (OH) D_3). Obtained data suggest that there is no correlation between vitamin D status of a child and probability of rickets development that demands an individual approach to prophylaxis and treatment of the disease.

EMBRYOTOXIC EFFECT OF CADMIUM SULPHATE AND PROTECTIVE ROLE OF ZINC ASPARTATE AT SIMULTANEOUS ADMINISTRATION

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Embryogenesis is sensitive to cadmium toxicity. Cadmium is able to transfer the hematoplacental barrier and derange accumulation of essential elements (Avtsyn et al., 1991; Paranko et al., 2002; Salpictro et al., 2002). In this study $CdSO_4$ (Group 1) and $CdSO_4$+Zn aspartate (Group 2) in dosage 100 μg ($CdSO_4$) and 40μg (Zn aspartate) daily were ingested *per os* to Wistar female rats during 1—16 days of gravidity (pregnancy), i.e. in periods of preimplantation development, implantation early organogenesis, placentation and organogenesis in foetuses. All newborns and their mothers were investigated post partum including ICP-MS multielement analysis of biosamples, provided by ANO CBM laboratory (Moscow, Russia). At prenatal cadmium intoxication (Group 1) preimplantation lethality of foetuses were increased more than sixfold, and postimplantation lethality — more than twofold. In Group 2, treated by zinc aspartate, the $CdSO_4$ administration had no effect on lethality. In control group the males/females ratio in newborns was 1.09 ± 0.24 as compared to 0.30 ± 0.06 in Group 1. In Group 1 the mothers' and foetuses' body mass and weight of internal organs were reduced and weight of placenta was increased, suggesting chronic hypoxia during cadmium intoxication. Simultaneous zinc aspartate administration restored the morphometric parameters in mothers and foetuses and even improved some of them in comparison with controls. Described protective effects of zinc aspartate against $CdSO_4$ embryotoxicity are corresponding to restoration of some trace elements content in liver of foetuses and Zn/Cd ratio. So, zinc aspartate prevents $CdSO_4$ embryotoxic effects in rats despite high level of cadmium accumulation in the mother-foetus system.