Session 5. EPIDEMIOLOGY OF METAL IONS

STRONTIUM CONCENTRATIONS IN BONE, WHOLE BLOOD AND URINE FROM OSTEOPOROTIC SUBJECTS SUBMITTED TO FEMUR HEAD REPAIR SURGERY

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A total of 23 subjects (17 female and 6 male) with ages between 47 and 89 years (69.39 ± 11.23) submitted to femur head fracture repair surgery were recruited for this study. The Sr content in bone, whole blood and urine had an inverse relationship with the age, being that in urine the most representative (49 % compared to 17 % and 14 % for bone and blood, respectively. These weak associations might be attributed to the narrow age range studied. The concentration of Sr in bone (28.00 ± 7.68 μg g^{-1}) has a highly positive correlation (94 %) with its content in blood (25.17 ± 6.28 μg l^{-1}) and less marked (only 14 %) with that in urine (87.43 ± 18.94 μg l^{-1}), indicating that the Sr depleted from bone deposits circulates in the blood stream and then it is eventually excreted. The determination of Sr in blood could be useful for diagnosing osteoporosis, while its concentration in urine could be related to the decreased renal function in elderly population.

BIOLOGICAL MONITORING OF OCCUPATIONAL EXPOSURE TO CYTOSTATIC DRUGS WITH PLATINUM

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Background: the past 20 years has been an explosion in the introduction of effective cytostatic agents for treating malignant disease. Several cytostatic drugs have been shown to be mutagenic, teratogenic and carcinogenic in experimental systems. Medical staff is potentially exposed to a wide spectrum of antineoplastic drugs in combinations not used in therapy althrough in significantly lower concentration.

The aim of the study was to investigate whether oncology workers are occupationally exposed to antineoplastic drug by measuring platinum urinary concentration used as marker.

Patients and methods: the exposed group consisted of nurses, pharmacy technicians and pharmacists, handling antineoplastic drugs for at least one month. The control group consisted of medical workers who had never been occupationally exposed to known carcinogenic substances. Each person was interviewed. The questions covered a detail occupational, medical and family history, and adverse effects outbreaks. Frequency of handling cytostatic drugs was evaluated. Last informations include the type of protective measures used.

Results: platinum was included in two of the four most frequently used drugs. An elevated level of urinary platinum (0.63 μg/g creat.) was found in one exposed worker, and none in the control group. No relationships were observed between the excretion rate and the kind of activity, the frequency or the duration of handling cytostatic drugs, or the excretion rates and the use of gloves or masks.

Conclusion: occupational surveillance of health care workers is often inconsistent. The biomonitoring using platinum or other methods is simple, fast and selective. Since even very low exposure levels may result in a health hazard, high sensitivity by metal dosage is required.

IRON IN MINERAL COMPOSITION OF GRASSHOPPER *SPHENARIUM PURPARASCENS* Ch., EDIBLE INSECT IN RURAL COMMUNITIES OF MEXICO

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Iron deficiency is a very widespread condition that leads to anemia, particularly in vulnerable groups of women in the reproductive age, children and working adult males. Anemia produces temporary and even long

lasting functional deficits that are an obstacle to self-fulfillment and overall development. Animal products provide hem iron readily absorbable, non hem iron from plant sources is much less absorbable, however if food is rich in Vitamin C ascorbic acid and consumed at the same time, absorption can be enhanced. Intervention strategies against iron malnutrition are: iron direct supplementation of vulnerable populations, fortification of common foods and dietary improvement. Supplementation with pharmacological preparations and food fortification in many cases are not available to all iron deficient individuals, communities, and populations in Mexico. Iron, analyzed in grasshopper *Sphenarium purpurascens* Ch., by atomic absorption spectrophotometer was: 12.10 mg/100g of dry sample. Iron bioavailability is the amount absorved from food and it can vary from << 1% to >> 50%, however the percentage that is absorved depends on the nature of the diet and on regulatory mechanisms in the intestinal mucosa that reflect the body need for iron, nevertheless average Recommended Dietary Allowances RDA are 10 mg for children to 15 mg for adults, consequently some insect daily intake can cover human necessities. They are available only from June to January, and are prepared for storage, toasted with citric acid (lemon) and salt. Dietary improvement, by micronutrient deficient groups of populations in developing countries, with grasshoppers increases availability, and consumption of rich iron food. Insect must be promote as foodstuff among people at risk.

PARKINSON DISEASE AND HEREDITARY HEMOCHROMATOSIS MUTATIONS IN A SWEDISH SAMPLE

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Background: Hereditary hemochromatosis is one of the most common single gene disorders in individuals of Celtic or northern European ancestry. Mutations in the gene HFE results in excessive iron uptake and deposition in many organs and tissues. Because of evidence of iron dysmetabolism in PD there is a strong rationale for looking at HFE mutations in PD.

Aims: To determine/compare the frequencies of the two most common HFE mutations (C282Y and H63D) in individuals with familial or sporadic PD and healthy normals, with/without consideration of sex and subject age.

Methods: Blood samples were obtained from 86 Swedish PD patients (43% female, mean age 70 years [range 50 to 90 years] and 57% male, mean age 63 years [range 43 to 89 years]) and 127 geographically matched controls (50% female and 50% male, mean age 38 years [range 20 to 65 years]). The patients were subdivided into those with idiopathic PD and those with a family history of PD. DNAs from blood samples were screened for C282Y and H63D. Associations were evaluated using Chi-square analysis.

Results: Relative to sex-matched controls, there were trends for H63D to be overrepresented in PD males and for C282Y to be underrepresented in PD females. In PD patients under the age of 55 years, the frequency of those with one or two H63D mutations was significantly greater in those over age 55 ($p = 0.037$), and significantly greater than in the controls ($p = 0.01$). These effects were apparent in patients with or without a family history of PD.

Conclusions: HFE mutation frequencies in PD are dependent upon sex and age. H63D may be a predisposing risk factor for PD particularly for males under age 55.

COULD EPIDEMIC PATHOGENIC SELECTION (EPS) BE AN EXPLANATION FOR HEREDITARY HEMOCHROMATOSIS?

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Hereditary hemochromatosis (HH) is a disorder associated with progressive iron overload and deposition in multiple organs. It is the most common inherited single gene disorder in people of northern and western European descent. About 80% of individuals of European descent with HH are homozygous for a cysteine-to-tyrosine substitution (C282Y) in the gene now called HFE. The function of HFE protein, a major histocompatibility class I-like transmembrane protein, has not been fully elucidated. A major puzzle is why population frequencies of HFE mutations are so high when the condition of HH is known to be associated with reduced life expectancy. We have carefully considered the possible origins of HH, and propose that certain alterations in HFE help the body to defend itself against pathogens. Three consequences of the C282Y mutation are lack of

expression of HFE on the cellular surface, a lowered iron level in macrophages, and an increased rate of clearance of iron from the intestinal lumen. These changes could confer protection against certain pathogens early in life before iron overload occurs by reducing the pathogenicity of infective agents that depend upon the availability of iron to proliferate and infect the human host. Furthermore, the C282Y mutation might have been selected for during the European plagues caused by Yersinia spp. and other pathogens because of the conferred resistance to infection, i.e., by Epidemic Pathogenic Selection (EPS). (Excerpted from Medical Hypotheses, in press.)

ZINC DEFICIENCY AMONG THE MAYAN CHILDREN OF GUATEMALA

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The Mayans are the indigenous population of Guatemala who live in the mountains of western Guatemala, Quiche Province. The economy is mostly agricultural and the lifestyle is primarily a survival existence. Sixty-seven of these children (34 male and 33 female) were subjects of this study. Anthropometric measurements were made of the children and food frequency data were collected from their parents. Samples of the foodstuffs were purchased from the local market and analyzed for phytate and zinc. The major dietary components were maize tortillas and refried black beans routinely three times a day; in addition some fruit, vegetables and much candy are also consumed. Meat is consumed about once each week as a stew, soup or gruel. The phytate: zinc molar ratio necessary to sustain homeostasis is 10 or less. A maize tortilla, dried before analysis, had a phytate: zinc molar ratio of 33, commercially canned refried black beans as canned 13, mature black beans 41, hybrid whole corn 21, open pollinated black corn 35, and open pollinated white corn 33. Thus the dietary composition alone would indicate zinc deficiency is universal among the children of this population. The height and weight for age of both the male and female children, when compared to a 50th percentile standard for the U.S., confirm that both height and weight of the children studied were compromised. The indication was that zinc deficiency is a universal problem among the children of this population. Since the adults consume these same diets, it may be concluded that zinc deficiency is by far the most prevalent deficiency among the Mayan population of Guatemala.

THE CONTENT OF THE CHOSEN TRACE ELEMENTS IN HAIR OF CHILDREN WITH FOOD ALLERGY

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The well-balanced diet, rich in all indispensable nutrients is one of the factors responsible for the right functioning of a child's organism. Food hypersensitivity has a chronic course and requires the application of individually selected elimination diet.

It refers not only to the main nutrients but also vitamins and trace elements.

The aim of the study is to denote the content of the chosen trace elements (Zn, Cu, Se) in hair of children with food allergy at its acute stage.

The research covers the group of 26 children aged from one month to three years; mean age — 15 months.

According to the type of clinical manifestation of the illness, the children were divided into three subgroups , I — where the skin manifestation dominated (15), II — with the prevailing digestive manifestation (6), and III — with the predominance of respiratory system manifestation (5).

The control group consisted of 21 healthy children of the same age. The content of trace elements in the hair of children was denoted with the usage of atomic absorption spectrophotometry method.

The results of the research – it was proved that the average content of zinc in the hair of 26 tested children was 146.19 μg/g, in the subgroup I — 146.56, II — 152.1, III — 130.32 μg/g as compared to the control group — 128.8 μg/g.

The average content of cooper in the hair children with food allergy was 18.815 μg/g and selenium was 0.68 μg/g. The average content of cooper in the hair of control group was 11.92 μg/g ($p<<0.0001$) and selenium was 0.410 μg/g ($p<<0.0001$).

Conclusions: The content of copper and selenium in the hair of children with allergy was higher with reference to the control group.

THE CONTENT OF ZINC IN BRAIN IN CASES OF SUICIDE (A PRELIMINARY STUDY)

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Zinc plays an important role in neurotransmission and in other systems of living organisms. In recent years, the role of zinc in depression has attracted the attention of researchers. The following factors, amongst others, have been observed: 1. in humans — a drop in the concentration of zinc in the plasma of persons suffering from depression; 2. in animals with experimentally induced depression — the anti-depressant activity of zinc has been demonstrated.

The aim of the work is to determine the content of zinc in samples of brain (frontal lobe cortex, hippocampus, cerebellum) taken from the bodies of persons who have committed suicide, and then to assess whether depression influences the content and distribution of this element in the studied anatomical structures of the brain.

The work is a preliminary investigation. 14 persons were studied, of whom 8 had committed suicide and 6 had died of other causes (control group). Determination of zinc was carried out by the method of flame atomic absorption spectrometry following microwave digestion.

The average content of zinc was lower in persons who had committed suicide (the greatest difference was ascertained in the cerebellum). The average content of zinc [micrograms per gram] in the control group and studied group was: in the cerebellum — 12.1 and 9.7; in the frontal lobe cortex — 10.8 and 9.4; in the hippocampus — 11.0 and 10.7 respectively.

The obtained results may indicate the possible role of zinc in the psychopathology of suicides (including depression). This conclusion should, however, be treated as a preliminary conclusion, because, amongst other reasons, both the group of studied persons and the control group were small.

CHANGES OF THE MICROELEMENT STATUS AND HEALTH OF CHILDREN LIVING IN INDUSTRIAL AREAS

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Background: It is known, that microelements (ME) play an important role in the function of living organisms and participate in the majority of biochemical processes. Inadequate intake of ME may result in imbalances of mineral exchange (microelementoses) of various intensity and degree. Due to unique anatomico-physiological features, a child's metabolism is more subject to the risk of ME imbalance. This imbalance may cause significant changes in the child's overall health status.

Aims: To estimate the prevalence of microelementoses among children from industrial areas (e.g. Vladivostok); to reveal the correlation between health parameters and the degree of microelement homeostasis; to give a scientific basis and apply the correction methods.

Methods: Bioindication method (detection of the levels of lead (Pb), cadmium (Cd), chromium (Cr), manganese (Mn), aluminum (Al), copper (Cu), zinc (Zn), and iron (Fe) by atomic absorption spectrometry method, and selenium (Se) by extraction-fluorometric method, in hair and urine); clinical method; laboratory method; and statistical method.

Results: Five hundred and forty-five children from 3 to 16 years old were surveyed. Microelement homeostasis resulting from excessive accumulation and/or deficiency of one or several ME was revealed in 72.5% of the children. More than a half of those surveyed had an imbalance of 2 to 7 ME. Significant changes in the health status of the children with polyhypermicroelementoses compared with the control group were noticed. The most frequent changes were in the digestive, nervous, urinary, and hematologic systems (parameters of CBC). We have designed, tested and applied the correction methods for the microelement status imbalance.

Conclusion: Evaluation and correction of the microelement status (deficiency, surplus and/or imbalance of ME) in children from industrial areas is paramount to their long-term health.

REGULAR CONSUMPTION OF NAFEEDTA FORTIFIED FISH SAUCE IMPROVES IRON STATUS IN ANEMIC VIETNAMESE WOMEN

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Background: Fish sauce, a condiment consumed daily by a large proportion of the Vietnamese population,

is a potentially useful food vehicle for iron fortification.

Objective: To evaluate the efficacy of NaFeEDTA-fortified fish sauce to improve iron status of anemic women.

Method: A randomized, double blind controlled trial in anemic Vietnamese women. All women were served a meal based on noodles or rice, six days per week under strict supervision, with 10-ml fish sauce containing either 10-mg of iron as NaFeEDTA (Group-1) or no added iron (Group-2). Hemoglobin concentration (Hb), Serum Ferritin (SF) and Transferrin receptor (TfR) were evaluated at baseline (T_0), after 3 months (T_3) and after 6 months (T_6) of intervention.

Results: 62 women in Group-1 and 67 in Group-2 completed the study. On average, 148 meals were consumed. Hb increased significantly in Group-1 from T_0 to T_6 ($P<0.0001$). SF improved significantly in Group-1 from baseline to T_3 ($P<0.001$) and to T_6 ($P<0.0001$). No significant changes occurred in Group-2. TfR decreased significantly in Group-1 from baseline to T_3 ($P<0.0001$) and to T_6 ($P<0.0001$). SF was higher in Group-1 at T_3 ($P<0.05$) and T_6 ($P<0.001$) and TfR was lower in Group-1 at T_3 ($P<0.05$) and T_6 ($P<0.001$) as compared with Group-2. By the end of the study, prevalence of anemia (Hb<120 g/L) had decreased by 33.9%, in Group-1, respectively. Prevalence of iron deficiency (SF<12μg/L) had decreased by 38.7% in Group-1; there was no significant change in Group-2.

Conclusion: Regular consumption of iron fortified fish sauce during 6-months improved iron status significantly and decreased the prevalence of anemia in Vietnamese anemic women. Iron fortification of fish sauce is thus a promising approach to control iron deficiency anemia in Vietnam.

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LEAD CONTENTS IN MOTHERS OF NEWBORNS WITH LOCOMOTOR SYSTEM MALFORMATIONS

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There have been reports on individual cases of significant lead intoxication in pregnant women. The case of a girl whose mother in the 8th week of pregnancy as a result of occupational exposure had a lead concentration in the blood of 62μg/dl was described. At birth, the girl exhibited numerous congenital defects, known as VACTERL-syndrome. Its causes have not yet been discovered. However, some authors have denied the existence of a relationship between lead and congenital malformations; therefore the problem requires further investigation.

Objectives: The aim of the study was to evaluate concentrations of lead in the blood and in the hair of 46 women after the delivery of healthy newborns and 48 women whose newborns were born with locomotor system malformations (LSM).

Methods: The samples of blood and hair were collected from the mothers during the first week after delivery. Lead levels were determined by electrothermal atomic absorption spectrometry with a Zeeman background correction.

Results: Mothers of healthy newborns had a lower lead concentration in their blood — mean 6.30 μg/dl and hair — mean 0.77 μg/g; in comparison to the mothers of newborns with LSM,14.08 μg/dl and 1.99 μg/g respectively. In mothers from control group, birth weights of newborns were higher by a mean of 417g in comparison of children born with LSM. In our studies the increase of lead concentrations in the blood and the hair in mother of newborns with LSM does not appear to be influenced by the nutritional habits of a pregnant woman.

Conclusions: Our results reflect the negative influence of lead on intrauterine fetal development.

THE SEXUAL DIFFERENCES IN 1–6 YEARS OLD CHILDREN MULTIELEMENT HAIR ANALYSIS

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The multielement hair analysis of relatively healthy 1-6 years old children (1986 males, 1994 females), living in different climato-geographical regions of Russia and CIS during the years 1997-2001 was made using ICP-AES.

It was found that the growing and maturation of both sex children is correlating with same typical changes in hair elemental content, for example, gradual decreasing of hair Ca, K levels, and also Pb level (after age of 5 years). The hair Zn level in both boys and girls are minimal in period from 2 till 5 years.

The analysis of obtained data showed more significant changes in hair elemental content of boys (Ca, K, Zn, Pb, Cr, Co) as compared to girls (Ca, K, Zn, Pb).

2–3 years old females demonstrated more profound decrease of hair Zn. Males have the significantly higher P, K, Na, Pb, Cd, females — Ni hair concentrations. From

age of 4 years girls have higher Ca, Mg levels. Both male and female groups demonstrated the significant elevation of average Mn hair concentration in 3–4 year age.

According to obtained analytical data, we can conclude that the human hair elemental content has the special features, depending on sex, not only in pubertal or adult age, but from the first years of human being. The anthropometrical and morphological differences of both sexes have the specific sexual depending basis, which is reflected in hair analysis.

MATERNAL SELENIUM AND FETAL LOCOMOTOR SYSTEM MALFORMATIONS

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Selenium is an essential nutrient. The key role of selenium in human metabolism is attributed to the presence of four selenocysteine residues in the enzyme glutathione peroxidase. It has been suggested that the locomotor system malformations in children may be explained by the selenium status in their mothers.

The aim of this study was to determine blood levels and hair selenium content in 46 mothers of healthy children and 49 mothers of children with locomotor system malformations (LSM). The newborns were clinically examined with ultrasound screening for hip dysplasia, performed by orthopaedic surgeons, usually 2 – 6 days after birth. According to the International Classification of Diseases (ICD–10) we found newborns with LSM (limb reduction defects, clubfoot, hip dislocation, syndactylia, polydactylia). The selenium in the blood and hair of mothers was determined in the first weeks after delivery and in the blood in the year after delivery. The blood and hair samples (after the washing procedure recommended by the International Atomic Energy Agency) were decomposed with concentrated nitric acid in a microwave mineralizer BM – 1z instrument UniClever (Plazmatronika, Poland). The selenium content in the blood and hair was analyzed by electrothermal atomic absorption spectrometry (ETAAS) on a Z-5000 instrument (Hitachi, Japan). Certified reference materials – Seronorm Trace Elements (Nycomed) for whole blood and GBW 09101 for human hair (from the Chinese Academy of Science) – were used to test the accuracy of this method.

In mothers of children with LSM the mean selenium blood concentration was 57.4 μg/l, which was significantly lower than in the control group – 69.9 μg/l. The mean selenium content of the hair of mothers of children with LSM was 0.162 μg/g also significantly lower than in control group – 0.238 μg/g. In mothers of healthy children a significant correlation (correlation coefficient = 0.36) between the blood and hair was noted. In the year after delivery the mean level selenium in the blood of mothers of children with LSM increased and we are not observed significantly differences between the control group.

COENZYME Q_{10} LEVEL IN PLASMA OF CHILDREN WITH INFLAMMATORY PROCESS

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Using a newly developed method by HPLC with ultraviolet detection we measured plasma coenzyme Q_{10} (CoQ_{10}) level in group of 43 children (19 femals and 24 males: ages 1 month – 9 years) with an acute inflammatory process. The results for coenzyme Q_{10} were expressed as molar concentration (mmmol/l plasma). Our study confirmed that CoQ_{10} concentration (median — 0.8 μmol/l) was independent of sex, and we established which biochemical parameters influence on ubiquinone levels. The results indicate that CoQ_{10} concentration is connected with leukocytosis, calcium and magnesium levels. These findings suggested that transferin, amylase and serum glutamic transaminase may also determine the CoQ_{10} levels plasma.

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EFFECTS OF MATERNAL LEAD EXPOSURE ON THE NEUROCHEMICAL PARAMETERS OF THEIR PROGENY

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Lead exposure from environmental and occupational sources still remains a serious health concern. The goal of this survey is to see if it exists changes of the neurochemical parameters during developmental relat-

ed to chemical dose treatment of female rats.

Female Wistar rats (3 weeks of age) were given to experiments during 90 days, were treated by lead acetate (2000 ppm) dissolved in drinking water. This female rats were mated with an unprocessed male. Their progeny was used in this survey. The dosage of the neurochemicals parameters: choline acetyltransferase activity (CAT) and glutamic acid decarboxylase (GAD) was achieved.

The level of the blood lead (PbB) of descendants varies from 15 to 24 μg/dl. The weight of young rats doesn't record any significant difference ($P < 0.05$) in relation to control group for a postnatal development of 14j. However, a significant difference ($P < 0.05$) for a postnatal development of 28j. This is how the lead exposure caused a reduction of 34% of the CAT activity, specific enzyme of neurons cholinergics, in relation to control group, in the hippocampe (postnatal 14 days).

This reduction attain 40% in the 28th days (postnatal 28 days), which indicate a reduction in the expression of the enzyme in the cellular bodies of neurons or in the number of their cells. In addition we note a significant effect on the expression of the GAD, enzyme GABAergic scorer, in this region of the brain, for the development postnatal 28th days (a reduction of the GAD activity of 25% in relation to control). It confirms that a perinatal exposure with PbB of 20 μg/dl induce a significant reduction in the Septal cholinergic muscarinic receptors during the period of the postnatal development.

ENVIRONMENTAL DUST AND BLOOD LEAD LEVELS IN CHILDREN LIVING ON A METAL-CONTAMINATED FORMER LANDFILL IN PUERTO RICO

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Over 200 houses have been constructed on a former landfill-crematory site in Vega Baja-Puerto Rico, where soil lead concentrations were > 3,000 μg/g (an United States Protection Agency (USEPA)-designated Superfund site). Although a major route of exposure for children living in this community is playing with contaminated soil, contamination by house dust could be a major contributor to lead exposure. This study determined the relationship between house dust lead and blood lead levels from children. Seventy eight children were enrolled with the written consent of parents in which a questionnaire was given to participants parents to gather information on socio-demographic and clinical characteristics. Floors house-dust from 48 houses were sampled inside using baby wipes on 1 ft^2 of the principal entrance, the living room, the kitchen, and the child bedroom. In addition, dust accumulated in window sills was collected. Dust-wipe samples were digested in concentrated nitric acid in a microwave oven CEM-model 1000, while whole blood samples contained in lavender top Vacutainer tubes with K_3EDTA, were analyzed by a Perkin Elmer atomic absorption spectrophotometer Analyst-model 800. About 15% of the houses had dust lead levels higher than the USEPA standard for floor of 40 μg/ft^2. Children had blood lead levels lower than the US Center for Disease Control and Prevention of 10 μg/dL, with the higher value being 7.8 μg/dL. However, statistically significant associations were found among mean blood and dust lead levels ($p=0.026$). A multivariate analysis showed significant predictors ($p<0.05$) of blood lead concentrations like dust lead levels on the principal entrance of the house, the living room, sex, carpets, consuming locally raised animals, toy chewing habits, and house construction activities, accounting for 65.8% of the variation in children blood lead levels. Other predictors (e.g., lead in soil and drinking water) of blood lead levels need to be evaluated.

IRON-DEFICIENCY ANEMIA AND ITS GENETIC MARKERS

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Background: Iron is one of the most obligatory elements in human body and is included in erythrocariocytes and erythrocytes, lots of enzymes, ferritin, transferrin. Iron decrease determines development of iron-deficiency anemia.

Aim: of investigation was determination of genetic markers in iron-deficiency anemia patients.

Methods and Material: The polymorphism of genes cytochrome P-4501A1 (CYP1A1, genotypes: Ile/Ile, Ile/Val, Val/Val) glutathione S-transferase M1 (GSTM1, genotypes: 0/0, +/+, +/0), N-acetyltransferase 2 (Nat2, genotypes: S/S, S/R, R/R), angiotensin-converting enzyme (ACE, genotypes: I/I, I/D, D/D) and activator of plasminogene (AP, genotypes: I/I, I/D, D/D) has been performed among 102 patients with iron-deficiency anemia and 105 practically healhty pearsons (controls) by PCR method with using specific oligonucleotedes primers.

Results: The increased frequency of mutant form of gene CYP1A1 in patients with iron-deficiency anemia (10.21%) has showed significant difference from that in healthy controls (4.29%, $p<0.05$, OR=3.17). The study of gene's polymorphisms GSTM1, Nat2, ACE and AP has demonstrated no significant differences between patients with iron-deficiency anemia and controls. But we have detected combinations of genotypes on polymorphic systems CYP1A1, GSTM1, Nat2, ACE and AP which are inherent by the iron-deficiency anemia patients. They are: Ile/Ile,+/+,S/R,D/D,I/I, (OR=12.84); Ile/Ile,+/+,S/R,I/I,I/D, (OR=12.84); Ile/Val,0/0,R/R,I/I,I/D, (OR=9.75).

Conclusion: Mutant form of gene CYP1A1 and combinations of genotypes Ile/Ile,+/+,S/R,D/D,I/I; Ile/Ile,+/+,S/R,I/I,I/D; Ile/Val,0/0, R/R,I/I,I/D have possibility to be used as genetic markers of iron-deficiency anemia.

THE INVESTIGATIONS OF THE HAIR, SERUM FE AND FERRITIN CONCENTRATIONS IN WOMEN SUFFERING FROM ANDROGENETIC ALOPECIA

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The simultaneous determinations of hair, serum Fe concentrations in 34 19–51 years old and ferritin women, suffering from androgenetic alopecia, were provided. The hair Fe by ICP-OES, serum Fe and ferritin by routine biochemical analyses were measured. We've found that 38% of all patients had the decreased hair Fe in 50% and 75% of cases, respectively; there were lowered serum ferritin and Fe concentrations revealed. The exceeding of normal ranges in any cases was observed. These data suggested the significant role of Fe metabolism disturbances in androgenetic alopecia ethiopathogenesis. Also we found, that decreased hair Fe is good corresponding to low serum Fe (66% of cases) but not ferritin (33%). In the cases of "Normal" hair Fe data (12–50 ppm) we detected the low serum Fe ferritin and only in 15.4 and 23% of patients. The statistical analysis the positive correlation (r=0.63) between the hair and serum Fe revealed.

So, the obtained analytical data demonstrated the essentiality of Fe metabolism disturbances diagnostics and correction in androgenetic alopecia female patients. Also, we concluded, that the Fe analysis is a relatively good tool for the evaluation of Fe status in humans.

THE ROLE OF MICROELEMENTS IN FORMATION OF ENDEMIC GOITER IN INDUSTRIAL AREAS

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Background: Mild endemic goiter caused by iodine deficiency was detected in Vladivostok, an industrial center of Russia. The disproportion between the degree of iodine deficiency and manifestations of other clinical indicators of endemic goiter was apparent. Probably, endemic goiter is caused not only by iodine insufficiency, but also by the influence of other strumagenic factors. Because iodine is one of the essential microelements (ME), its metabolism is interrelated with other ME.

Aims: To estimate the condition of the microelement homeostasis in children with one of the basic manifestation forms of endemic goiter — diffuse non-toxic goiter (DNG).

Methods: Bioindication method (detection of the levels of lead (Pb), manganese (Mn), zinc (Zn), cobalt (Co), copper (Cu), magnesium (Mg), and calcium (Ca) by atomic absorption spectrometry method, selenium (Se) by extraction-fluorometric method, in hair and urine); clinical method; laboratory method; and statistical method.

Results: Ninety children from 7 to 11 years old were surveyed. The children were divided into 3 groups (30 patients in each): group I, children with 1st degree DNG; group II, children with 2nd degree DNG; group III (control group), children without enlarged thyroid gland. The frequency and degree of microelement imbalance was significantly higher in the group of children with DNG compared to the children in the control group. The complex microelement imbalance in children with DNG included development of hypermicroelementoses of Pb, Mn, Zn, and also hypomicroelementoses of Cu, Co, Se. A correlation between levels of the investigated ME in children and their thyroid gland morphofunctional characteristic was shown.

Conclusion: Imbalance of the microelement status may be associated with the strumagenic factors. Inclusion of ME status is warranted as a criterion of DNG diagnostics-and intervention.

THE EXPERIMENTAL RESEARCH OF RELATIONSHIP BETWEEN PREVALENCE OF KASHIN-BECK DISEASE AND TRACE ELEMENTS

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Background: As an endemic osteo-cartilaginous disease with unknown causes, Kashin-Beck disease (KBD) had been deeply studied, especially on the trace elements relevant to the disease, such as selenium (Se). But, up to now most of the studies still confined to the comparison between endemic and non-endemic areas.

Objective: The present experimental research focuses on the prevalence of KBD and level of 7 trace elements in order to reveal the relationship between them.

Methods: Fourteen endemic villages with different prevalence rates of KBD and 3 non-endemic villages were surveyed. Local children aged from 6 to 12 were examined by a X-ray camera for diagnosis of KBD as well as the biological and environment samples were collected for assay. A fluoroscent method was used to determine Se in hair and plasma, as well atomic absorption spectrotometer to copper, zinc, manganese and iron in hair. Molybdenum and phosphorus were analyzed by spectrometer methods.

Results: Among all the trace elements, only Se is significantly related to the prevalence of KBD. The level of Se is very low in KBD patients, especially in those severe ones. In the individuals living in the same area, the difference of Se in KBD-and non-KBD group remained unsignificant.

Conclusion: Se-deficiency may be an environmental agent for KBD since it occurs in KBD patients commonly. At the other side, there may exists other factor(s), for Se-deficiency hypothesis can not explain the undulation of KBD. The disease, as the author's opinion, is very likely elicited by joint stress of Se-deficiency and biological agent(s).