

POPULATION STRUCTURE OF THE ISLAND OF RAB ESTIMATED BY THE ANALYSIS OF BIOCHEMICAL TRAITS

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Island population isolates are best for investigating theoretical hypotheses about microevolution by applying holistic approach. Anthropological and genetic research of the inhabitants on the Adriatic coast, particularly of the island populations, was started in 1972 by Academician Pavao Rudan. Biochemical traits are good indicators of the microevolutionary influence on the biological structure of the population. The aim of this research was to study the population structure of the island of Rab by the analysis of biochemical traits. This research contributes to anthropological investigations of microevolutional trends that have shaped the present genetic structure of the population of Rab. The sample collected in 2002 is comprised of 600 adult individuals from five island settlements. Biochemical traits (creatinine, urate, cholesterol, triglycerides, HDL cholesterol, LDL cholesterol, glucose) were analyzed using multivariate biostatistical methods in order to determine the degree of heterogeneity among the populations of the island settlements and the pattern of their variation. Heterogeneity among subpopulations of the island of Rab in biochemical traits was determined by blood glucose and LDL cholesterol. Biochemical variability among the populations corresponds to that of previously established for morphological traits of head and body and most likely reflects genetic differences, given the fact that those populations have been exposed to a homogenous physical environment. The results on biological variability within the population of the island of Rab are in line with the historical data on settlers from different areas from the mainland and in different time periods, and with the data on their reproductive isolation.

Key words: *population structure, island isolate, Rab, Croatia, biochemical traits*

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THE LINEAR GROWTH: PROGNOSIS CRITERIA IN GROWING UP CHILDREN

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The linear growth is an important indicator of health and harmonious development of child. It is known that dimensions of skeleton depend on content of calcium in bones. Until now, it was considered that only dual-energy x-ray absorptiometry made it possible to determine amount of bone mineral in skeleton bones. However, application of dual-energy x-ray absorptiometry for evaluation of growth processes in children is not recommended. The implementation of qualitative ultrasound analysis of bones in pediatrics permitted to establish that this method reflects content of calcium in cortical layer of tubular bones. During last 10 years it is proved that linear growth of children of early and preschool age depend on content of calcium in cortical layer of tubular bones. The original national standards of bone strength in children from birth to 16 years were developed to implement qualitative ultrasound analysis into pediatric practice. The sampling included 2854 examined children from period of newborn to 16 years. The study used ultrasound device Sunlight Omnisense (Israel). The indicators of bone strength were determined according speed of sound - SOS (m/sec) passing along cortical layer. The speed of sound is an integral value characterizing content of mineral in bone, structure of cortical level and its thickness. This method is distinguished by its high sensitivity and specificity, rapidity of application and low cost. The analysis provides values of bone strength and integral value (Z-score) expressed in units of standard deviation (SD) towards middle-aged standard of bone strength for children of the same age and gender. The original standards of bone strength ($M \pm m$) with regard to age and gender were developed. On the assumption of standards, children with decrease of speed of sound less than -1SD are referred

to risk group with decreasing of growth rate, skeleton size and insufficient content of mineral in cortical layer. The application of national standards made it possible to establish insufficient mineralization of tubular bones in 9.8% of newborns, 10.2% of children of first year of life, 10.8% of two-year-old children and in 12.5% of three-year-old children. Besides, it is proved that under value of speed of sound less than -1SD significantly more frequent low physical development and body height less than 10th percentile were observed ($p < 0,05$). This pattern is observed in older age and especially in children with severe chronic pathology effecting linear growth. Therefore, monitoring of age-related mineralization of bones using method of quantitative ultrasound examination makes it possible to form risk group with disorders of physiological processes of mineralization of skeleton and linear growth for benefit of practical significance.

Key words: *children, quantitative ultrasound examination, mineralization of skeleton, linear growth.*

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BROWN ADIPOSE TISSUE IN HUMANS: PRESENCE AND ACTIVITY

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Over the past 7 years the interest in brown adipose tissue (BAT) has increased dramatically due to several bright publications in which it was shown that active BAT is found not only in infants but also in 70–80% of adults. In animal models, the efficiency of BAT in the prevention of the obesity and type 2 diabetes has been proven. Therefore, when in January, 2012, a hormone IRISIN was discovered, which is produced by muscles during their activity and stimulates transformation of white fat cells into BAT cells or similar ones (“beige”ones), expectations have been raised on the use of certain therapeutic techniques for the increase in the amount of active BAT in adult humans. It is shown that the production of irisin in muscles occurs both at movement, and at thermogenic shivering in cold conditions. To date, it became apparent that there are at least three varieties of BAT, differing in origin (from different progenitor cells), in the ratio of active biochemical mechanisms and methods of activation. Moreover, it is clear that the amount of BAT in the body itself and even the content and activity of specific for BAT protein UCP1, uncoupling oxidation and phosphorylation, do not reflect the real functionality of the normalization of metabolic processes. It is likely (and this possibility has been widely discussed in the literature of the past two years) that, despite the unified mechanisms for energy dissipation, known today as 3 options BAT fundamentally differ in their function. According to one hypothesis, the original version of BAT, available in neonates and continuing in a small number of adults, provides thermal homeostasis; “Beige” version of BAT, formed under the influence of a muscle hormone irisin, is far more widespread and is involved in the maintenance of carbohydrate homeostasis and thus is a factor in the prevention of obesity and diabetes. The third option – “brite” – also, apparently, depends on the irisin influence, but is intended to solve the problem of homeostasis during intense muscular activity due to its ability to oxidize lactic acid. As far as the functioning of these options overlap and whether they can be compatible solutions for such different homeostatic problems is an issue to the further studies.

Key words: *brown adipose tissue; irisin; homeostasis; adult humans; functional activity*

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