THE RELATIONSHIP OF THE GENOMIC AND EPIGENOMIC PROFILE TO LIFESTYLE AND PHYSICAL ACTIVITY

P.Rogers*, N.Tsyba, K.Adaricheva, R.Bulbulian

School of Science and Technology, Nazarbayev University, Astana, Kazakhstan; *progers@nu.edu.kz

Physical activity, or lack thereof, has recently attracted a great deal of attention in the fields of genomics and clinical medicine. Our research group in 'Physical Activity and Sports Medicine' initiated a study to determine if a multidisciplinary research program was in fact indicated in view of the recent developments in our present understanding of the role of physical activity in health, disease and disease prevention. We first considered the following. Physical inactivity increases the relative risk of coronary artery disease by 45%, stroke by 60%, hypertension by 30%, colon cancer by 41%, breast cancer by 31%, Type 2 diabetes by 50%, and osteoporosis by 59%. Furthermore evidence is rapidly accumulating that physical inactivity increases dementia and is detrimental to scholastic (academic) performance in children. Our first objective was to select specific genomic and epigenomic sites that are known clinical markers for the diseases and disorders cited above. Our next objective was to determine what methodology we would employ to analyze the selected markers with respect to standard physiological parameters. Given the temporal and spacial complexity of the gene expression related to the impact of physical activity on the expression of specific disease genes, it was concluded that a new and novel data approach to data analysis would be required.

The method of analysis we have selected assumes the presentation of the data in the form object/attribute table, where the attributes will be measured numerically. Such table can then be uniquely associated with algebraic structure known in the mathematical literature as the Galois lattice. In turn, the Galois lattice can be presented by the series of association rules, expressing the causalities between attributes of the table. We conclude that this particular mathematical approach will contribute to our understanding of the mechanism(s) by which physical activity translates into such substantial health benefits.

In summary it would appear entirely clear that a dedicated and concerted effort by university researchers, a concerned national government, and clinicians will be required to ensure a healthy Kazakh population. The significance of this investigation, although in its initial stage, is to suggest that a major research investigation is required to reveal the mechanism by which physical activity remodels the human physiology and its genomics. Finally it is proposed that a major Physical Activity and Health Awareness/Education campaign will be necessary to obtain a significant impact on the health of the Kazakh nation. A program of this nature and magnitude would have a major economic impact on medical and health care expenditures. It is estimated that from multiple North American studies that the per capita saving from workplace health promotion programs is in the range of 1.88 to 3.92 USD per dollar spent on the program. It is reasonable to assume that similar savings with commensurate benefits could be achieved in Kazakhstan while generating millions in cost savings in national health care expenditures.