

How Genes Rule Endurance Training Induced Skeletal Muscle Tension?

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Purpose. Providing general tools to allow for monitoring athletes' physiological responses to endurance training on the basis of the underlying expression of genes derived from DNA microarray experiments.

Methods. Since genes and proteins do not function independent, but participate in complex, interconnected pathways, regulatory networks and molecular systems, taken together, give rise to the working of organisms, we need to adapt the confounding effects arising from the interaction between genes. With this requirement in mind, we have led to a system of fixed effect regression modeling, which is free of arbitrary effects due to the roles of shifts in the expression of genes. To demonstrate this approach, we have used fixed effect logistic regression modeling to study a gene expression model relating to endurance training-induced vastus lateralis muscle contraction.

Results. We first identify significantly differential expressed genes with endurance training-induced muscle contraction using fixed effect logistic regression, which effectively adapts the confounding effects arising from the interaction between genes. We next map key genes

onto acknowledged biochemical pathways to attain a linkage between key molecules and biochemical pathways with endurance training-induced muscle contraction in a cause-effect format.

A study of the gene expression model relating to endurance training-induced vastus lateralis muscle contraction exhibits the occurrence of complex carbohydrate, lipid and energy metabolisms, the transcriptional regulations of endurance training-induced vastus lateralis muscle contraction status, including the level of contractile force, tissue strength, plasticity and energy homeostasis, and the presence of the deleterious effects of oxygen from the metabolic reduction of the reactive oxygen species (ROS) excess promoting endothelial damage or dysfunction and atherosclerosis.

Conclusion. The approach described here can supply general tools to diagnose athletes' physiological responses to endurance training on the strength of the underlying expression of genes.