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Swimming improves metabolic syndrome by regulation insulin sensitivity and monosaccharide transporter proteins activity via NF-κB signaling pathway

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Objective Diabetes is one kind of metabolic diseases characterized by hyperglycemia and metabolic syndrome due to insulin secretion defects or/and biological function damage. Evidences have suggested that sports plays essential role in the progression of diabetes and affects insulin resistance and monosaccharide transporter proteins activity. The purpose of this study was to investigate relationship between sports and diabetes by evaluation the insulin sensitivity and monosaccharide transporter proteins activity.
Methods A db/db mice model of type-II diabetes mellitus was used to analyze the efficacy of swimming in the processes of glucose and insulin. Body weight, glucose metabolism and insulin serum levels were studied in experimental mice. Expression levels of inflammatory factors of IL-1, IL-17, TGF-β and VEGF in the serum was analyzed in the experimental mice. Expression levels of sirtuin-1 and NF-κB signaling pathway was investigate in the lives. Histological analysis was studied the therapeutic effects of swimming on mice with type-II diabetes.
Results Our results indicated that swimming up-regulated metabolism of glucose and insulin. Sport of swimming enhanced the consumption of fat and fatty acid in the mice with diabetes. In addition, expression levels of inflammatory factors of IL-1, IL-17, TGF-β and VEGF in the serum were down-regulated by swimming in the mice with diabetes. Toll-like receptor 4 (TLR4) and sirtuin-1 expression levels were up-regulated in the liver in the experimental mice after receive swimming. Furthermore, we observed that swimming improved insulin sensitivity and monosaccharide transporter proteins (MTP) activity in liver in the experimental mice after receive swimming. Histological analysis showed that TTLR4 and sirtuin-1 accumulation were significantly decreased in the live in mice treated by swimming. NF-κB activity and expression levels of p65,IKK-β and IκBα were up-regulated in the mice receiving swimming.
Conclusions In conclusion, these results indicate that swimming is beneficial for glucose and insulin metabolism for type-II diabetes mice, which further improves metabolic syndrome by regulation insulin sensitivity and monosaccharide transporter proteins activity via NF-κB signaling pathway.