Exercise Biochemistry Review

Proceedings of IBEC 2018, Beijing, China, October 23-25
PO-184

Effects of resistance training and aerobic training on Fibronectin of Skeletal Muscle Extracellular Matrix and Satellite Cell in Aging Mice

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Objective To investigate the effects of resistance and aerobic training on the content of fibronectin in skeletal muscle extracellular matrix and satellite cell in 9-month-old BALB/c mice, and then explore the effect of fibronectin content change on satellite cell and its intrinsic mechanism, which will provide a new research perspective and theoretical evidence for delaying sarcopenia.
Methods 27 one-month-old BALB / c mice of SPF grade were purchased and fed for natural aging. At 9 months of age, the mice were divided into three groups randomly. Group R was resistance exercise training group (n=9), group A was aerobic exercise training group (n=9), and group C was control group (n=9). The load ladder model for resistance training in group R, the pyramid training program for 9 week training, 5 sets of load ladder training every time. 2 min for rest between sets, 1 min for rest between repetitions, 3 times a week. The treadmill training for aerobic training in group A for 9 weeks, the speed of 0.8km/h, 40min every time, 3 times a week. There is no training in group C. During the training, mouse grip strength was tested by the BIOSEB grip instrument once a week. After exercise intervention, the blood of mice was taken from the eyeball, and the gastrocnemius muscles were removed and placed in -80℃ temperature refrigerator to be freezed for tested . Immunofluorescence was used to detect FN and Pax7; The Real-time PCR was used to detect mRNA of FN, Sdc4, Fzd7, Wnt7a, c-Jun, Pax7; Western Blotting was used to detect the FN, sdc4, Fzd7, Wnt7a, c-Jun, p-c-Jun, Pax7 protein content.
Results *(1) Body weight, grip strength and skeletal muscle mass of mice: The body weight of group C and group R were significantly decreased after 9 weeks to compared with group A (P <0.05; P <0.05). The grip strength of group R and A was significantly increased in the ninth week to compared with group C, (P <0.01; P <0.05); The grip strength of group R and A in the ninth week were significantly higher than that in the first week (P <0.01; P <0.01)*;
(2) FN in skeletal muscle extracellular matrix and it's receptor Sdc4: The integrated optical density (IOD) of FN in group R was higher than that in group C and group A, but there was no significant difference among the three groups. The FN mRNA in group R was significantly increased to compared with group A (P<0.05). The FN protein content in group R was significantly increased to compared with group C and group A (P <0.01; P <0.01). There was no significant difference in the expression of Sdc4 mRNA in gastrocnemius muscle among the three groups. Compared with group C, the Sdc4 protein content was significantly down-regulated in both group R and group A (P<0.01; P<0.05).
(3) Wnt7a/PCP signaling pathway: The Wnt7a mRNA and Wnt7a protein content in the gastrocnemius muscle of group R were significantly increased to compared with group C (P<0.05; P<0.01)). Compared with group A, Wnt7a protein content in group R was also significantly increased (P<0.05). There was no significant difference in Fzd7 mRNA in gastrocnemius muscle among the three groups; but the Fzd7 protein content in group R was significantly increased to compared with group A (P<0.05). The c-Jun mRNA in group R was significantly increased to compared with group C and A (P<0.05; P< 0.05). The content of c-Jun protein in group R was significantly increased to compared with group C and group A (P<0.01; P<0.01). The content of p-c-Jun protein in group R was significantly increased to compared with group C (P<0.05).

(4) Pax7 : The number of Pax7 positive cells in group R was higher than that in group C and group A, but there was no significant difference among the three groups. Pax7 mRNA in group R and group A were significantly lower than that in group C (P<0.05; P<0.01), but Pax7 protein content in group R was significantly higher than group C and group A (P <0.05; P <0.05)

Conclusions (1) Exercise can improve muscle strength of aging mice.

(2) Resistance training can promote FN in skeletal muscle extracellular matrix and improve skeletal muscle extracellular matrix components of aging mice.

(3) Resistance exercise training can promote Pax7 expression through the increase of FN and up-regulation of Wnt7a / PCP signaling pathway, thus make it possible for satellite cell proliferation.