Caloric restriction and High intensity training alters metabolic adaptation in different tissues.

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Intro: Caloric restriction (CR) is associated with a decline in basal metabolism rates while regular training promotes its increase. Both CR and training are known to induce global changes in energetic metabolism. The bioenergetic adaptation was investigated in rats with a long-term CR diet to those on a CR diet and a High Intensity Intermittent Training (HIIT) protocol to those with a regular diet and a HIIT protocol. Controls were sedentary.

M & M: Wistar rats were randomly divided into four groups of 6: Control (C), Training (Tr), Caloric Restriction (CR) and Calorie Restriction/Training (CR/Tr). CR was an every other day (EOD) feeding protocol. The HIIT protocol consisted of 10 weeks swimming 14 series of 20s each with a 10s rest between series 3 times a week.

Results & Discussion: Tr groups displayed a 90% increase in liver hexokinase (HK) activity than CR and the CR/Tr group a 136% increase in respect. In gastrocnemius muscle, HK activity was not affected by CR, but increased in CR & Tr. A six-fold increase in heart HK activity was observed in CR/Tr group. Training induced a reduction in the PFK content of muscle while in CR it slightly increased. High resolution oxigraphy showed that both Tr and CR protocols lead to an uncoupling effect in mitochondria of permeabilized muscles fibers (9-24% coupling reduction). NADH content was reduced in CR, Tr and CR/Tr groups in the heart (35-44%). In soleus muscle, NADH was reduced 16-29% in CR and increased 81% in Tr.

Conclusion: The results indicate that both CR and Tr can modulate glycolysis, mitochondrial metabolism and metabolic long-term signalization, but in different ways. In gastrocnemius and soleus, exercise diminished the effects of CR. Overall, the data suggests that adaptation and the signaling mechanisms to control metabolism are different for exercise and caloric restriction.

Key Words: Caloric Restriction, Energetic Metabolism and Training.

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