

# Mitochondria Scientific Study

## Quercetin Increases Brain and Muscle Mitochondrial Biogenesis and Exercise Tolerance

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Quercetin is one of a broad group of natural polyphenolic flavonoid substances that are being investigated for their widespread health benefits. These benefits have generally been ascribed to its combination of anti-oxidant and anti-inflammatory activity, but recent in vitro evidence suggests that improved mitochondrial biogenesis could play an important role.

However, the in vivo effects of quercetin on mitochondrial biogenesis exercise tolerance are unknown. We examined the effects of 7-days of quercetin feedings in mice on markers of mitochondrial biogenesis in skeletal muscle and brain, and on endurance exercise tolerance. Mice were randomly assigned to one of three treatment groups: placebo, quercetin 12.5mg/Kg, or quercetin 25mg/Kg. Following 7 days of treatment mice were sacrificed and soleus muscle and brain were analyzed for mRNA expression of PGC-1 $\alpha$  and SIRT1, and mtDNA and cytochrome c. Additional mice underwent a treadmill performance run to fatigue or were placed in voluntary activity wheel-cages and their voluntary activity (distance, time & peak speed) was recorded. Quercetin increased mRNA expression of PGC-1 $\alpha$  and SIRT1 ( $P < 0.05$ ), mtDNA ( $P < 0.05$ ) and cytochrome c concentration ( $P < 0.05$ ). These changes in mitochondrial capacity were associated with an increase in both maximal endurance capacity ( $P < 0.05$ ) and voluntary wheel running activity ( $P < 0.05$ ). These benefits of quercetin may have important implications for enhancement of athletic and military performance and if clinically translated may even extend to prevention and/or treatment of various chronic diseases characterized by mitochondrial dysfunction and inactivity.