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### Treadmill Running Ameliorates Alcohol-Induced Malfunctioning of Intra- and Extra-Mitochondrial Enzymes in Liver of Aged Rats

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**Objective** Alcohol consumption particularly at old age can cause severe liver damage through malfunctioning of vital organelles, including mitochondria. Exercise is known to improve the cellular functions against alcohol-induced adverse effects and oxidative stress. Nevertheless, whether exercise can promote mitochondrial function in old alcohol-fed rats remains unclear. In this study, we investigated the effect of exercise training on intra- and extra-mitochondrial enzyme activities in alcohol/ethanol treated rats.

**Methods** Young (3-month, n=24) and old (18-month, n=24) Wistar albino rats were equally divided into control, exercise, ethanol and combination of exercise plus ethanol treated groups. Following treadmill exercise (23 m/min, 30 min/day 5-day/wk) and ethanol (2 g/kg b.w.) treatment for 2 months, cytosol and mitochondrial enzyme activities, triglycerides and phospholipids were estimated in the liver of young and old rats.

**Results** We found ethanol intoxication significantly decreased ( $P<0.01$ ) the hepatic intra- and extra-mitochondrial enzyme activities, including glucose-6-phosphate dehydrogenase (G6PD), succinate dehydrogenase (SDH), malate dehydrogenase (MDH) and glutamate dehydrogenase (GDH) in both young and old rats. However, exercise training considerably reversed the loss of these enzyme activities, and further maintained above control levels in respective age groups. Restoration of mitochondrial marker enzymes (SDH and GDH) with exercise against ethanol-loss was prominent in young compared to old rats, which indicates old rats are prone to alcohol-induced adverse effects. Alcohol-induced elevated LDH levels in both ages were slightly decreased by exercise plus ethanol treatment. We further noticed that amplified triglycerides and phospholipids were substantially decreased following treadmill exercise in both age groups. Decreased triglycerides level with exercise was prominent in young alcohol-fed rats than that of old.

**Conclusions** Our results imply that 2-month treadmill exercise training effectively ameliorated the ruined cytosol and mitochondrial enzyme activities in young and old ethanol-fed rats. Improved mitochondrial enzymes and decreased triglycerides with exercise training may protect the alcohol-induced liver damage.