# Moderate Exercise Mitigates Inflammation, Liver Fat Accumulation and Liver Cancer in Mice

Mice that performed modest exercise were less likely to show signs of inflammation, cell aging and liver cancer.

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Adding a moderate amount of exercise to the daily routine of mice slowed down inflammation, fat accumulation in the liver and even tumor formation, according to study results reported in the Journal of Immunology.

Inflammation is known to be related to aging and chronic disease. Hepatitis B or C, non-alcoholic fatty liver disease (NAFLD) and other causes can trigger liver inflammation, which can lead to fibrosis, cirrhosis and the development of liver cancer.

Caroline Wilson, PhD, of Newcastle University in the United Kingdom, and colleagues set out to study how a moderate exercise regimen might impact inflammatory liver disease and the development of tumors in an established inflammation-driven aging mouse model.

Some 40% of these genetically altered mice develop liver tumors by age 20 months. At 19 months, they tend to display liver inflammation if sedentary, and the aging mice show steatosis, or liver fat accumulation. These mice also show a general decline in motor and cognitive function as well as overall body condition.

So the team used this aging mouse model to see whether three months of moderate exercise could slow down the development of liver disease and cancer. Sixteen-month old mice exercised on a treadmill for 30 minutes three times a week over a period of three months. Sedentary control mice were limited to normal activity in their cages.

The researchers found that only one mouse in the exercise group developed a liver tumor compared with 39% of those in the sedentary control group. They also found that mice that exercised had fewer liver cells that showed signs of cellular aging. So moderate levels of exercise appeared to be able to turn back the clock on cellular aging and tumor formation.

Of the mice that exercised, 31% showed no evidence of liver steatosis while the rest had low-

grade fat accumulation. In contrast, all sedentary mice developed steatosis, and 38% had severe steatosis.

Mice in the exercise group had mild liver inflammation, while those in the control group had substantial inflammation. The mice that exercised had much lower levels of inflammatory immune cells and cytokines compared with the sedentary mice. Moreover, the buildup of immune cells usually seen in the aging mouse model was reduced in the lungs and stomachs of mice from the exercise cohort. Overall, the researchers noted fewer molecular changes involved in lipid metabolism, oxidative damage and cellular aging in the mice that exercised compared with the sedentary mice.

The researchers saw no decline in the mice's activity levels or general body condition and no major changes in body weight or muscle mass after the addition of a moderate exercise routine.

"In this study, we report that interventional exercise alone, even at a modest intensity, is sufficient to ameliorate preestablished and progressively worsening inflammatory and metabolic pathologies that actively promote unhealthy aging and cancer," wrote the researchers.

Click here to read the full study in the Journal of Immunology.
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