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Eccentric Exercise in Rodents: Modeling Resistance Training for Translational Oncology Applications.

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Introduction: Exercise is a key factor in reducing cancer risk and improving care, with structured physical activity linked to reduced treatment-related toxicities, enhanced physical function, and better quality of life. Resistance training is specifically recommended to preserve or restore muscle mass and strength during chemotherapy-induced sarcopenia and functional decline; however, its influence on tumor biology and systemic treatment responses is not fully understood. While most preclinical research has focused on endurance modalities, there is a lack of studies investigating resistance training's underlying impacts. We implemented a model of eccentric (lengthening) muscle contractions in female rats to develop an effective preclinical paradigm for resistance exercise. Eccentric exercise offers high mechanical stimulus at a low metabolic cost, making it promising for oncology patients with limited capacity.

Methods: Obese, female Wistar Rats were randomized to eccentric exercise (Ex) or sedentary controls (Sed). The 8-week Ex protocol consisted of treadmill exercise at a 16° decline, simulating downhill hiking at a brisk walking pace. Rats trained three times per week, each session comprising six 5-minute bouts separated by 2-minute rest intervals.

Results: Exercise did not impact body weight, but significantly increased lean mass (qMR) and tended to increase quadriceps mass vs sedentary controls. Further molecular analyses of muscle hypertrophy and damage are ongoing.

Conclusion: These findings demonstrate that eccentric treadmill exercise is a feasible and effective resistance training model in rodents, resulting in increased lean muscle mass. Resistance training may offer distinct advantages in future translational oncology studies, providing beneficial effects with lower cardiorespiratory demand relative to endurance training. This preclinical framework provides the basis for further investigation into the role of resistance exercise in cancer care.

Keywords

Resistance training, exercise, rodent, preclinical

Conflict of Interest & Ethical Approval

yes

Abstract submitters declaration

yes

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