

Resistance training and its effect on the development of mammary tumors in MNU-induced Wistar rats

Jessica Silva¹, Tiago Azevedo¹, Abigaël Valada¹, Lara Anjos¹, Ana I. Faustino-Rocha^{2,3}, Paula A. Oliveira^{1,2}, José A. Duarte^{4,5}.

¹CITAB, Inov4Agro, Vila Real, Portugal; ²Department of Veterinary Science, University of Trás-os-Montes and Alto Douro (UTAD), Vila Real, Portugal; ³Department of Zootechnics, School of Sciences and Technology, CHRC, University of Évora, Évora, Portugal; ⁴CIAFEL, ITR Laboratory, Faculty of Sport, University of Porto, Porto, Portugal; ⁵TOXRUN-Toxicology Research Unit, CESPU, Gandra, Portugal.

Introduction

Mammary cancer is the most common cancer in women. Wistar rats have been generally recommended in experimental protocols to study mammary carcinogenesis. This outbred strain is very sensitive to chemical carcinogen agents, such as N-methyl-N-nitrosourea (MNU). According to many publications, physical activity improves body condition and may help in the breast cancer prevention. In order to evaluate the effects of resistance training in the mammary tumors' development, we evaluated several parameters such as, the latency period, total number of tumors *per* group, mean number of tumors *per* animal, mean volume and weight of tumor *per* group.

Materials and Methods

Twenty-five female Wistar rats were divided into four groups (n=7): Sedentary (SED); SED+MNU; Exercised (EX); and EX+MNU. SED+MNU and EX+MNU animals received an intraperitoneal injection of the carcinogen MNU (50mg/Kg), at seven weeks of age. Exercised animals were trained 3 days/week for 18 weeks, by climbing a 1-meter-high homemade ladder, 8-12 dynamic movements/climb and 4-8 climbs/session. Three animals (two from SED+MNU and one from EX+MNU groups) were humanely sacrificed before the end of the experiment and excluded from the study. All experiments were approved by the Ethics Committee and National Competent Authority. Data were analyzed using Microsoft Excel®.

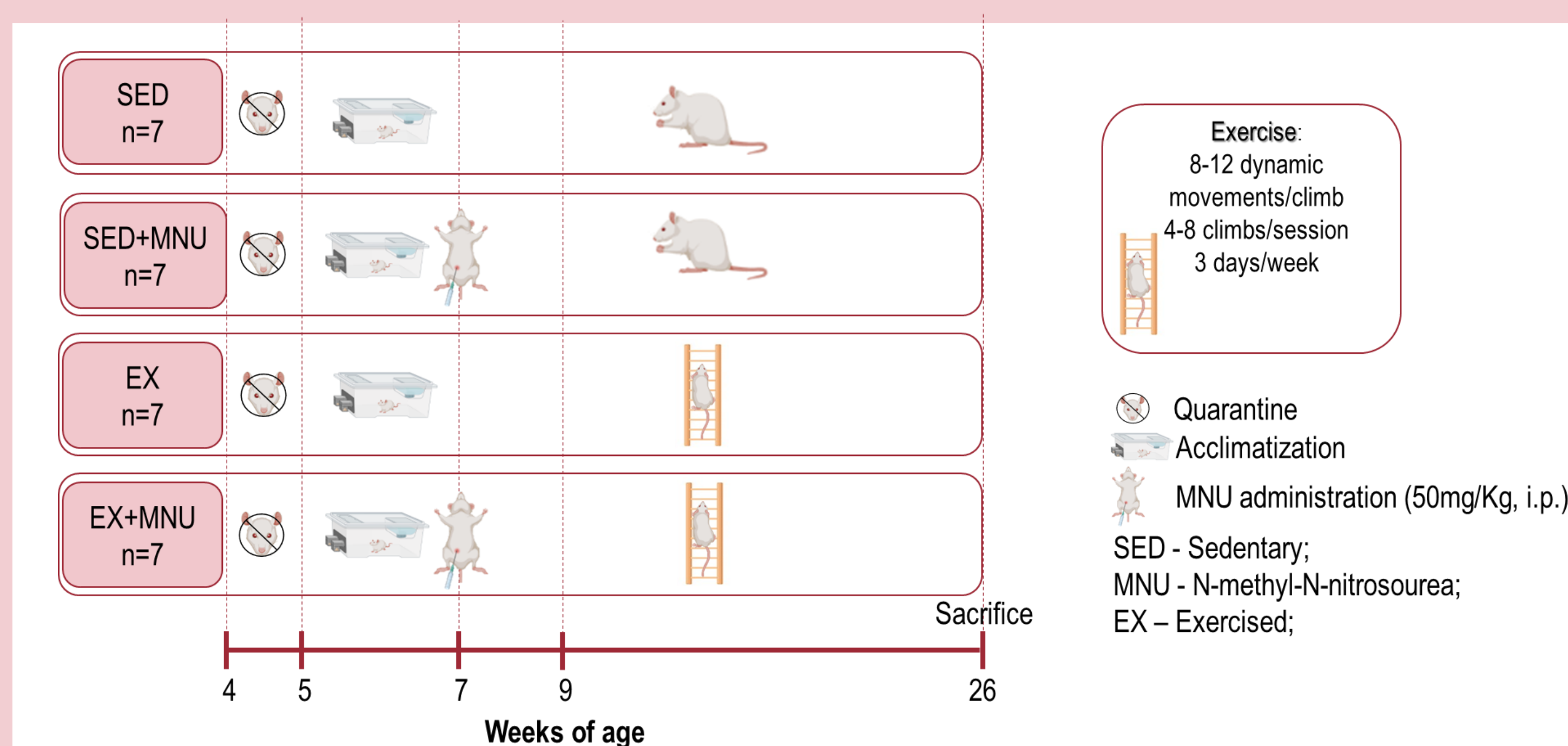


Fig.1 – Schematic representation of the experimental protocol.

Results

Animals from control groups (SED and EX) did not develop any mammary tumor. In order to ensure animals' welfare, two animals from SED+MNU group were sacrificed at twelfth and seventeenth weeks and one animal from EX+MNU was sacrificed at seventeenth week of the experiment. The first mammary tumor was detected at the tenth week after MNU administration in SED+MNU group. Two weeks later, EX+MNU developed the first mammary tumor. At the end of the experiment, we detected a total of four tumors in SED+MNU group (0.8 ± 1.17 tumors *per* animal) and 10 tumors in EX+MNU group (1.67 ± 2.87 tumors *per* animal). The average tumor volume was slightly higher in SED+MNU group (6.71 ± 6.28) when compared with EX+MNU group (6.43 ± 7.88). Despite this, the average tumor weight was higher in EX+MNU group (3.05 ± 0.98) when compared with SED+MNU (2.31 ± 1.95).

Table 1 – Effect of exercise on the development of mammary tumors.

Parameter	SED+MNU	EX+MNU
Latency period	10 weeks	12 weeks
Tumors <i>per</i> animal	0.8 ± 1.17	1.67 ± 2.87
Total number of tumors	4	10
Average tumor volume	6.71 ± 6.28	6.43 ± 7.88
Average tumor weight	3.05 ± 0.98	2.31 ± 1.95

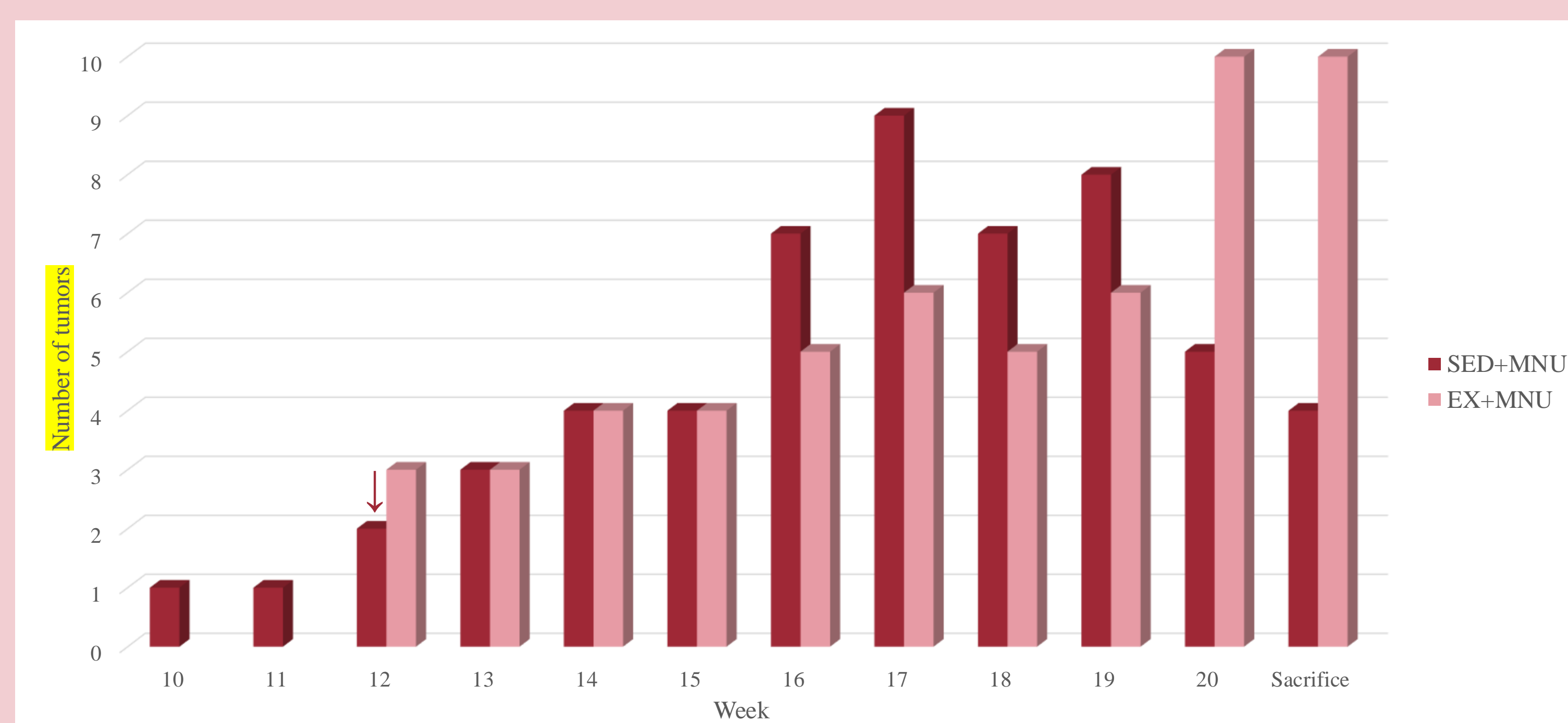


Fig.2 – Number of mammary tumors detected by palpation *per* week.

Conclusions

The difference of two weeks between the appearance of the first mammary tumor in the SED+MNU group and the EX+MNU group suggests that exercise effectively delays the appearance of mammary tumors by increasing the latency period. The higher number of tumors *per* animal and tumors' weight in EX+MNU group can be explained by the enhancement of blood perfusion caused by exercise activity. The disparity in the results obtained regarding the volume and weight of the tumor may be related to its histology, which is currently being analyzed.

Acknowledgments

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