

The effect of resistance training on hematological parameters: data from an animal model of mammary cancer

Silva J ^{1*}, Azevedo T ¹, Valada A ¹, Anjos L ¹, Faustino-Rocha AI ^{1,2}, Silvestre-Ferreira AC ³, Queiroga FL ^{3,4}, Oliveira PA ^{1,5}, Duarte JA ^{6,7}

¹ CITAB, Inov4Agro, Vila Real, Portugal; ² Department of Zootechnics, School of Sciences and Technology, CHRC, University of Évora, Évora, Portugal; ³ Associate Laboratory for Animal and Veterinary Science (AL4Animals), University of Trás-os-Montes and Alto Douro (UTAD), Vila Real, Portugal; ⁴ Animal and Veterinary Research Centre (CECAV), UTAD, Vila Real, Portugal; ⁵ Department of Veterinary Sciences, UTAD, Vila Real, Portugal; ⁶ CIAFEL, ITR Laboratory, Faculty of Sport, University of Porto, Porto, Portugal; ⁷ TOXRUN–Toxicology Research Unit, CESPU, Gandra, Portugal

*_silva_jessy@hotmail.com

Keywords: breast cancer, physical exercise, serum parameters

Breast cancer continues to be one of the main causes of death from cancer worldwide. Haematological analysis is not only useful to evaluate the animals' health status, but also for the diagnosis and to study the progression of several diseases, including cancer. This study aimed to evaluate the effects of resistance training on haematological parameters in a rat model of mammary cancer. Twenty-eight female rats were divided into four groups (n=7): Sedentary (SED); SED+N-methyl-N-nitrosourea (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. At necropsy, blood was collected by intracardiac puncture into an EDTA tube and kept at 4°C until the analysis. The following haematological parameters were evaluated using a haematology analyser (IDEXX ProCyte Dx Haematology system): red blood cells (RBC), haematocrit (HCT), haemoglobin (HGB), reticulocytes, leucocytes, neutrophils, lymphocytes, monocytes, eosinophils, basophils, and platelets. Data were analysed using SPSS and values were considered statistically significant at $p < 0.05$. Some significant differences in the haematological parameters were found among groups ($p < 0.05$). RBC (M/ μ L), HCT (%) and HGB (g/dL) were significantly higher in MNU+EX group when compared with the remaining groups ($p < 0.05$). Inversely, in the leukocyte formula, we noticed a lower percentage of neutrophils and lymphocytes in MNU+EX group when compared with non-exercised groups (SED and SED+MNU) ($p < 0.05$). The leucocytes were higher in MNU+EX group when compared with MNU group ($p > 0.05$). Reticulocytes, monocytes, eosinophils, and basophils were slightly lower in both EX groups, when compared with SD groups, but the difference did not reach the level of statistical significance ($p > 0.05$). Despite the increase in RBC, there was no decrease in HGB, suggesting that the animals, were not anaemic, even though the haematological effort caused by exercise and the tumour environment. Consistent with this information, no alterations were observed in the reticulocytes, indicating that immature RBCs were not being sent to the bloodstream. The leucocytosis observed in EX+MNU animals corresponds to a typical inflammatory response. The absence of neutropenia is suggestive of positive response of animals to exercise. These results suggest that resistance training can lessen the negative effects caused by mammary cancer.

Acknowledgements: This work was supported by FCT, under the projects UIDB/04033/2020 and LA/P/0126/2020, and the PhD grant 2020.07999.BD.