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Evaluation of total and free sialic acids as a potential biomarkers in canine neoplasia

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Citation

Biagini, L., Salvatori, N., Muollo, M.C., De Bellis, D., Maggiori, A., Masci, C., Gavazza, A., Rossi, G. Evaluation of total and free sialic acids as a potential biomarkers in canine neoplasia.

Sialic acids, of which Neu5Ac and Neu5Gc are the most representative, are a subset of α-ketoaldonic acids, often found as terminal residues in glycolipids and membrane glycoproteins. Neu5Gc synthesis is mediated by the enzyme cytidine monophospho-N-acetylneuraminic acid hydroxylase (CMAH), selectively inactivated in humans and other species during evolution. Nevertheless, Neu5Gc can be incorporated into tissues through dietary intake and function as a xeno-autoantigen, eliciting chronic inflammatory responses. This process, referred to as xenosialitis, may contribute to tumour development and progression. It has been displayed that serum levels of total sialic acid (TSA) can be altered in many types of cancer (e.g. ovarian cancer, breast cancer). This indicates that measuring serum levels of TSA and free sialic acids (FSA) is a valuable clinical tool with potential as a tumour marker

for diagnostic/prognostic purposes [1]. Conversely, information on this topic in relation to animals is limited [2]. Objective of this study is to determine the levels of circulating sialic acids in dogs with various types of tumours. The study included a total of 28 serum samples from dogs of various breeds and genders, equally divided into an oncological group and a healthy group. Serum samples were collected at the Veterinary Hospital of the University of Camerino, either during oncology consultations or from blood donors at the Veterinary Blood Transfusion Centre. The samples were analysed using an ELISA assay (MAK314, Sigma-Aldrich, St. Louis, MO), to quantify TSA and FSA levels. The data were analysed using the Mann-Whitney test after assessing the type of distribution (MedCalc® v.20.110 software package). The mean concentrations of both TSA (45.45 $\pm$ 22.81 vs 29.43 $\pm$ 5.71 mg/dL) and FSA (4.03 $\pm$ 1.24 vs 3.14 $\pm$ 0.60) in oncology patients were significantly higher than those in the control group ($p < 0.05$), regardless of the specific type of neoplasm. The neoplasms observed in this study were predominantly mast cell tumours (n = 5) and lymphomas (n = 4). The analysis revealed an outlier sample for the TSA concentration (129.64 mg/dL) in a case of lymphangiosarcoma, followed by a case of histiocytic sarcoma (63.50 mg/dL). Several studies have indicated that TSA concentration may act as a valuable biochemical marker for the detection of metastases, disease staging or assessment of treatment response, potentially in combination with other markers. In this instance, the data obtained indicate that the TSA and FSA may be regarded as a potential biomarker for the present neoplastic condition in dogs. Nevertheless, the limited sample size and the diversity of tumour types included in the study limit the interpretation of the results. Furthermore, it is not excluded that a significant elevation in TSA/FSA may not be observed during chronic inflammation, which can also be concomitant of a neoplastic condition. Therefore, further characterisation is required to validate this marker, particularly increasing the number of cases for each neoplastic type. Regarding the involvement of Neu5GC specifically, it is essential to direct greater attention towards Neu5Gc levels and Neu5Gc circulating antibodies.

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