LIPIDOMIC ANALYSIS OF THE ERYTHROCYTES MEMBRANE IN STORED CANINE PACKED RED BLOOD CELLS UNITS WITH AND WITHOUT LEUKOREDUCTION

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The leukoreduction (LR) of packed red blood cells units (pRBC) significantly reduces the accumulation of pro-inflammatory mediators (PIM) deriving from platelets and leukocytes that appear to be modifiers of biological response. In human medicine, it has been shown that PIM accumulate in stored pRBC despite the LR [1]. Some of that PIM have been implicated in the pathogenesis of multi-organ failure and of Transfusion Related Acute Lung Injury, experimentally induced by administering lipid derived from RBCs stored at 28 and 42 days [2]. Recently, lipidomic analysis (LA) has become an interesting topic of study also in the evaluation of RBC storage lesions [3].

The aim of this study was to perform a LA of the RBCs membranes of canine pRBC stored for up to 42 days, with and without LR.

Three donor dogs were used for collection of 450 ml of whole blood using a CPD-SAG-Mannitol transfusion bags with an LR filter *in-process*, to produce 2 pRBC for each donor, before (nLR pRBC) and after (LR pRBC) LR. The pRBC were stored in blood bank refrigerator at 4°C and 1 sample from each pRBC was removed aseptically at T0 and T42. LA evaluated a cluster of 10 fatty acids (FA), comprised of saturated (SFA), monounsaturated (MUFA) and polyunsaturated FA [PUFA (ω3 and ω6)] on each sample at 0 and 42 days, using Gas-Chromatography to obtain quantitative data as relative percentages of this cluster. All data were expressed as median (range) and compared by rank tests (MedCalc software, 12.6.1). Statistical significance was set at $P<0.05$.

The % of SFA, MUFA and PUFA in nLR pRBC membranes were 33.2 (32.9-35.1), 11.9 (9.4-16.8), 53.0 (50.3-57.4) at T0 and 30.7 (29.5-34.6), 11.7 (11.4-13.4), 57.6 (52.0-59.1) at T42, respectively; whereas the % in LR pRBC were 39.6 (27.8-41.2), 13.1 (12.4-17.9), 53.2 (46.3-54.3) at T0 and 32.4 (31.8-34.7), 10.8 (10.5-13.0), 55.2 (54.5-57.1) at T42, respectively. There were no significant difference in FA composition both between pRBC at T0 and T42, that between LR and nLR pRBC in the same time of storage.

Our preliminary data show that the LR does not modify the lipidomic profile of stored RBCs in dogs. In human blood, accumulation of ω6 PUFA in RBCs after 42 days of storage was reported [1] and it could indicate a potential increased susceptibility to oxidative damage due to the PUFA increase in RBCs membranes. A similar increase in canine blood was not detected probably due to the small sample size in our study. LA monitoring of the canine RBCs membranes could be a potentially useful tool for assessing storage lesions. An increase of the case studies is needed to confirm or disprove the trend observed in this first preliminary study in veterinary medicine.

[1] Fu X. et al. Bioactive lipids accumulate in stored red blood cells despite leukoreduction: a targeted metabolomics study, Transfusion, 56:2560-70, 2016. [2] Silliman C.C. et al. The accumulation of lipids and proteins during red blood cell storage: the roles of leucoreduction and experimental filtration, Blood Transfus, 15:131-6, 2017. [3] Timperio A.M. et al. Red Blood Cell Lipidomics analysis through HPLC-ESI-qTOF: application to red blood cell storage, JIOMICS, 3:11-24, 2013.