

EVALUATION OF THE ERYTHROCYTE MEMBRANE LIPIDOME PROFILE IN HEALTHY DOGS AND ASSESSMENT OF THE POTENTIAL ROLE AS DIAGNOSTIC TOOLS IN CANINE DIABETES MELLITUS AND CHRONIC ENTEROPATHY

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Analysis of red blood cells (RBC) membrane lipidome represents a powerful diagnostic tool in humans for assessing the quantity and quality of fatty acids and for the follow-up of the membrane remodeling under physiological and pathological conditions [1], however a systematic study to evaluate membrane homeostasis in dogs has not yet been established. The aim of this study was to compare RBC membrane lipidome profiles of healthy dogs (HD, n=17) with dogs newly diagnosed with diabetes mellitus (DM, n=6) and dogs with chronic signs (i.e. >3 weeks) of enteropathy (CE, n=6). All dogs receiving dietary ω 3 supplementation were excluded from the study.

The RBC membranes were isolated from EDTA-treated blood and a cluster made of 10 saturated [SFA (palmitic; stearic)], monounsaturated [MUFA (palmitoleic; oleic; vaccenic)] and polyunsaturated [PUFA (linoleic; dihomogamma-linolenic; arachidonic; EPA; DHA)] fatty acids was determined by Gas-Chromatography.

The HD were 5 males (1 neutered) and 12 females (3 sterilized), with a median age of 38 months (2-98); DM dogs were 2 males and 4 females (2 sterilized), with a median age of 120 months (96-158), and all CE dogs were male (2 neutered) with a median age of 81 months (12-126).

In HD SFA, MUFA and ω 6 levels were close to each other, while the ω 3 values showed a wider variability (mean 1.67%; SD 0.91%).

The RBC fatty acid-based membrane lipidome profiles in DM and CE dogs compared to HD showed different trends connected to metabolic transformations along the fatty acid pathways.

The CE dogs had decreased levels of palmitic acid ($p<0.01$) and higher stearic acid ($p<0.01$) whereas DM did not show significant changes in these values, compared to HD.

The MUFA levels were interestingly diverse in the two health conditions: higher in DM ($p<0.01$) and lower in CE ($p<0.05$) compared to HD. In particular, CE dogs had lower levels of palmitoleic ($p<0.05$) and vaccenic acids ($p<0.01$), while DM dogs showed an increased content of palmitoleic ($p<0.01$) and oleic acids ($p<0.01$).

As regards of ω 6-PUFA, only in DM arachidonic acid levels differed if compared to the HD, in particular lower levels were observed ($p<0.01$). ω 3-PUFA levels were increased only in DM dogs in comparison to HD, both for EPA ($p<0.05$) and DHA ($p<0.05$) values.

These preliminary data have clear limitations as for the sample size, the lack of data in geriatric healthy dogs and the lack of retrospective diagnosis of disorders associated with the chronic enteropathy. The variability of ω 3 values found in erythrocyte membranes of healthy dogs, can be probably due to the individual dietary variations. However, it can be preliminarily observed that the SFA-MUFA pathway shows significant involvement in canine diabetes mellitus, with a higher palmitic-palmitoleic and palmitic-oleic transformations due to an accelerated delta-9 desaturase enzymatic activity. On the other hand, CE dogs showed increased levels of stearic, and decreased palmitoleic and vaccenic acids suggesting an activation of elongation pathway, leading to profound changes of membrane fluidity and permeability properties.

In conclusion, erythrocyte membrane lipidome of dogs may be successfully applied in veterinary medicine, providing important information of different profiles under normal and pathological conditions.

[1] Ferreri C. Chatgialloglu C. Role of fatty acid-based functional lipidomics in the development of molecular diagnostic tools. *Expert Rev Mol Diagn*, 12(7):767–780, 2012