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The erythrocyte membrane lipidome in dogs with chronic enteropathy



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INTRODUCTION

Chronic enteropathies (CE) are common cause for persistent or recurrent gastrointestinal signs in dogs. Food Responsive Enteropathy (FRE), Antimicrobial Responsive Enteropathy (ARE), and Immunosuppressive Responsive Enteropathy (IRE) have different etiologies however clinical signs overlap and distinguishing among these disorders may be challenging with the most reliable diagnostic tool represented by sequential treatment using diet, antimicrobials, and immunosuppressive drugs.

Analysis of erythrocyte membrane lipidome represents a powerful tool in humans for assessing the quantity and quality of fatty acids (FA) and the follow-up of the membrane FA remodeling under physiological and pathological conditions. The aim of this study was to compare the FA membrane profile of healthy dogs (HD, n=68) with 29 dogs with CE (i.e. >3 weeks). Dogs receiving dietary ω 3 supplementation were excluded from the study.

MATERIALS & METHODS

Erythrocyte membranes were isolated from EDTA-treated blood and a cluster of 10 FA, i.e. saturated [SFA (palmitic; stearic)], mono-unsaturated [MUFA (palmitoleic; oleic; vaccenic)], polyunsaturated [ω -6 (PUFA- ω 6): linoleic, dihomo-gamma-linolenic, arachidonic and ω -3 (PUFA- ω 3): eicosapentaenoic and docosahexaenoic] FA, was determined by Gas-Chromatography. Results are referred as % of one FA in the cluster. Relevant lipid parameters (SFA/MUFA, SFA/PUFA, ω 6/ ω 3, PUFA balance, unsaturation and peroxidation indexes) were calculated.

RESULTS

HD dogs were 30 males (6 neutered) and 38 females (12 sterilized) with a median age of 41 months (2-156), while CE dogs were 20 males and 9 females (4 sterilized) with a median age of 43 months (10-114). Among CE dogs 11 were diagnosed with FRE, 1 ARE, 6 IRE, while 11 are undergoing diagnostic trials or were lost to follow-up. Diminished value of palmitic acid ($p<0.0001$) and increased value of stearic acid ($p<0.0001$), with decreased total SFA ($p<0.05$) were observed in CE group. Among PUFA- ω 6, CE dogs showed increased values of dihomo-gamma-linolenic ($p<0.001$) and arachidonic ($p<0.05$) acids, while no differences were observed in PUFA- ω 3 levels between the two groups (Figure 1). Unsaturation ($p<0.05$) and peroxidation ($p<0.05$) indexes were found significantly increased in CE dogs (Figure 2). Interestingly, dogs with FRE and IRE dogs had similar erythrocyte membrane lipidome profiles; ARE was not object of statistical analysis, due to the low number of dogs in this group.

CONCLUSIONS

These results point out the importance of the balance between pro-inflammatory arachidonic acid and the anti-inflammatory dihomo-gamma-linolenic acid levels in the inflammatory conditions of CE.

The erythrocyte membrane lipidome of dogs may be successfully applied in dogs with CE, providing important information leading to personalized intervention targeted to decrease inflammation and increase protective components.

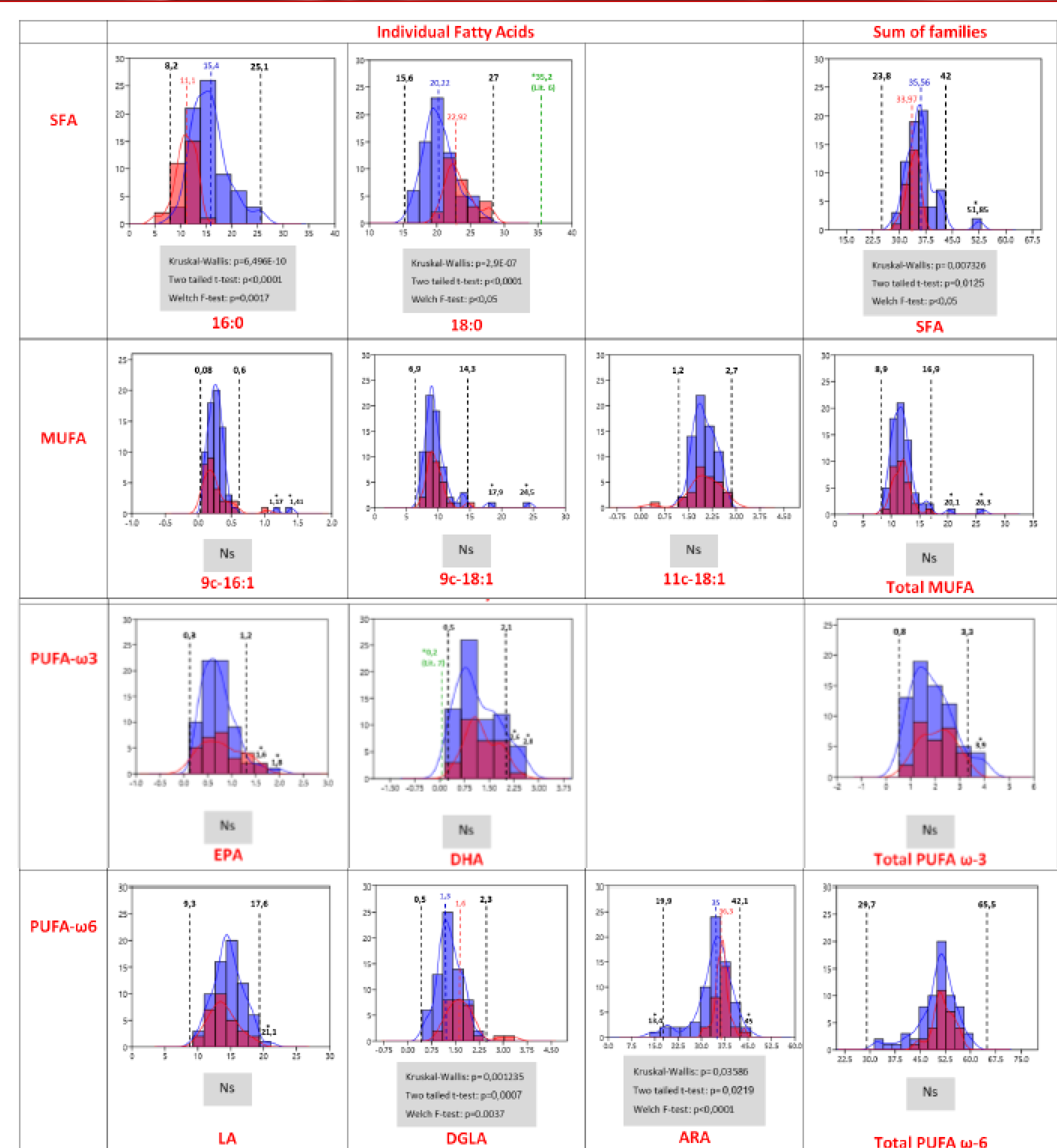


Figure 1. Distribution of each fatty acid and its respective family for Dogs with Chronic Enteropathy (n=29) and significances found (with p-value) when compared to the intervals of the analysis on the Healthy Dogs (HD, n=68).

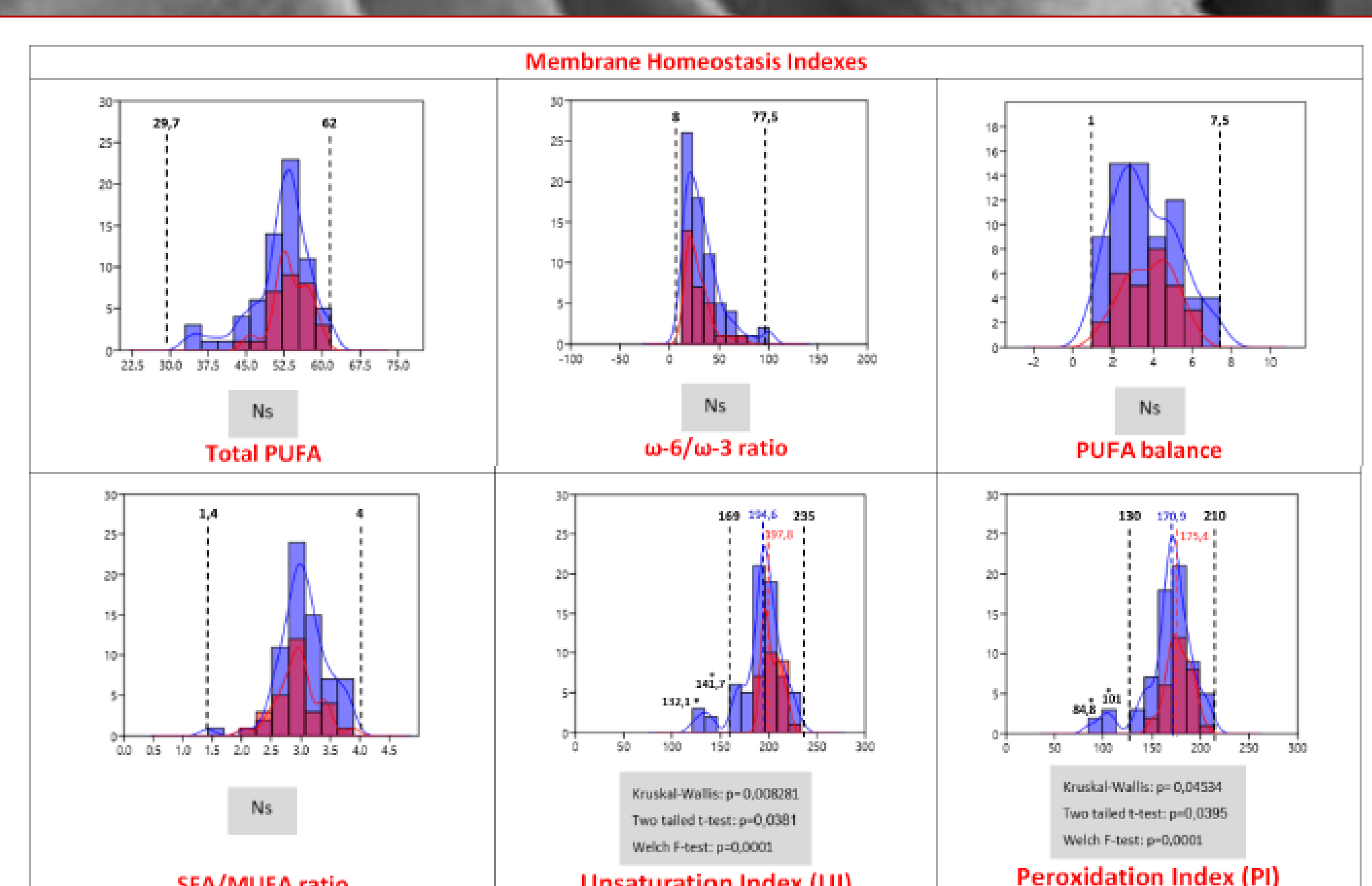


Figure 2. Distribution of the total PUFA and the membrane homeostasis indexes for Dogs with Chronic Enteropathy (n=29) and significances found (with p-value) when compared to the intervals of the analysis on the Healthy Dogs (HD, n=68)

Healthy Dogs Dogs with Chronic Enteropathy