The interface between fatty acid composition of platelet membrane and platelet-leukocyte aggregates formation during stress

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Objective

Platelet-leukocyte aggregates (PLAs) are associated with a range of acute and chronic thrombo-inflammatory conditions. Platelet phospholipid membrane is also extremely susceptible to peroxidation, so prolonged stress has a synergistic effect on above mentioned injuries. Therefore, the aim of our study was to evaluate the interface between platelet phospholipid membrane fatty acids (FAs) composition and formation of PLAs under psychological stress.

Methods

In this study ten Wistar rats were on a diet with extra omega (ω) 9 FA for a month. Half of the time subjects underwent psychological stress. Then the same rats were on a diet with extra ω3 and ω6 FAs for the next four weeks with a fortnight stress as well. FA methyl esters of platelet phospholipid membrane of ten rodents were identified by gas chromatography/mass spectrometry while PLAs were analyzed by whole blood flow cytometry. The composition of platelet phospholipid membrane FAs was compared to the percentage of PLAs' formation of test animals during stress and stress-free periods.

Results

The total sums in percentage of saturated FAs and ω3 FAs separately were statistically significantly higher in platelet phospholipid membrane of rats consuming extra ω3/ω6 FAs than extra ω9 FA in stress-free period (median: 82.12 *vs* 76.77, **p = 0.009766**; 3.745 *vs* 1.705, **p = 0.04883**). Whereas the level of monounsaturated FAs was lower (median: 9.145 *vs* 14.53, **p = 0.01367**). The percentage of platelet and monocyte aggregates' formation was statistically significantly higher in ω3/ω6 FAs stress-free group than in ω9 FA stress group of our study laboratory animals (median: 2.65 *vs* 1.25, **p = 0.001953**).

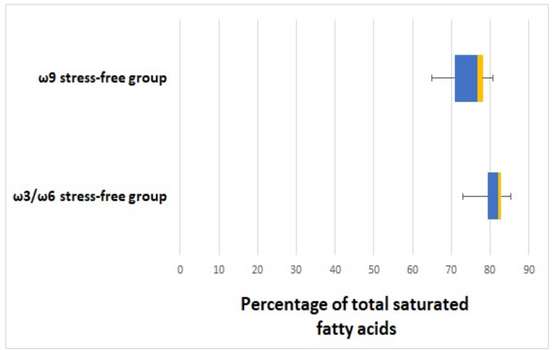

Fig. 1. Box plots represent a comparison of the percentage of total saturated fatty acids in platelet phospholipid membrane between ω9 and ω3/ω6 stress-free groups.
P = 0.009766; N = 10.

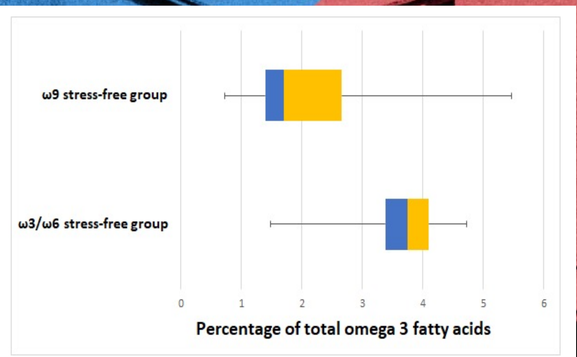

Fig. 2. Box plots represent a comparison of the percentage of total omega 3 fatty acids in platelet phospholipid membrane between ω9 and ω3/ω6 stress-free groups.
P = 0.04883; N = 10.

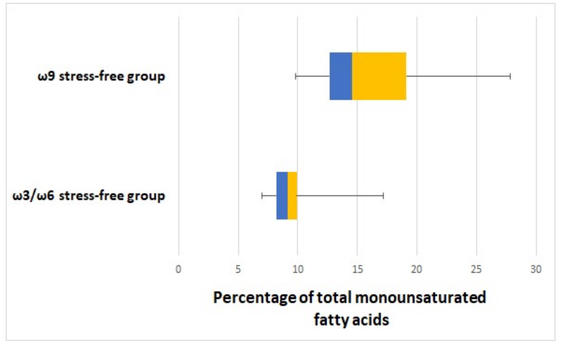

Fig. 3. Box plots represent a comparison of the percentage of total monounsaturated fatty acids in platelet phospholipid membrane between ω9 and ω3/ω6 stress-free groups.
P = 0.01367; N = 10.

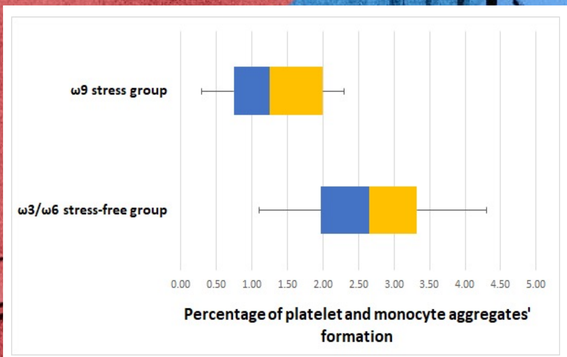

Fig. 4. Box plots represent a comparison of the percentage of platelet and monocyte aggregates' formation in whole blood between ω9 stress group and ω3/ω6 stress-free group.
P = 0.001953 ; N = 10.

Conclusions

After a period of stressful conditions, platelets may increase synthesis and incorporation of polyunsaturated FAs in platelet phospholipid membrane and that could potentially influence platelet activation in the future.

Key words

Platelet membrane, platelet-leukocyte aggregates, stress.