Omega-3 polyunsaturated fatty acids- can they decrease risk for ventricular fibrillation?

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Background: Reports, including ours, indicate that lower omega-3 (ω-3) index accompanied by cardiac extracellular and myocardial connexin-43 remodelling and enhanced autoantibody production to the adrenergic beta-1 receptors (b1-AAB) are implicated in development of heart failure and increased incidence of lethal arrhythmias. Based on these results we aimed to explore the effect of ω-3FA supplementation on ω-3 index, b1-AAB, matrix metalloproteinases (MMP), connexin 43 (Cx43) and susceptibility to arrhythmias in aged male (♂) and female (♀) spontaneously hypertensive rats (SHR).

Methods: 1 year-old SHR and age-matched healthy Wistar rats (WR) fed with ω-3FA (Vesteralens, Norway, EPA+DHA 200mg/day/2month) were compared with untreated rats. Gas chromatography was used for determination of red blood cells ω-3FA and ω-6FA composition. Blood serum was used for the detection of b1-AAB. Left ventricular tissue was taken for examination of MMP-2 activity using zymography; Cx43 expression and its cellular distribution using Western blot and immunohistochemistry. Susceptibility to electrically-induced ventricular fibrillation (VF) was tested using Langendorff-perfused heart.

Results: Compared to healthy WR ω-3 index was lower in both ♂ and ♀ SHR. This parameter was significantly increased due to ω-3 FA intake in both sexes of SHR. ♂ and ♀ SHR also exhibited a significant increase of serum levels of b1-AAB, activity of MMP2, down-regulation and miss-localisation of Cx43. It was associated with higher incidence of VF. ω-3FA intake resulted in significant decrease of b1-AAB levels and MMP2 activity, upregulation of Cx43 and partial elimination of Cx43, its miss-localisation in both ♂ and ♀ SHR. Moreover, ω-3FA decreased incidence of electrically-induced VF.

Conclusions: These findings suggest multiple cardio-protective effects of omega-3 intake that can contribute to decreased susceptibility of the hypertensive rat heart to lethal arrhythmias.