

### Effect of dietary fish oil (MAXEPA) supplementation on non-esterified fatty acid composition and content of porcine myocardium

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Cardiac arrhythmia is the most common cause of sudden cardiac death. Experimental studies have established that diets high in n-3 fatty acids from fish oil prevent cardiac arrhythmias induced by ischaemia (1). Different mechanisms have been suggested to explain the prophylactic effect of fish oil n-3 fatty acids. Increased levels of myocardial non-esterified fatty acid (NEFA) observed in experimental animals subjected to ischaemia is believed to be a major factor that determines the vulnerability of the heart to develop arrhythmias (2). The diet modified fatty acid content and composition of myocardial NEFA is also implicated in the activation of Ca<sup>++</sup> channels thereby triggering arrhythmias. This study attempts to examine this mechanism by comparing the non-esterified fatty acid composition of ischaemic and non-ischaemic porcine myocardium.

Two groups of four pigs (female, 10 week old) were fed diets supplemented with beef tallow (5%) and fish oil (5%) respectively. At the end of six weeks, the animals were anaesthetised, heart exposed and ischaemia induced by occluding the left anterior descending artery. Sections of non-ischaemic and ischaemic myocardium were rapidly excised and frozen immediately in liquid nitrogen. Tissue lipids were extracted and fractionated by thin layer chromatography on silica gel plates. The non-esterified fatty acid fractions were methylated using boron trifluoride and analysed by gas chromatography using nonadecanoic acid (C19:0) as the internal standard. Total fatty acids, saturated, monounsaturated, n-6 and n-3 fatty acids in the non-ischaemic and ischaemic tissue of the two groups were compared.

	Beef Tallow (n=4)		Fish oil (n=4)	
	Non-ischaemic	Ischaemic	Non-ischaemic	Ischaemic
Total fatty acids (mg/g)	20.94 ± 3.60	22.58 ± 2.45	27.22 ± 1.89	35.63 ± 5.08
SFA (mg/g)	5.95 ± 1.08	6.64 ± 0.58	7.56 ± 0.34	9.50 ± 1.54
MUFA (mg/g)	7.15 ± 1.31	7.59 ± 0.96	6.36 ± 0.47	8.16 ± 1.31
n-6 FA (mg/g)	6.71 ± 2.34	7.17 ± 1.88	5.50 ± 0.58	7.02 ± 0.91
n-3 FA (mg/g)	1.13 ± 0.13 <sup>a</sup>	1.18 ± 0.13 <sup>a</sup>	7.80 ± 0.60 <sup>b</sup>	10.95 ± 1.37 <sup>b</sup>

a & b significant P<0.001 (ANOVA)

The result of this study indicates that n-3 fatty acids are incorporated into the NEFA fraction of the porcine myocardium after six weeks of MAXEPA supplementation in both the ischaemic and non-ischaemic portions. The total NEFA tends to be higher in the ischaemic sections both in the beef tallow and fish oil supplemented animals but the difference was not statistically significant (P>0.05). From the results obtained, it is evident that the NEFA content and composition may be affected by diet treatment and by inducing ischaemia. This data will be discussed in the light of the role of NEFA in cardiac arrhythmias and the effect of dietary fat manipulation.

1. Billman GE, Hallaq H, Leaf A. Prevention of ischaemia induced ventricular fibrillation by n-3 fatty acids. Proc Natl Acad Sci 1994;91:4427-30.
2. McLennan PL. Relative effects of dietary saturated, monounsaturated, and polyunsaturated fatty acids on cardiac arrhythmias in rats. Am J Clin Nutr 1993;57:207-12.