THE RELATIONSHIP BETWEEN LINOLEIC ACID LEVEL IN SERUM, ADIPOSE TISSUE AND MYOCARDIUM IN HUMANS

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Analysis of population trends in dietary consumption suggests an inverse relationship between dietary levels of polyunsaturated fatty acids and mortality from coronary heart disease (CHD) (Hetzel et al. 1989). The finding that the fatty acid composition of adipose tissue is a good indicator of dietary fatty acid intake (van Stavaren et al. 1986) has resulted in a number of epidemiological studies using adipose tissue samples to confirm the inverse relationship between dietary levels of linoleic acid and risk of mortality from CHD (Riemersma et al. 1986). A recent study has shown an inverse relationship between levels of linoleic acid in adipose tissue and risk of sudden cardiac death (Roberts et al. 1993). Given the association between dietary fat, adipose tissue fatty acid composition and the risk of sudden cardiac death, it is important to establish whether dietary linoleic acid, as reflected in levels of linoleic acid in adipose tisue, correlates with linoleic acid levels in human myocardium.

A cross-sectional study of 80 consecutive cases at necropsy was undertaken to determine the relationship between linoleic acid in the serum, adipose tissue and myocardium of humans. The sample consisted of 55 males and 25 females aged seven to 92 years who had died from cardiac and non-cardiac causes in the Southern Region of Tasmania. Fatty acids were extracted from samples of serum, adipose tissue and myocardium and separated using capillary gas liquid chromatography. Means and standard deviations were calculated for each other main fatty acids in the three tissues studied. In serum and adipose tissue, there were significantly higher levels of linoleic acid ($p<0.001$ and $p<0.001$ in serum and adipose tissue, respectively) and total n-6 fatty acids ($p<0.002$ and $p<0.001$ in serum and adipose tissue, respectively) and significantly lower levels of oleic acid in females than in males (p,0.001 and $p<0.05$ in serum and adipose tissue, respectively). In myocardium, there were significantly higher levels of oleic acid ($p<0.05$) and linoleic acid ($p<0.001$) and significantly lower levels of arachidonic acid ($p<0.001$) and docosapentaenoic acid ($p<0.02$) in females than males. Total n-3 fatty acids in myocardium were significantly lower in females ($p<0.001$) resulting in significantly higher ratio of total n-6 to total n3 fatty acids in females ($p<0.001$). Highly significant Pearson correlations were found between levels of linoleum acid in adipose tissue and myocardium ($p<0.0001$), between adipose tissue and serum ($p<0.001$) and between serum and myocardium ($p<0.001$). The proportion of total polyunsaturated fatty acids in the myocardium was inversely related to the proportion of monounsaturated fatty acids ($p<0.001$) and inversely related to the proportion of saturated fatty acids ($p<0.001$). There was a significant positive correlation between the ratio of linoleic acid to linolenic acid in all three tissues. This study showed that there was a very strong relationship between the level of linoleic acid in adipose tissue and myocardial tissue, which suggests that dietary linoleic acid influences the level of myocardial linoleic acid. These findings support the hypothesis that dietary linoleic acid has a direct influence on myocardial membrane linoleic acid levels.

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