



Heart rate variability and long chain n-3 PUFA dietary intake and status: a comparison between matched vegans and omnivores

A.M. Pinto, H.K. Al Khatib, T.A.B. Sanders and W.L. Hall

Diabetes & Nutritional Sciences Division, Faculty of Life Sciences & Medicine, King's College London, Franklin Wilkins Building, 150 Stamford Street, London, SE1 9NH

Heart rate variability (HRV) refers to a range of parameters that reflect variability in interbeat intervals (IBI), and is an indirect measure of cardiac autonomic function. Low HRV is a powerful predictor of sudden cardiac death⁽¹⁾. HRV has been positively associated with long chain n-3 PUFA tissue content, mainly docosahexaenoic acid (DHA), which is a component of myocardial membranes⁽²⁾. We hypothesise that lower n-3 PUFA status in vegan subjects, whose diets are devoid of eicosapentaenoic acid (EPA) and DHA, might be associated with lower HRV compared to omnivores. This cross-sectional study aimed to compare HRV between non-smoking vegans and sex/age/BMI-matched omnivores (40–70 y).

Measurements of 24 h HRV were made using Actiheart monitors (CamNtech Ltd, Cambridge, UK). The Actiheart device provides IBI data of similar quality to a Holter monitor but also records movement using an accelerometer. The following 24 h HRV parameters (frequency and time domain) are reported adjusted for age, sex, BMI and physical activity: SDNN is an estimate of overall variability; SDANN and very low frequency (VLF) power indicate longer-phase variability. Plasma and erythrocyte fatty acid composition were analysed by GC-MS and a food frequency questionnaire was used to estimate dietary fatty acid intake.

	Omnivore (n = 24)	Vegan (n = 23)	Mean Δ	95 % CI	P value [†]
Erythrocyte fatty acid composition (weight %)					
LA	11.7 (11.0, 12.3)	13.3 (12.5, 14.1)	1.64	(0.64, 2.64)	0.002
ALA ^b	0.34 (0.26, 0.45)	0.32 (0.27, 0.38)	0.07	(-0.20, 0.08)	0.610
EPA	1.26 (1.07, 1.45)	0.67 (0.52, 0.81)	-0.59	(-0.83, -0.36)	< 0.001
DHA ^b	4.19 (3.63, 4.83)	2.07 (1.85, 2.32)	-2.27	(-2.86, -1.67)	< 0.001
Dietary fatty acid intake (%E)					
LA	3.2 (2.8, 3.6)	6.4 (5.0, 7.8)	-3.2	(-4.6, -1.8)	< 0.001^a
ALA	0.29 (0.25, 0.32)	0.92 (0.25, 1.59)	-0.64	(-1.27, 0.00)	0.017^a
EPA	0.07 (0.06, 0.09)	0.00 (0.00, 0.00)	0.07	(0.06, 0.09)	< 0.001^a
DHA	0.30 (0.20, 0.41)	0.00 (0.00, 0.00)	0.30	(0.19, 0.41)	< 0.001^a
HRV measurements (24 h)					
IBI (ms)	834 (791, 877)	795 (750, 840)	-38	(-103, 26)	0.237
SDNN (ms)	144 (129, 158)	167 (152, 182)	23.6	(1.9, 45.3)	0.034
SDANN (ms)	125 (111, 134)	154 (140, 169)	29.4	(8.4, 50.4)	0.007
VLF (ms ²) ^b	12308 (10142, 14932)	17588 (14360, 21538)	6027	(1102, 10953)	0.017

Results expressed as mean (95 % CI). ALA, α-linolenic acid; EPA, eicosapentaenoic acid; LA, linoleic acid ^aUsing Mann-Whitney U test. ^bGeometric mean. [†] Using independent samples t-test.

SDNN, SDANN and VLF were significantly higher in vegans. There were no differences in HRV parameters reflecting shorter-phase variability. The proportions of both EPA and DHA in erythrocyte membranes and plasma were significantly lower in vegans whereas LA was significantly higher. Although there was no difference in ALA in erythrocytes, the proportion of total plasma fatty acids as ALA was significantly higher in vegans (mean difference 0.23 %wt; 95 % CI 0.06,0.41).

These data disprove the hypothesis that vegans would have reduced HRV linked to their lower long chain n-3 PUFA status. In fact, vegans had increased parameters of overall and longer-term HRV compared to omnivores. This suggests that other factors associated with a vegan diet and overall lifestyle might offset the cardiovascular autonomic consequences of low EPA + DHA tissue status.

1. Malik M, Bigger JT, Camm AJ *et al.* (1996) Task Force of the European Society of Cardiology, and the North American Society of Pacing, and Electrophysiology. *Circulation* **93**, 1043–1065.
2. Christensen JH, Svensson M, Strandhave C *et al.* (2010) N-3 Fatty acids and cardiac autonomic function in humans. *Cell Mol Biol* **56**, 131–139.

