EPA prevents insulin resistance and glucose intolerance in mice fed a high fat-high sucrose diet

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EPA PREVENTS INSULIN RESISTANCE AND GLUCOSE INTOLERANCE IN MICE FED A HIGH FAT-HIGH SUCROSE DIET

TEAM : CONTROL OF LIPIDO-ENERGETIC HOMEOSTASIS AND OBESITY

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Introduction:

Insulin resistance (IR) is a key feature of obesity. IR favors the progression of metabolic syndrome (MetS), increases the risk of type 2 diabetes and cardiovascular diseases. IR results from metabolic dysfunctions caused by ectopic fat depots in the liver and skeletal muscle when adipose tissue storage capacity is exceeded. Nutritional strategies using n-3 PUFA were proposed to prevent IR and MetS associated to obesity by unclear mechanisms.

Objectives:

The aim of the present work was to compare the effect of ALA, EPA and DHA on insulin resistance and metabolic dysfunctions during a high fat (HF)-high sucrose (HS) challenge.

Materials & Methods :

C57BL6 and Ob/Ob mice were fed a HF (45% energy)-HS (17% energy) diet without or with 1% energy replaced by ALA, EPA or DHA for 16 and 6 weeks respectively. IR was evaluated by intraperitoneal (ip) injection of insulin followed by monitoring of glycaemia over 2 hours. Glucose tolerance was similarly assessed using glucose injection. Fatty acid composition of tissues was determined by gas chromatography.

Results:

Figure 1. Body weight of mice during HF/HS diet

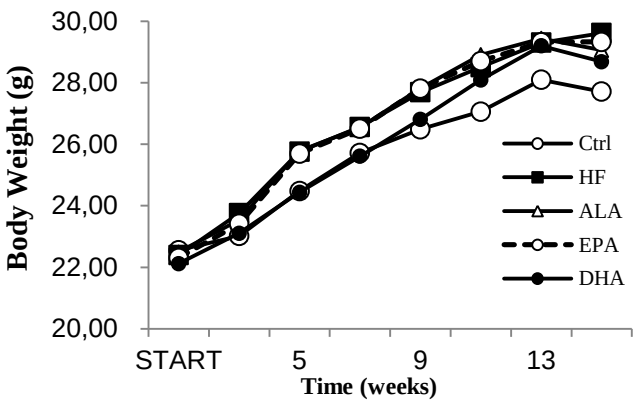
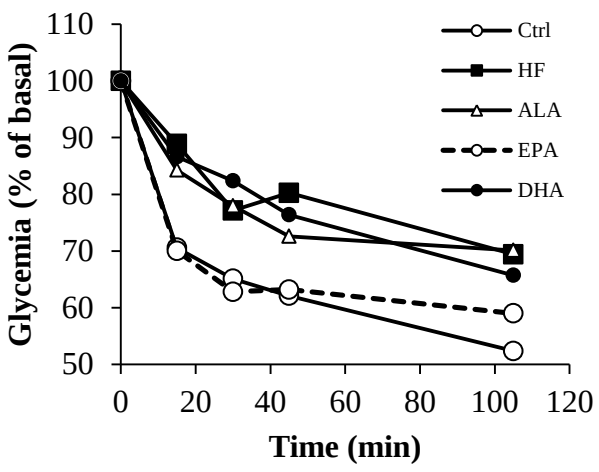


Table 1. plasma concentration of cholesterol (Chol) and non esterified fatty acids (NEFA)

	CTRL	HF	ALA	EPA	DHA
Chol (g/L)	0,72±0,03c	0,92±0,04a	0,83±0,08ab	0,73±0,04c	0,74±0,02bc
NEFA (g/L)	0,30±0,01ab	0,27±0,01bc	0,37±0,03a	0,22±0,01c	0,31±0,01ab

Figure 2. ip-insulin tolerance test.



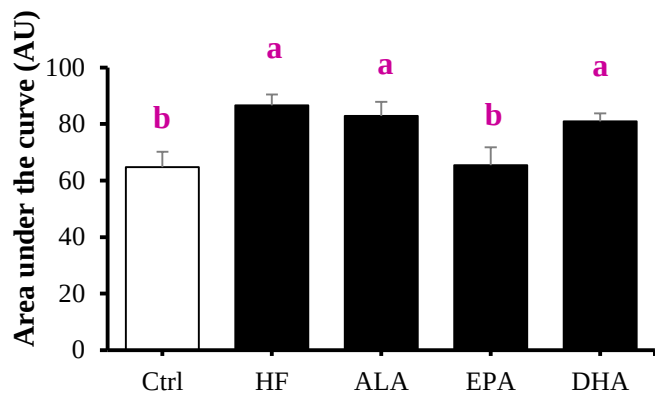
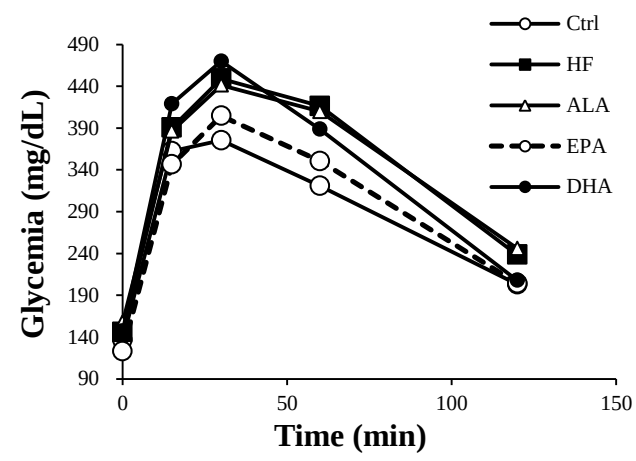


Figure 3. ip-Glucose tolerance test.



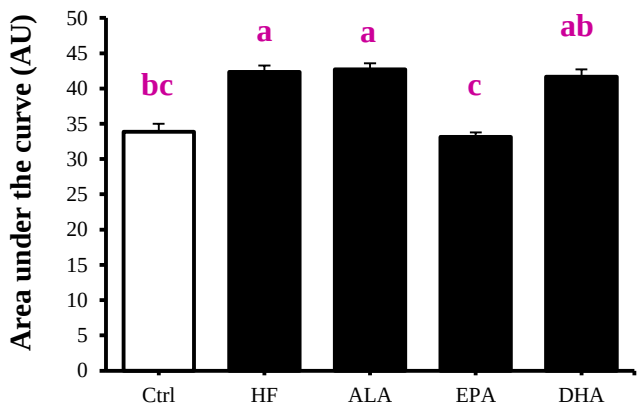


Table 2. n-3 PUFA incorporation into plasma

(% of total fatty acids)

	CTRL	HF	ALA	EPA	DHA
C18: 3 n-3	0,45 ± 0,05a	0,31 ± 0,05c	0,63 ± 0,03b	0,31 ± 0,04c	0,32 ± 0,04c
C20: 5 n-3	0,37 ± 0,02a	0,39 ± 0,05a	0,77 ± 0,06a	4,84 ± 0,26b	2,84 ± 0,36c
C22:5 n-3	0,24 ± 0,01a	0,26 ± 0,02a	0,35 ± 0,01b	0,82 ± 0,04c	0,23 ± 0,01a
C22: 6 n-3	5,19 ± 0,17a	6,00 ± 0,27a	6,95 ± 0,19b	8,07 ± 0,31c	11,65 ± 0,51d

Figure 4. n-3PUFA enrichment in the adipose tissue

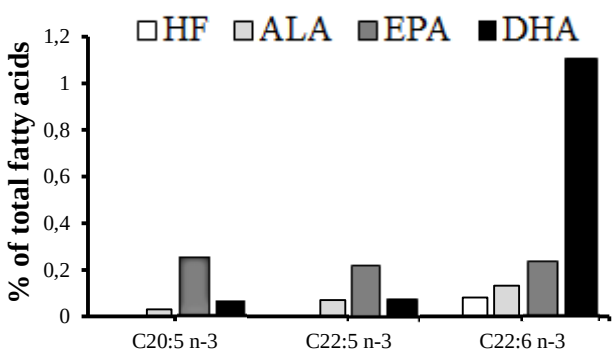
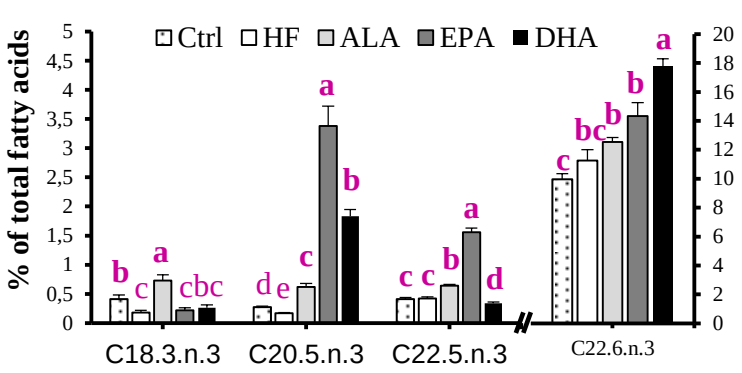


Figure 5. n-3PUFA enrichment in the liver



Conclusion :

Long chain omega 3 fatty acids have distinct effects on IR and glucose tolerance. By contrast with ALA and DHA, EPA has interesting protective effect against several key parameters of MetS.

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