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Impact of high fat "Western" diets on the fetal programming of atherosclerosis

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Whilst the origins of atherosclerosis (ATH) are multifactorial, a robust literature shows that ATH in animals can be programmed *in utero*, through lactation and post natal exposure to both maternal under- and over-nutrition[1,2,3].

The aim of this study was to elucidate the effect of maternal intake of a high fat diet with a fatty acid composition similar to that consumed in many industrialized 'Western' countries (Western diet) in comparison to chow fed diets on the development of ATH in offspring, using the atherosclerosis-susceptible ApoE*3 Leiden (ApoE*3L) mouse model.

Female wild type C57BL/J6 mice were mated with heterozygous ApoE*3L males and fed either a chow (C) or Western (W) diet (total fat, SFA, MUFA, PUFA) during gestation. At birth of pups, dams were transferred onto a lactation diet of either Chow (CC), or Western diet (WC, WW). Female ApoE*3L offspring were subsequently weaned onto either a chow (CCC) or high cholesterol 'atherogenic' diet (CCA, WCA, WWA) for 12 weeks.

Maternal plasma lipoprotein levels were increased by the Western diet during pregnancy and lactation (but not pregnancy alone) in comparison to the Chow diets (Table 1). However, there was no impact of maternal diet on plasma lipoproteins of offspring fed a postnatal atherogenic diet (15% cocoa butter 0.25% cholesterol) (Table 2).

Table 1. Maternal Plasma Lipoproteins (C57J6BL mice)

	CC (n = 13)		WC (n = 6)		WW (n = 12)	
	Mean	SEM	Mean	SEM	Mean	SEM
Cholesterol (mmol/L)	3.08	0.16	3.54	0.31	5.41*	0.26
TAG (mmol/L)	1.01	0.10	1.09	0.14	1.30	0.20
LDL Cholesterol (mmol/L)	0.17	0.01	0.20**	0.03	0.39*	0.05
HDL Cholesterol (mmol/L)	1.50	0.10	1.65**	0.44	2.49*	0.10
Non-HDL (mmol/L)	1.57	0.08	1.89**	0.17	2.92*	0.22

Statistical Analysis: One way ANOVA. [t]transformed data (1/)
*significant when compared to CC ** significant when compared to WW $P<0.05$.

Table 2. Offspring Plasma Lipoproteins (ApoE*3 Leiden mice)

	CCC (n = 11)		CCA (n = 11)		WCA (n = 10)		WWA (n = 12)	
	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM
Cholesterol (mmol/L)	2.66	0.15	9.63*	0.37	10.40*	0.70	10.27*	0.54
TAG (mmol/L)	2.63	0.14	2.24	0.15	2.39	0.17	2.53	0.22
LDL Cholesterol (mmol/L)	0.63	0.03	3.34*	0.20	3.46*	0.18	3.35*	0.12
HDL Cholesterol (mmol/L)	0.71	0.03	1.64*	0.18	2.06*	0.18	1.86*	0.18
Non-HDL (mmol/L)	1.95	0.15	7.99*	0.42	8.34*	0.80	8.41*	0.68

Statistical Analysis: One way ANOVA. [t]denotes transformed data (1/)
*significant when compared to CCC $P<0.05$

We conclude that in this animal model feeding a high fat 'Western' diet does not programme increases in plasma lipoproteins in the offspring.

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