

Effects of Eicosapentaenoic Acid (EPA) and Docosahexaenoic Acid (DHA) Diets on Behavior during Lactation and Neonatal Period in Rats



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RATIONALE & OBJECTIVES:

Depression is an important disease in the 21st century, especially in women during the pregnancy. Pregnancy and delivery process might give a lots physical stress to women. The aim of this study is to evaluate the effects of eicosapentaenoic acid- (EPA) and docosahexaenoic acid-rich (DHA) diets on behavior during lactation and neonatal period in rats.

MATERIALS & METHODS:

Sprague-Dawley mother rats (n=8 for each group) were subjected to a diet rich in soy oil, EPA-rich oil or DHA-rich oil during lactation period. After lactation period, mother rats and selected male rat pups were tested in the forced swim test (FST) and determined the lipid composition in plasma and selected areas brain. Other male rat pups (n=8 for each group) were subjected to a diet as same as mother rats for 4 weeks. Behavior performance on the FST and the fatty acid profile from selected tissues were determined.

RESULTS & FINDINGS:

The results of the forced swimming test showed that the EPA group had a significantly shorter immobile time than other two groups. The immobile time is negative correlation with the fatty acid profile in plasma C20:5 and prefrontal cortex C22:5. The EPA-rich diet might be impairing the depression-like behavior under the physical stress, but not DHA-rich diet.

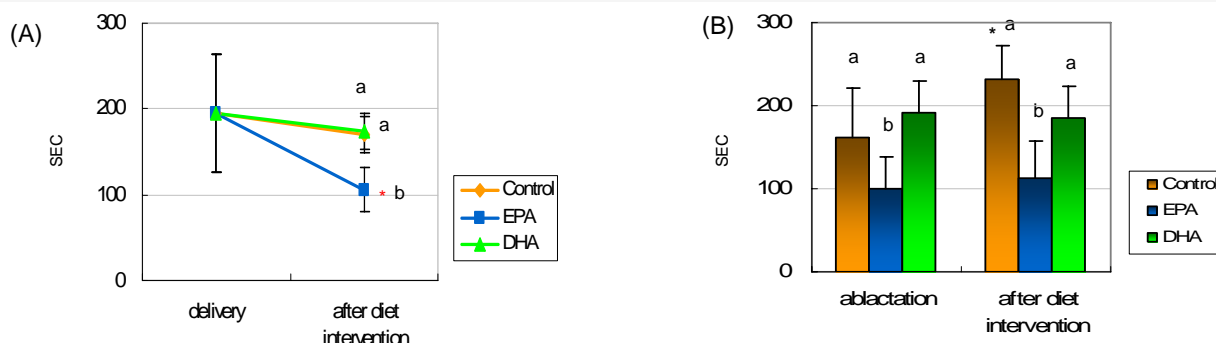


Figure. (A) Immobile time during forced swim test (FST) in control group, EPA group and DHA group of mother rats, (B) Immobile time during forced swim test (FST) in control group, EPA group and DHA group of male pup rats.

*, $p < 0.05$, compared with baseline; values with different superscript letters are significantly different, $p < 0.05$.

In the results of the fatty acid profile, the prefrontal cortex C22:5 is positive correlation with struggle times and the plasma C20:5 is positive correlation with swim times. In the EPA group, C20:5 and C22:5 are significant changed in blood or prefrontal cortex. The EPA-rich diet might be improving the antidepressant-like behaviors under the physical stress. According to these data, it seems to imply the various molecular roles of EPA and DHA under pregnancy stress

Table. (A) Fatty acid profile in plasma and prefrontal cortex from mother rats after diets intervention, (B) Fatty acid profile in plasma and prefrontal cortex from male pup rats after diets intervention.

(A)	Control	EPA	DHA	(B)	Control	EPA	DHA
Plasma				Plasma			
C20:4n6	6.04±2.49 ^a	3.46±1.15 ^b	2.00±0.31 ^b	20:4	12.53±2.13 ^a	6.41±0.99 ^b	4.59±1.40 ^b
C20:5n3	0.49±0.33 ^a	1.32±0.47 ^b	1.36±0.47 ^b	20:5	0.50±0.64 ^a	3.74±1.87 ^b	2.36±1.78 ^{ab}
C22:5n3	0.46±0.05 ^a	0.87±0.20 ^b	0.73±0.11 ^b	22:5	0.30±0.11 ^a	1.30±0.59 ^b	0.93±0.33 ^b
C22:6n3	2.43±0.26 ^a	3.19±0.45 ^a	6.24±1.50 ^b	22:6	2.39±0.48 ^a	3.31±0.52 ^a	9.05±3.98 ^b
Prefrontal cortex				Prefrontal cortex			
C20:4n6	10.73±0.81	9.78±0.73	9.35±0.83	C20:4n6	11.44±0.35 ^a	11.61±1.83 ^a	8.70±1.50 ^b
C20:5n3	0.47±0.13	0.53±0.09	0.35±0.09	C20:5n3	0.27±0.34	0.23±0.22	0.39±0.22
C22:5n3	0.36±0.02 ^a	1.03±0.34 ^b	0.85±0.21 ^b	C22:5n3	0.25±0.12 ^a	1.40±0.14 ^b	1.04±0.46 ^b
C22:6n3	14.06±1.14	13.95±1.12	17.52±2.71	C22:6n3	17.74±4.82	18.45±3.32	21.99±4.25

Values with different superscript letters in the same row are significantly different, $p < 0.05$.

CONCLUSION:

These observations demonstrate that EPA-rich diet, but not DHA-rich diet, could impair the immobile times and improve the struggle and swim times under physical stress during pregnancy and lactation in mother rats. A similar effect presented in male rat pups both in ab lactation and after diet intervention.

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