Effects of Estradiol on Brain Lipid and Fatty Acid composition.

Comparison between Pregnant and Ovariectomized Estradiol-treated Rats.

Noemí Fabelo¹, Virginia Martín¹, Ana Alonso², Celestino González² and Mario Díaz¹

¹Department of Animal Biology & Institute of Biomedical Technologies, University of La Laguna, Tenerife, Spain.
²Department of Functional Biology, University of Oviedo, Oviedo, Spain.

Physiological doses of estradiol could be involved in the lipid brain metabolism. We studied the lipid classes and fatty acid composition of phospholipids in the brain tissue from pregnant and 17β-estradiol-treated rats. Rats were randomly divided into three groups: ovariectomized control (V), ovariectomized estradiol-treated (E) and pregnant rats (P). Rats from the E group were injected daily with different doses of 17β-estradiol mimicking the plasma levels observed during pregnancy. Lipid classes and fatty acid composition were assessed at three stages (days 6, 11 and 16) in each group. Analyses of lipid class composition showed that physiological doses of estradiol increased cholesterol levels in the brain tissue of the E group respect to the V group. It was also found that cholesterol levels in the P group were significantly different from V and E groups, which clearly indicates that estradiol is not the only steroid hormone involved in brain cholesterol regulation during pregnancy. Results obtained from the detailed analyses of fatty acid composition of phospholipids revealed that physiological doses of estradiol increased docosahexaenoic acid (DHA, 22: 6 n-3) levels. Moreover, DHA levels in pregnant rats were not significantly different from the E group at any stage of pregnancy or estradiol treatment, suggesting that estradiol itself could be responsible for alterations of brain DHA levels during pregnancy. Therefore, such a significant relationship between brain tissue fatty acid composition and circulating plasma estradiol suggest a role of sex hormones in modulating n-3 PUFA metabolism. Our observations are well in consonance with an estradiol-induced increased bioavailability of brain DHA in rats undergoing pregnancy, presumably to cope with the high demands of DHA in the developing brain fetus.

This study was supported by grant number SAF2007-66148-C02-02 (Ministerio de Educación y Ciencia, Spain)