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Cloning essential oil related genes, and developing genetic markers for lavenders

Soheil S Mahmoud

University of British Columbia, Canada

Several members of the genus *Lavandula* (Lavenders) are economically important crop plants that produce and store large quantities of essential oils (EO; a mixture of primarily monoterpenes) in glandular trichomes, or oil glands. Because glandular trichomes are specialized for EO production, they strongly express the related structural and regulatory genes. We have generated substantial genomic resources to probe essential oil metabolism in lavenders, and have cloned several key EO biosynthetic genes including lavandulyl diphosphate synthase, caryophyllene, borneol dehydrogenase, cineole synthase, and beta-phellandrene synthase from these plants. We have also developed a set of EST-SSR markers capable of delineating a number of lavender species effectively. In this presentation the author will present a summary of his recent findings.

soheil.mahmoud@ubc.ca

Maternal diet high in omega-3 polyunsaturated fatty acids has cardio protective and neuro protective effects in the offspring

Sukhinder Cheema

Memorial University, Canada

A decline in omega-3 polyunsaturated fatty acids (n-3 PUFA) is associated with the severity of depression, Alzheimer's disease, dementia, cognitive disorders and heart health. N-3 PUFA promotes neurogenesis and the maturation of neurons. However, the mechanisms by which n-3 PUFA regulate neurogenesis and neurotrophic factors such as the brain derived neurotrophic factor (BDNF) and nerve growth factor (NGF) is not known. BDNF is responsible for neuronal outgrowth, differentiation, connectivity, repair and survival during development and in adulthood. We investigated the effects of maternal diets varying in the amounts of n-3 PUFA on spatial phospholipid fatty acid composition and the impact on gene expression of neurotrophins in the offspring and whether the effects are sex and age specific. A diet high in n-3 PUFA increased the amount of docosahexaenoic acid (DHA) and total n-3 PUFA in phospholipids compared to the low n-3 PUFA group. Furthermore, a diet high in n-3 PUFA increased desaturation of saturated fatty acids to mono unsaturated fatty acids which are required for myelin sheath formation. The high n-3PUFA group also increased the gene expressions of BDNF, NGF and the BDNF receptor TrkB compared to low n-3 PUFA group. The cyclic AMP response element binding protein (CREB) has been suggested to be involved in the stimulation of neurotrophins. There was no effect of diets on the gene expression of CREB, however high n-3 PUFA diets increased the phosphorylation of CREB. Using in vitro studies we found that DHA directly stimulated the gene expression of BDNF. We also found that a diet high in n-3 PUFA elicits cardio protective effects and the effects were sex and age dependent. Lastly, our findings strongly indicate that BDNF may be a common link in n-3 PUFA mediated neuro protective and cardio protective effects thereby emphasizing the need to incorporate n-3 PUFA in the diet.

skaur@mun.ca