Editorial

Global environmental contamination: Challenge for the human brain

The first international congress devoted to the impact of global environmental contaminants on the human brain was held in Luxembourg in 2014. The Congress attracted 160 delegates from 18 countries.

Six papers drawn from the Congress are published here: three (#1–3) describe mechanisms and effects on brain and behavior of manmade chemicals (certain pesticides, polyaromatic hydrocarbons, and polychlorinated biphenyls). The other three (#4–6) examine natural products, including secondary fungal metabolites (patulin and zearalenone mycotoxins) and the potential anti-inflammatory properties of the mushroom Coriolus versicolor. The second congress will be held in Marrakech, Morocco in 2017 (http://gec2014.sciencesconf.org/).

1. Charli and colleagues from the USA compare the effects on rat dopaminergic neurons of the mitochondrial toxin rotenone with two structurally related pesticides (acaricides), tebufenpyrad and pyridaben, all of which are mitochondrial Complex 1 inhibitors. Both compounds disrupted mitochondrial dynamics via oxidative damage with severe structural and functional changes. Widely used in greenhouses and vineyards, these pesticides may be potential risk factors for parkinsonism.

2. Elnar and colleagues from France examine the late-life effects of amyloid-induced brain stress in aged rats that had been given lactational exposure of an environmentally relevant dose of non-dioxin-like polychlorobiphenyls, the most abundant PCB congeners in environmental and food matrices. Early-life PCB treatment reduced the expression of hippocampal synaptic proteins and increased long-term memory impairment following single intracerebroventricular treatment with amyloid-beta peptide.

3. Peiffer and colleagues from France address the murine neurotoxic potential of fluorene, regarded by the WHO and US EPA as a relevant indicator of atmospheric exposure to polyaromatic hydrocarbons by reason of its ubiquitous presence in air. Since food ingestion as well as inhalation is an important route of PAH exposure, the study examines the neurobehavioral and physiological effects of subchronic oral treatment and compares the effects with inhalation exposure reported by the authors in an earlier study.

4. Ben Salem and colleagues from Tunisia examine two metabolites of the non-steroid mycotoxin zearalenone, a food and milk contaminant that can act as an estrogenic agonist in rat brain. Alpha and eta-zearalenol increased production of reactive oxygen species, enhanced the endoplasmic reticulum stress response, and activated the mitochondrial pathway of apoptosis in human carcinoma cells. Quercetin, a common dietary flavonoid with antioxidant activity, showed a significant reduction of zearalenone toxicity in these cell lines.

5. Boussabbeh and colleagues from Tunisia seek methods to ameliorate the toxic effects of patulin, a pervasive mycotoxin that contaminates apple products, rotten fruits, moldy feeds and stored cheese. An EU limit of 10 µg/kg has been established for patulin in apple products, including baby foods. Patulin has mutagenic, immunosuppressive, neurotoxic and teratogenic damage by increasing oxidative damage. They show that treatment of mice with crocin, a carotenoid pigment dietary antioxidant, inhibits patulin-induced tissue damage.

6. Trovato and colleagues from Italy explore how to reduce the neuroinflammation involved in the pathogenesis of many neurodegenerative disorders. Lipoxin A4, a metabolic product of arachidonic acid has potent anti-inflammatory properties in many non-neural inflammatory disorders. The authors report increased brain lipoxin A4 and modulation of other cytoprotective proteins when rats were subchronically treated orally with a solution of powdered C. versicolor, a mushroom with possible immune-modulating properties.

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The scientific program, keynote speakers and highlights of the Congress are available at http://gec2014.sciencesconf.org/. The second Congress will be held in 2017 in Marrakech, Morocco.

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