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Editorial:

RECENT RESEARCH IN NEUROTOXICOLOGY

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Large projects are currently ongoing to establish in vitro systems for identification of compounds that induce neurotoxicity or developmental neurotoxicity (Hardelauf et al., 2011; Frimat et al., 2010). An example is the EU funded network ESNATS where human embryonic stem cells are differentiated to neuronal cells. This gives the opportunity to expose the differentiating stem cells to test chemicals during specific sensitive periods and analyze if the differentiation process is compromised. However, this is an ongoing project and it will take several years until the novel in vitro techniques can be integrated into routine toxicological testing. Current publications still include in vivo studies, for example possible neurotoxic effects of diesel exhaust in newborn mice (Tsukue et al., 2009), developmental neurotoxicity of acrylamide in rats (Takahashi et al., 2009) and oxidative stress in the cerebral cortex of rats after exposure to diphenyl ditelluride (Stangherlin et al., 2009). It remains currently difficult to predict, when it will be possible to replace conventional neurotoxicity in vivo studies by in vitro tests. The table gives an overview over recent studies in neurotoxicology or developmental neurotoxicology.

Table 1: Recent studies in neurotoxicology and developmental neurotoxicology

Key message	Reference
Perinatal exposure of mice to diesel exhaust increased expression levels of estrogen receptor alpha and beta, CYP1A1 and heme oxygenase-1 in the cerebrum of newborns, suggesting a possible influence of diesel exhaust inhalation on sexual differentiation.	Tsukue et al., 2009
A LC-tandem MS based technique was established that allows quantification of organophosphorothioate albumin adducts at (in vitro) concentrations as low as 1 µM parathion and chlorpyrifos. The technique offers a sensitive perspective for pesticide biomonitoring.	Noort et al., 2009
4-Pyridine aldoximine is a metabolite of the oxime acetylcholinesterase reactivator methoxime (MMB-4). 4-Pyridine aldoxime did not induce toxicity, did not alter acetylcholinesterase activity and did not modify the toxicity of sarin of cyclosarin.	Shih et al., 2009
A novel conotoxin was purified and sequenced which enhances tetrodoxin-sensitive sodium currents in adult rat dorsal root ganglion neurons.	Wang et al., 2009
Brevetoxins are lipid soluble polyether neurotoxins linked to periodic “red tide blooms”, excerting their toxicity via sodium channels. This study demonstrates that brevetoxins also induce DNA strand breaks and apoptosis.	Murrell and Gibson, 2009

Table 1 (cont.): Recent studies in neurotoxicology and developmental neurotoxicology

Key message	Reference
Acrylamide causes neurotoxicity by mechanisms including caspase-dependent apoptosis. This study demonstrates that acrylamide induced apoptosis in neuronal cells is associated with the decrease in intracellular GSH concentration, which can be antagonized by carboxyfullerene.	Sumizawa and Igisu, 2009
To study developmental neurotoxicity of acrylamide pregnant rats were given 25, 50 or 100 ppm in the drinking water from gestational day 6 to postnatal day 21. However, the internal concentration of acrylamide in the offspring was too low to induce neurotoxicity.	Takahashi et al., 2009
D-Serine is used as add-on therapy of treatment-refractory schizophrenia. This study presents genome wide gene expression alterations induced by D-serine in rats.	Davidson et al., 2009
This study presents the toxicokinetics of arsenic species in the brains of mice.	Juárez-Reyes et al., 2009
Occupational exposure to carbon disulfide can induce polyneuropathy in workers. This study shows that carbon disulfide leads to disruption of neurofilament homeostasis and activation of calpains in rat sciatic nerves.	Song et al., 2009
Exposure to diphenyl ditelluride via maternal milk causes oxidative stress in cerebral cortex, hippocampus and striatum of rats.	Stangherlin et al., 2009
UPD-glucuronosyltransferase enzymes can be induced in the choroid plexus of rats in vivo.	Gradinaru et al., 2009
Administration of subtoxic doses of the organophosphorus insecticide chlorphyrifos to rats causes differential expression of genes implicated in neurological functions.	Stapleton and Chan, 2009
Diazinonoxon, a metabolite of the phosphorothionate insecticide diazinon, causes neurotoxic effects on differentiating cells.	Sidiropoulou et al., 2009

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