The impact of cadmium on neuronal differentiation: a simple model for a complex issue

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Abstract

Cadmium is a non-essential heavy metal, released in the environment at a rate of 30000 tons/year, with a well-known toxicity in humans, considering both toxicity and exposure frequency. Environmental exposure to this metal has been suggested to damage the nervous system and to be involved in the etiopathogenesis of neurodegenerative diseases; moreover, cadmium administration at the embryonic level caused impaired neurogenesis, resulting in reduced neuronal differentiation. Since the exact mechanism of cadmium toxicity towards neurons differentiation is still unresolved, our work focuses on the investigation of cadmium impact on neuronal differentiation by using the human neuroblastoma SH-SY5Y cell line. This cell line is a widely used *in vitro* model to study potential neurotoxic effects of environmental pollutants and xenobiotics, as well as neurodegenerative disorders, like Parkinson's and Alzheimer's diseases. The possibility to easily differentiate these cells toward adult neuronal phenotypes has brought several advantages to neuroscience research, with relatively low cost and no ethical concerns associated with primary neurons. Moreover, in addition to Russel and Burch 3Rs principles (Replacement, Reduction, Refinement), human cultured cells offer the advantage of recapitulating human-specific mechanisms that may differ from those of other organisms.

In this work SH-SY5Y have been differentiated with all trans retinoic acid up to 9 days in the presence of different cadmium doses and both metabolic and biophysics analysis have been performed.

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