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Impact of melatonin supplementation on Polychlorinated biphenyls (Aroclor 1254) induced neurotoxicity

Numerous toxic substances that are found in the urban environment cause abnormalities in normal growth and development. Important examples of such toxicants are polychlorinated biphenyls (PCBs), which are widely used in electrical industry, as coolants for transformers and capacitors. PCBs have been a continuous problem in urban environments because they persist for many years and can bioaccumulate. PCBs are distributed throughout the entire ecosystem, including in soil, air and water. They are absorbed through the skin, lungs and GI tract and are transported by blood to liver and muscles. Aroclor 1254 is a commercial mixture of PCBs, which is defined as being 54% chlorine by weight. PCBs affect several organ systems in mature and developing animals. The central nervous system is one of the target organs for PCBs. Based on reviews of both animal testing and human epidemiology studies, it is now accepted that PCBs are developmental neurotoxicants. Studies show that PCBs induced toxic manifestations are associated with the production of reactive oxygen species (ROS). ROS are closely involved in several diseases of nervous system including parkinson's disease, schizophrenia and alzheimer's disease. Melatonin, an indoleamine plays an important role in neurodegenerative diseases as an antioxidant and neuroprotector.

We found that the impact of melatonin supplementation on PCB (Aroclor 1254) induced oxidative stress in selected brain regions such as cerebellum, cerebral cortex and hippocampus of experimental animals. Along with this we also determined Cu/ Zn Superoxide dismutase (SOD) and Glutathione peroxidase (GPx) mRNA expressions, β amyloid protein levels, brain creatine kinase system and histological parameters in the experimental groups. Group 1: Rats intraperitoneally (i.p) with corn oil for 30 days. Group II: Rats injected (i.p) with PCB at 2 mg / kg bwt/ day for 30 days. Groups III and IV: Rats received melatonin (5 or 10 mg/ kg bwt/ day, i.p) simultaneously with PCB for 30 days. Separate melatonin controls were also maintained. After 30 days, rats were sacrificed and brain regions were separated. Neuronal damages and changes in specific activities of antioxidant enzymes, Cu/ Zn SOD, GPx-4 mRNA expressions, β amyloid protein levels and brain creatine kinase levels were significantly observed in PCB treated rats. Exogenous melatonin supplementation in PCB treated groups retrieved all the parameters. These results suggest that melatonin protects PCB induced oxidative stress and prevents neuronal damage in brain regions.

Biography

P Venkataraman has completed his MPhil degree from Department of Endocrinology, University of Madras, Chennai, India and was awarded PhD degree at the age of 32 years from the same department. At present he is working as an Assistant Professor in Department of Medical Research, SRM Medical College Hospital and Research Centre, SRM University, Chennai, India. He has published his research works in 30 international peer reviewed journals especially *Journal of Nutritional Biochemistry, Endocrine Research, Neurotoxicology, International Journal of Developmental Neuroscience* and *Neuroscience Research*. He is the reviewer of reputed journals especially *Comparative Clinical Pathology, Reproductive Sciences, Oxidants* and *Antioxidants in Medical Sciences*. He is also the Editorial Board Member of *Journal of Experimental and Integrative Medicine*. He has participated and presented research papers in international and national conferences in the field of reproductive and comparative endocrinology and environmental toxicology. He served as a resource person in two national workshops (DST, DBT, ICMR and CSIR sponsored) entitled, "*Techniques in molecular and cellular endocrinology*", organized by Department of Endocrinology, University of Madras in 2010 & 2013. He got PhD research guide ship from SRM University and now supervising more than 5 PhD students.

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