Commentary

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Treatment of Gamma Radiation Damage in Male Rats by Using of Stem Cells and Silymarin

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Introduction

Therapeutic effect of Mesenchymal Stem Cells Transplantation (MSCs) and an antioxidant such as silymarin have been postulated as hepatoprotectors against ionizing radiation induced injury. The present study was undertaken to evaluate the protective effect of MSCs and silymarin to ameliorate damage caused by gamma radiation. Bratton-Marshall Reagent was given by intravenous injection to male rats, one day post gamma irradiation at the dose level of 4 Gy. Rats were orally administrated silymarin at dose (70 mg/kg dissolved in distilled water) before irradiated three days and continued for 21 days post irradiation. After one and three weeks post irradiation results revealed that irradiated animals receiving MSCs and silymarin separately or with each other exhibited a pronounced elevation in liver antioxidant such as glutathione (GSH) superoxide dismutase (SOD), glutathione-S-transferase (GST), total antioxidant capacity (TAC), catalase (CAT) and glucose-6-phosphate dehydrogenase (G-6-PDase) activity accompanied with significant decline in lipid peroxidation and hydrogen peroxide levels in comparing with irradiated rats. Moreover, RAPD-PCR with primers OP-B10 and OP-B14 exhibited different banding patterns in all treated rats compared to untreated control rats after one and three weeks of treatment. In conclusion, treatment with MSCs and silymarin possess a radio protective capacity against ionizing-radiation induced oxidative stress and organ injury. In multicellular organisms, stem cells are undifferentiated or partially differentiated cells that can differentiate into various types of cells and proliferate indefinitely to produce more of the same stem cell. They are the earliest type of cell in a cell lineage.

Embryonic

Embryonic stem cells (ESCs) are the cells of the inner cell mass of a blastocyst, formed prior to implantation in the uterus. In human embryonic development the blastocyst stage is reached 4–5 days after fertilization, at which time it consists of 50–150 cells. ESCs are pluripotent and give rise during development to all derivatives of the three germ layers: ectoderm, endoderm and mesoderm. In other words, they can develop into each of the more than 200 cell types of the adult body when given sufficient and necessary stimulation for a specific cell type. They do not contribute to the extra embryonic membranes or to the placenta. During embryonic development the cells of the inner cell mass continuously divide and become more specialized. For example, a portion of the ectoderm in the dorsal part of the embryo specializes as 'neurectoderm', which will become the future central nervous system. Later in development, neurulation causes the neurectoderm to form the neural tube. At the neural tube stage, the anterior portion undergoes encephalization to generate or 'pattern' the basic form of the brain. At this stage of development, the principal cell type of the CNS is considered a neural stem cell. The neural stem cells self-renew and at some point transition into radial glial progenitor cells (RGPs). Early-formed RGPs self-renew by symmetrical division to form a reservoir group of progenitor cells. These cells transition to a neurogenic state and start to divide asymmetrically to produce a large diversity of many different neuron types, each with unique gene expression, morphological, and functional characteristics. The process of generating neurons from radial glial cells is called neurogenesis. The radial glial cell, has a distinctive bipolar morphology with highly elongated processes spanning the thickness of the neural tube wall. It shares some glial characteristics, most notably the expression of glial fibrillary acidic protein (GFAP). The radial glial cell is the primary neural stem cell of the developing vertebrate CNS, and its cell body resides in the ventricular zone, adjacent to the developing ventricular system. Neural stem cells are committed to the neuronal lineages (neurons, astrocytes, and oligodendrocytes), and thus their potency is restricted.