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Bone marrow mesenchymal stem cells increases survival after ionizing irradiation combined with wound trauma

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Ionizing radiation combined with wound trauma (CI) induces more mortality than radiation alone (RI). The increase is mediated partly by activation of inducible nitric oxide synthase (iNOS) pathway, cytokines increases, bacterial infection, and ATP loss. A promising therapeutic regimen for managing CI is transfusion with bone marrow-derived mesenchymal stem cells (BMSCs). The aim of this study was to evaluate efficacy of BMSCs on survival after CI. BMSCs were collected from the femur bone marrow of B6D2F1/J mice, expanded and cultivated in hypoxic conditions for 28 days. The cell phenotype was identified by BMSC-positive markers: CD44, STRO1, and SCA1. B6D2F1/J mice were exposed to 60Co-γ photon radiation followed by a 15% total body skin-wound trauma. Twenty-four hours later, these mice received a single injection of BMSCs. As a result, BMSCs treatment significantly improved mouse 30-day survival by more than 30% above the control group. To understand mechanisms underlying BMSC action in septic conditions because of CI-induced bacterial infection, BMSCs were treated with LPS in vitro. LPS significantly increased gene expression of IL-1α, IL-1β, and iNOS in a dose- and time-dependent manner. At 24th h after exposure to 0.5 μg/ml LPS, expression of NF-kB-p65, IL-1β, and iNOS proteins, and NO production in the cells were increased 2-, 11-, 4-, and 6-fold, respectively. These data are consistent with the idea that LPS-induced alterations in BMSCs are mediated by the TRL4/NF-κB axes, which in turn modulates the host adaptive responses during septic conditions.

Biography

Juliann G Kiang completed her PhD and Postdoctoral studies at the University of California at Berkeley. She is a Professor of Radiation Biology at the Uniformed Services University of the Health Sciences, Bethesda, MD and Principal Investigator at Armed Forces Radiobiology Research Institute. She is an inventor and editorial members of journals and has over 140 publications. Among all awards, she received the Research and Development Achievement Award from the US Department of Army. She is a US DoD STEM model and is the first to describe the skin-wound amplifies iNOS activation, cytokine concentrations, and sepsis after ionizing irradiation.

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