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Assessing the effectiveness of umbilical cord-derived mesenchymal stem cells under conditions of ischemia

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Mesenchymal stem cells (MSCs), due to their paracrine, anti-inflammatory and wound healing applications, have emerged as a promising treatment option for various human diseases. However, the efficacy of MSC therapy is currently limited by low retention and poor survival of transplanted cells as demonstrated consistently by clinical studies using bone marrow-MSCs. This is due to the harsh microenvironment marked by oxygen and nutrient deprivation and inflammation at the injured sites. Also, the choice of MSC source could be critical in determining fate and cellular function of MSCs. Therefore, our objective was to investigate the influence of ischemic stress on Wharton's Jelly (WJ)-MSCs from the umbilical cord, to assess their therapeutic relevance in ischemic diseases. We simulated conditions of ischemia in-vitro by culturing WJ-MSCs under 2% oxygen in a serum deprived and low glucose medium for 48 hrs. Under ischemic stress, WJ-MSCs retained a viable population of greater than 80%. Ischemic WJ-MSCs got arrested at G0/G1 phase of cell cycle but did not show signs of senescence. Moreover, the ischemic WJ-MSCs expressed the characteristic MSC surface antigens and in addition, were negative for the expression of costimulatory molecules, thus maintaining their immunoprivileged status under ischemia. To evaluate the wound healing properties of ischemic WJ-MSCs, we compared gene expression profile between control and ischemic WJ-MSCs by PCR array and found an upregulation of many ECM and adhesion molecules, cytokines, trophic factors in the ischemic population. Our findings thus provide evidence that WJ-MSCs might be therapeutically beneficial and potent in treating ischemic diseases.

Biography

Malancha Ta completed her PhD from the National Institute of Immunology (NII), New Delhi, India and postdoctoral studies from NIH, Bethesda, USA. Currently she holds the position of Assistant Professor at the IISER-Kolkata, India and has been working in the area of stem cells for the last 15 years. She has published many papers in reputed journals and her research interest includes investigating the molecular differences between MSCs from different tissue sources and understanding their functioning under different degrees of physiological stress.

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