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Treatment with mesenchymal stem cells (MSC) of lesions induced by accidental irradiation and radiotherapy

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We have developed and tested cell therapy for protection against radiation side effects in several animal models, and we proposed mechanisms to explain the benefit brought by this new therapeutic approach. We established the proof of concept that MSC migrate to damaged tissues in the NOD/SCID immunotolerant mice model and in non-human primates. In the NOD/SCID mouse model, we showed that the intravenous injection of MSC (i) sustains haematopoiesis after total body irradiation, (ii) improves wound healing after radiodermatitis and (iii) protects gut function from irradiation damages. **Haematopoiesis correction:** In collaboration with Saint-Antoine Hospital (Paris, France), we first reported the haematopoiesis recovery in two patients with Bone Marrow failure (graft failure post grafting and Aplastic Anemia) after intravenous injection of MSC which restored the BM micro-environment, mandatory to sustain haematopoiesis after total body irradiation. We also treated with the clinical team the first patients over irradiated in Epinal with infusion of MSC, following a specific mission form the ministry of health. **Radio-induced burns:** Cutaneous reactions are major actors in radiation accidents and a limitation for radiotherapy. In collaboration with Percy hospital, we have shown for the first time the efficiency of MSC therapy in five patients with acute cutaneous and muscle damages following accidental irradiation delivered at doses and to fields higher than initially planned. **Gastrointestinal disorder management:** We demonstrated in the rat model that MSC restore gut functions after radiation damages through regulation of endogenous epithelial cell homeostasis. Four patients were successfully treated for pelvic overdose exposure. Cell therapy combining different sources of adult stem cells (endothelial progenitor, gingival fibroblast) is under investigation and is being tested in preclinical models of radio induced damage. In parallel, we started analyzing potential side effects after injection.

Biography

Alain Chapel is Scientific Investigator at IRSN. He has been developing cell therapy to protect against the effects of radiation. He collaborates with clinicians to strategies for treatment of patients after radiation. He has participated in the establishment of proof of concept of the therapeutic efficacy of MSCs. He is a member of national and international societies. He is Associate Editor of *World Journal of Stem Cells, World Journal of Gastrointestinal Surgery, World Journal of Radiology, The Open Gene Therapy Journal and Journal of Clinical Rehabilitative Tissue Engineering Research.* He has participated in the scientific organization of international conferences.

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