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Insulin-producing cells from adult human bone marrow mesenchymal stem cells control chemically-induced diabetes in dogs

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Evidence was provided that human bone marrow-derived mesenchymal stem cells (HBM-MSCs) could be differentiated to form insulin-producing cells (IPCs). The efficacy of these cells to control diabetes in large animals was carried out to evaluate the sufficient number of cells needed/kg body weight and to determine the functional longevity in vivo. Ten male mongrel dogs weighting 15-20 kg were used in this study. Diabetes was chemically-induced in seven dogs by a mixture of alloxan and streptozotocin. Three non-diabetic dogs served as normal controls. Differentiated HBM-MSCs (5 million/Kg) were encapsulated in Theracyte capsules and transplanted beneath the rectus sheath. Each dog received two capsules. One dog died four days postoperative from inhalation pneumonia. The remaining six dogs were followed up for 6-18 months. Four dogs became normoglycemic within 6-8 weeks with normal glucose tolerance curves providing evidence that the transplanted cells were glucose-sensitive and insulin-responsive. In the remaining two dogs, fasting blood glucose was reduced but did not reach euglycemic levels. The sera of all transplanted dogs contained human insulin and c-peptide but negligible levels of canine insulin. When the HBM-MSCs- loaded capsules were removed the rapid return of diabetic state was noted. The harvested capsules were examined by immuno-fluorescence. IPCs were seen and co-expression of c-peptide was confirmed. Furthermore, all the pancreatic endocrine genes were expressed by the transplanted cells. This study provided evidences that Theracyte capsules could protect the xenogenic HBM-MSCs from the host immune response. This is an important issue when clinical stem cell therapy is considered for definitive treatment for T1DM.

Biography

Maha Azzam has received her Bachelor's degree in Veterinary Medicine from University of Mansoura. She has completed her Diploma of Clinical Biochemistry and Master's degree in Animal Physiology from Veterinary Medicine, Mansoura University, her Master's title is "Impact of insulin producing stem cells derived from human bone marrow on some diabetic complications". She is a Research Veterinarian at Biotechnology Department in Urology and Nephrology Center, Mansoura University. She has published two papers in stem cells for diabetes treatment.

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