SELECTED PUBLICATIONS ON THERAPY USING STEM CELLS IN HUMANS

July 2017

BioEden

Where tomorrow never felt so secure

SELECTED PUBLICATIONS ON THERAPY USING STEM CELLS IN HUMANS

This list of peer-reviewed publications shows the use of mesenchymal stem cells (MSC) in Humans (in vivo). This document is intended to illustrate the current work (since 2001) being completed for each disease/disorder, it is NOT comprehensive. There are hundreds of clinical trial being conducted with MSC for various conditions or diseases, and many news stories of individual applications that have never been published in a medical journal.

CARTILAGE REPAIR

Stem cells have been shown to differentiate into chondrocytes. Stem cells have been used to repair knee cartilage damaged by ageing, trauma, or degenerative diseases.

Adult human mesenchymal stem cells delivered via intra-articular injection to the knee following partial medial meniscectomy: a randomized, double-blind, controlled study.

Vangsness CT Jr, Farr J 2nd, Boyd J, Dellaero DT, Mills CR, LeRoux-Williams M. "Adult human mesenchymal stem cells delivered via intra-articular injection to the knee following partial medial meniscectomy: a randomized, double-blind, controlled study." J Bone Joint Surg Am. (2014). PMID: 24430407

http://www.ncbi.nlm.nih.gov/pubmed/24430407

** Randomized, double-blind, controlled study, the safety of the intra-articular injection of human mesenchymal stem cells into the knee. There was evidence of meniscus regeneration and improvement in knee pain following treatment with allogeneic human mesenchymal stem cells.

Safety of autologous bone marrow-derived mesenchymal stem cell transplantation for cartilage repair in 41 patients with 45 joints followed for up to 11 years and 5 months.

Wakitani S, Okabe T, Horibe S, Mitsuoka T, Saito M, Koyama T, Nawata M, Tensho K, Kato H, Uematsu K, Kuroda R, Yoshiya S, Hattori K, Ohgushi H. "Safety of autologous bone marrow-derived mesenchymal stem cell transplantation for cartilage repair in 41 patients with 45 joints followed for up to 11 years and 5 months." J Tissue Eng Regen Med. (2011). PMID: 20603892

http://www.ncbi.nlm.nih.gov/pubmed/20603892

**Autologous BMSCs are thought to be safe due to absence of immunological reactions and disease transmission. The potential for tumor formation over long-term follow up was evaluated in this study. No tumors nor infections were observed between 5 and 137 months of follow up. Autologous BMSC transplantation is a safe procedure and will be widely used around the world.

Increased knee cartilage volume in degenerative joint disease using percutaneously implanted, autologous mesenchymal stem cells.

Centeno CJ, Busse D, Kisiday J, Keohan C, Freeman M, Karli D. "Increased knee cartilage volume in degenerative joint disease using percutaneously implanted, autologous mesenchymal stem cells." Pain Physician. (2008). PMID: 18523506

http://www.ncbi.nlm.nih.gov/pubmed/18523506

**Case study showing bone marrow mesenchymal stem cells used for knee transplantation. After 24 weeks significant cartilage and meniscus growth was observed as well as increased range of motion. BMMSC can be used in the future for treatment of osteoarthritis and meniscal injury.

DENTAL INJURY/DISEASE

Stem cells can provide a novel approach to treat diseases like periodontitis, dental caries, and many more. Clinical applications including regeneration of teeth, periodontal ligament regeneration, and salivary gland regeneration will continue to emerge in the near future.

Osteogenic potential of mesenchymal cells embedded in the provisional matrix after a 6-week healing period in augmented and non-augmented extraction sockets: an immunohistochemical prospective pilot study in humans.

Heberer S, Wustlich A, Lage H, Nelson JJ, Nelson K. "Osteogenic potential of mesenchymal cells embedded in the provisional matrix after a 6-week healing period in augmented and non-augmented extraction sockets: an immunohistochemical prospective pilot study in humans." Clin Oral Implants Res (2012) Jan; 23; PMID:21435013

http://www.ncbi.nlm.nih.gov/pubmed/21435013

**The osteogenic potential of mesenchymal cells embedded in a matrix of Bio-Oss was evaluated in human extraction sockets after 6-weeks of healing time. No evidence of acute or chronic inflammation was observed. The matrix demonstrated a high proportion of cells displaying a mature osteoprogenitor cells to osteoblasts.

A novel approach to periodontal tissue regeneration with mesenchymal stem cells and platelet-rich plasma using tissue engineering technology: A clinical case report.

Yamada Y, Ueda M, Hibi H, Baba S. "A novel approach to periodontal tissue regeneration with mesenchymal stem cells and platelet-rich plasma using tissue engineering technology: A clinical case report." Int J Periodontics Restorative Dent (2006) Aug; 26; PMID:16939018

http://www.ncbi.nlm.nih.gov/pubmed/16939018

**MSC were isolated from a bone marrow aspirates, platelet-rich plasma (PRP) was isolated from peripheral blood. Treatment results showed a disappearance of bleeding and tooth mobility. There was also evidence of interdental papillae regeneration. The use of MSC in PRP gel might be useful for periodontal tissue regeneration.

DIABETES MELLITUS (TYPE I/II)

In type I diabetes mellitus insulin producing cells are destroyed leaving the body incapable of regulating blood glucose. Type II diabetes mellitus is characterized by hyperglycemia or high blood sugar with insulin resistance and relative lack of insulin. A significant number of clinical trials have been reported using stem cells to treat diabetes in humans. The following examples are used to illustrate the type of work being conducted.

Preserved β-cell function in type 1 diabetes by mesenchymal stromal cells.

Carlsson PO, Schwarcz E, Korsgren O, Le Blanc K "Preserved β-cell function in type 1 diabetes by mesenchymal stromal cells." Diabetes (2015) Feb:64(2); PMID:25204974

http://www.ncbi.nlm.nih.gov/pubmed/25204974

**This clinical study describes patients with recently-onset type 1 diabetes being treated with mesenchymal stromal cells. It was observed that patients treated with MSC had preserved response to C-peptide or increased as compared to the non-treated. In addition no side effects of MSC treatment were observed. Autologous MSC treatment in new-onset type 1 diabetes constitutes a safe and promising strategy to intervene in disease progression and preserve β-cell function.

Efficacy and safety of autologous bone marrow-derived stem cell transplantation in patients with type 2 diabetes mellitus: a randomized placebo-controlled study.

Bhansali A, Asokumar P, Walia R, Bhansali S, Gupta V, Jain A, Sachdeva N, Sharma RR, Marwaha N, Khandelwal N. "Efficacy and safety of autologous bone marrow-derived stem cell transplantation in patients with type 2 diabetes mellitus: a randomized placebo-controlled study." Cell Transplant (2014); PMID:23561959

http://www.ncbi.nlm.nih.gov/pubmed/23561959

**Autologous bone marrow derived stem cell transplantation resulted in significant decrease in the insulin dose requirement along with an improvement in C-peptide levels.

Autologous nonmyeloablative hematopoietic stem cell transplantation in new-onset type 1 diabetes: a multicenter analysis.

D'Addio F, Valderrama VA, Ben Nasr M, Franek E, Zhu D, Li L, Ning G, Snarski E, Fiorina P. "Autologous nonmyeloablative hematopoietic stem cell transplantation in new-onset type 1 diabetes: a multicenter analysis." Diabetes (2014); PMID:24947362

http://www.ncbi.nlm.nih.gov/pubmed/24947362

**A total of 59% of individuals with type 1 diabetes obtained insulin independence within 6 months after receiving immunosuppressive therapy and a single infusion of autologous HSC. All treated patients observed a decrease in HbA1c and an increase in C-peptide levels.

Umbilical cord mesenchymal stem cells transfusion ameliorated hyperglycemia in patients with type 2 diabetes mellitus.

Kong D, Zhuang X, Wang D, Qu H, Jiang Y, Li X, Wu W, Xiao J, Liu X, Liu J, Li A, Wang J, Dou A, Wang Y, Sun J, Lv H, Zhang G, Zhang X, Chen S, Ni Y, Zheng C. "Umbilical cord mesenchymal stem cells transfusion ameliorated hyperglycemia in patients with type 2 diabetes mellitus." Clin Lab (2014); PMID:25651730

http://www.ncbi.nlm.nih.gov/pubmed/25651730

**Umbilical cord MSC transfusion is safe and well-tolerated. It effectively alleviates blood glucose, and increases C-peptide levels.

Long term effects of the implantation of Wharton's jelly-derived mesenchymal stem cells from the umbilical cord for newly-onset type 1 diabetes mellitus.

Hu J, Yu X, Wang Z, Wang F, Wang L, Gao H, Chen Y, Zhao W, Jia Z, Yan S, Wang S. "Long term effects of the implantation of Wharton's jelly-derived mesenchymal stem cells from the umbilical cord for newly-onset type 1 diabetes mellitus." Endocr J (2013); PMID:23154532

http://www.ncbi.nlm.nih.gov/pubmed/23154532

**This study accessed the long-term effects of the implantation of Wharton's jelly-derived mesenchymal stem cells (WJ-MSC) from the umbilical cord for newly-onset type 1 DM. Newly-onset type 1 DM according to the American diabetes association and diabetic duration of no more than 6 months. There were no reported acute or chronic side effects with patients treated with WJ-MSC. HbA1c and C peptide were significantly better than the non-treatment. Implantation of WJ-MSC for treatment of newly onset type 1 DM is safe and effective. This therapy can restore the function of islet B cells in a longer time, although precise mechanism are unknown.

Long term effects of the implantation of autologous bone marrow mononuclear cells for type 2 diabetes mellitus.

Hu J, Li C, Wang L, Zhang X, Zhang M, Gao H, Yu X, Wang F, Zhao W, Yan S, Wang Y. "Long term effects of the implantation of autologous bone marrow mononuclear cells for type 2 diabetes mellitus." Endocr J (2012); PMID:22814142

http://www.ncbi.nlm.nih.gov/pubmed/22814142

**Long term effects of using autologous bone marrow in the treatment of type 2 diabetes mellitus was evaluated. BM cells were injected into patients' pancreas via catheter. No reported acute or chronic side effects were observed. HbA1c and C-peptide was significantly better with the patients receiving bone marrow mononuclear cells. Mean value of HbA1c showed gradual decrease and reached lowest level at the end of the first year.

Autologous hematopoietic stem cell transplantation modulates immunocompetent cells and improves β-cells function in Chinese patients with new onset of type 1 diabetes.

Li L, Shen S, Ouyang J, Hu Y, Hu L, Cui W, Zhang N, Zhuge YZ, Chen B, Xu J, Zhu D. "Autologous hematopoietic stem cell transplantation modulates immunocompetent cells and improves β-cells function in Chinese patients with new onset of type 1 diabetes." J Clin Endocrinol Metab (2012) May:97(5); PMID:22419704

http://www.ncbi.nlm.nih.gov/pubmed/22419704

**Patients with newly onset type 1 diabetes (within 12 months) were treated with autologous hematopoietic stem cells with cryopreserved CD34+ progenitor cells. (11/13) patients required significantly reduced doses of insulin for glycemic control accompanied by reduced levels of glycosylated hemoglobin and increased C-peptide concentrations. (3/13) experienced exogenous insulin independence for 7-54 months.

ISCHEMIA/ANGIOGENESIS/VASCULOGENESIS

Stem cells can be used to create new blood vessels. They could be used in the treatment of heart damage from heart attack, and to grow blood vessels to give blood a route to regenerated tissue or tissue that has lost its blood supply. Stem cell therapy will have an increased role in the treatment of limb ischemia, which is characterized as the obstruction of arties that reduces blood flow to the extremities like hands, feet, and legs.

A double blind randomized placebo controlled phase I/II study assessing the safety and efficacy of allogeneic bone marrow derived mesenchymal stem cells in critical limb ischemia.

Gupta PK, Chullikana A, Parakh R, Desai S, Das A, Gottipamula S, Krishnamurthy S, Anthony N, Pherwani A, Majumdar AS. "A double blind randomized placebo controlled phase I/II study assessing the safety and efficacy of allogeneic bone marrow derived mesenchymal stem cells in critical limb ischemia." J Transl Med (2013); PMID:24480430

http://www.ncbi.nlm.nih.gov/pubmed/23758736

**Patients were administered with allogenic bone marrow MSC, improvement was observed in the rest pain scores. Significant increase in ABPI and angle pressure was seen in patients treated with bone marrow MSC. BM-MSC were found to be safe when injected IM.

Autologous stem cell therapy in the treatment of limb ischaemia induced chronic tissue ulcers of diabetic foot patients.

Kirana S, Stratmann B, Prante C, Prohaska W, Koerperich H, Lammers D, Gastens MH, Quast T, Negrean M, Stirban OA, Nandrean SG, Gotting C, Minartz P, Kleesiek K, Tschoepe D. "Autologous stem cell therapy in the treatment of limb ischaemia induced chronic tissue ulcers of diabetic foot patients." Int J Clin Pract (2012); PMID:22284892

http://www.ncbi.nlm.nih.gov/pubmed/22284892

**Bone marrow mononuclear cells were compared to expanded bone marrow cells enriched in CD90+ cells in treatment of diabetic ulcers ability to induce revascularization. The transplantation of of BMC and TRC was proven to be safe and feasible. Improvement of microcirculation and complete would healing was observed in the transplant groups.

Therapeutic angiogenesis in patients with severe limb ischemia by transplantation of a combination stem cells product.

Lasala GP, Silva JA, Minguell JJ. "Therapeutic angiogenesis in patients with severe limb ischemia by transplantation of a combination stem cells product." J Thorac Cardiovasc Surg (2012); PMID:22079876

http://www.ncbi.nlm.nih.gov/pubmed/22079876

**Patients with limb ischemia received an infusion of cell product in the most ischemic leg. Efficacy assessment indicated that after cell infusion there was a significant improvement in walking time an dangle-brachial index.

A long-term follow-up study of intravenous autologous mesenchymal stem cells transplantation in patients with ischemic stroke.

Lee JS, Hong JM, Moon GL, Lee PH, Ahn YH, Bang OY. "A long-term follow-up study of intravenous autologous mesenchymal stem cells transplantation in patients with ischemic stroke." Stem Cells (2010); PMID:20506226

http://www.ncbi.nlm.nih.gov/pubmed/20506226

**Evaluated MSC transplantation in patients with ischemic stroke. Clinical improvement in the MSC group was associated with serum levels of stromal cell derived factor. IV administration of autologous MSC transplantation was safe fro stroke patients during long term follow up.

LIVER DISEASE

Mesenchymal stem cells have emerged as a promising therapy for various liver conditions/diseases including infection and inflammation (hepatitis), congenital liver disease, and alcoholism. Human clinical trials using MSC for liver pathologies are increasing in number and those that have been published have shown improvements in patient outcome.

Transplantation of autologous mesenchymal stem cells for end-stage liver cirrhosis: a meta-analysis based on seven controlled trials.

Ma XR, Tang YL, Xuan M, Chang Z, Wang XY, Liang XH. "Transplantation of autologous mesenchymal stem cells for end-stage liver cirrhosis: a meta-analysis based on seven controlled trials." Gastroenterol Res Pract (2015); PMID:25861263

http://www.ncbi.nlm.nih.gov/pubmed/25861263

**Bone marrow MSC therapy significantly improved liver function in patients with end-stage liver cirrhosis. This therapy is safe and effective in improving liver function. Different variables should be controlled to optimize the therapeutic effects.

Short-term evaluation of autologous transplantation of bone marrow-derived mesenchymal stem cells in patients with cirrhosis: Egyptian study.

Amin MA, Sabry D, Rashed LA, Aref WM, el-Ghobary MA, Farhan MS, Fouad HA, Youssef YA. "Short-term evaluation of autologous transplantation of bone marrow-derived mesenchymal stem cells in patients with cirrhosis: Egyptian study." Clin Transplant (2013); PMID:23923970

http://www.ncbi.nlm.nih.gov/pubmed/23923970

**The safety and efficacy of autologous transplantation of bone marrow-derived stromal cells in post HCV liver cirrhosis patients was evaluated. A decrease was detected in the total bilirubin, AST/ALT and an increase in albumin after treatment with BM-SC. This study demonstrates the safety, feasibility, and efficacy of the intrasplenic injection of autologous BM stromal cells in improving liver function in Egyptian patients with cirrhosis.

Pilot study of umbilical cord-derived mesenchymal stem cells transfusion in patients with primary biliary cirrhosis.

Wang L, Li J, Liu H, Li Y, Fu J, Sun Y, Xu R, Lin H, Wang S, Lv S, Chen L Zou Z, Li B, Shi M, Zhang Z, Wang FS. "Pilot study of umbilical cord-derived mesenchymal stem cells transfusion in patients with primary biliary cirrhosis." J Gastroenterol Hepatol (2013); PMID:23855301

http://www.ncbi.nlm.nih.gov/pubmed/23855301

**Symptoms such as fatigue and pruritus were relieved from patients receiving umbilical cord derived MSC. UC-MSC transfusion is feasible and well tolerated in patients.

MUSCLE DISEASE

Regeneration of muscle tissue has been achieved using mesenchymal stem cells. Muscular diseases or conditions such as tendinitis, muscular dystrophy and myositis are actively being investigated.

Transplantation of human umbilical cord-derived mesenchymal stem cells for the treatment of Becker muscular dystrophy in affected pedigree members.

Li P, Cui K, Zhang B, Wang Z, Shen Y, Wang X, Zhang J, Tong F, Li S. "Transplantation of human umbilical cord-derived mesenchymal stem cells for the treatment of Becker muscular dystrophy in affected pedigree members." Int J Mol Med (2015); PMID:25647308

http://www.ncbi.nlm.nih.gov/pubmed/25647308

**Bone marrow MSC therapy significantly improved liver function in patients with end-stage liver cirrhosis. This therapy is safe and effective in improving liver function. Different variables should be controlled to optimize the therapeutic effects.

A clinical study shows safety and efficacy of autologous bone marrow mononuclear cell therapy to improve quality of life in muscular dystrophy patients.

Sharma A, Sane H, Badhe P, Gokulchandran N, Kulkarni P, Lohiya M, Biju H, Jacob VC. "A clinical study shows safety and efficacy of autologous bone marrow mononuclear cell therapy to improve quality of life in muscular dystrophy patients." Cell Transplant (2013); PMID:24070109

http://www.ncbi.nlm.nih.gov/pubmed/24070109

**This study was carried out with patients diagnosed with Duchenne muscular dystrophy, limb-girdle muscular dystrophy, and Becker muscular dystrophy. Autologous bone marrow derived MSC were used. No adverse events were reported. Neurological improvement and overall 86.67% cases showed symptomatic and functional improvements. These data showed an improvement in quality of life of patients having muscular dystrophy.

MYOCARDIAL INFARCTION (HEART ATTACK)/ CARDIAC DISEASES

Myocardial infarction is the leading cause of death in the developing world. Heart attack is defined as permanent damage to the heart muscle due to lack of oxygen rich blood flow. Mesenchymal stem cells have been shown to improve an infarcted heart or heart attack in patients. Stem cell transplantation appears to be safe and effective option for treating patients after a heart attack.

Autologous mesenchymal stem cells produce concordant improvements in regional function, tissue perfusion, and fibrotic burden when administered to patients undergoing coronary artery bypass grafting: The Prospective Randomized Study of Mesenchymal Stem Cells Therapy in Patients Undergoing Cardiac Surgery (PROMETHEUS) trial.

Karantalis V, DiFede DL, Gerstenblith G, Pham S, Symes J, Zambrano JP, FishmanJ, Pattany P, McNiece I, et al. "Autologous mesenchymal stem cells produce concordant improvements in regional function, tissue perfusion, and fibrotic burden when administered to patients undergoing coronary artery bypass grafting: The Prospective Randomized Study of Mesenchymal Stem Cells Therapy in Patients Undergoing Cardiac Surgery (PROMETHEUS) trial." Circ Res (2014); PMID:24565698

http://www.ncbi.nlm.nih.gov/pubmed/24565698

**The impact on cardiac structure and function was evaluated after intramyocardial injection of autologous MSC. After 18 months patients receiving MSC had decrease scar mass and increase LV ejection fraction. Intramyocardial injection of autologous MSC produced a regional functional improvement.

Safety and feasibility of intramyocardial versus intracoronary delivery of autologous cell therapy in advanced heart failure: the REGENERATE-IHD pilot study.

Mozid A, Yeo C, Arnous S, Ako E, Saunders N, Locca D, Brookman P, Archbold RA, Rothman M, Mills P, Agrawal S, Marin J, Mathur A. "Safety and feasibility of intramyocardial versus intracoronary delivery of autologous cell therapy in advanced heart failure: the REGENERATE-IHD pilot study." Regen Med (2014); PMID:24935040

http://www.ncbi.nlm.nih.gov/pubmed/24935040

**The safety and efficacy of three different delivery routes of bone marrow MSC in patients with ischemic heart failure was evaluated. No significant differences were found in terms of safety and feasibility between different delivery routes. There was improved heart failure symptoms in the patients treated with intramyocardial injection of mobilized BMSCs.

Adipose-derived regenerative cells in patients with ischemic cardiomyopathy: The PRECISE trial.

Perin EC, Sanz-Ruiz R, Sanchez PL, Lasso J, Perez-Cano R, Alonso-Farto JC, Perez-David E, Fernandez-Santos ME, Surreys PW, et al. "Adipose-derived regenerative cells in patients with ischemic cardiomyopathy: The PRECISE trial." Am Heart J (2014); PMID:24952864

http://www.ncbi.nlm.nih.gov/pubmed/24952864

**The safety and feasibility of transendocardial injections of adipose derived regenerative cells was evaluated in patients with no options that had ischemic cardiomyopathy. Isolation and transendocardial injection of autologous ADRCs in no-option patients were safe and feasible. Results suggest that ADRCs may preserve ventricular function, myocardial perfusion, and exercise capacity in these patients.

Late TIME: a phase-II, randomized, double-blindied, placebo-controlled, pilot trial evaluating the safety and effect of administration of bone marrow mononuclear cells 2 to 3 weeks after acute myocardial infarction.

Traverse JH, Henry TD, Vaughan DE, Ellis SG, Pepine CJ, Willerson JT, Zhao DX et al. "Late TIME: a phase-II, randomized, double-blindied, placebo-controlled, pilot trial evaluating the safety and effect of administration of bone marrow mononuclear cells 2 to 3 weeks after acute myocardial infarction." Tex Heart Inst J. (2010); PMID:20844613

http://www.ncbi.nlm.nih.gov/pubmed/20844613

**This study evaluated cardiac output after a single infusion of autologous bone marrow mononuclear cells administered 2-3 weeks after acute myocardial infarction. Insight into the clinical feasibility and appropriate timing of autologous cell therapy in high risk patients after myocardial infarction.

Combined delivery approach of bone marrow mononuclear stem cells early and late after myocardial infarction: the MYSTAR prospective, randomized study.

Gyongyosi M, Lang I, Dettke M, Beran G, Graf S, Socher H, Nyolczas N, Charwat S et al. "Combined delivery approach of bone marrow mononuclear stem cells early and late after myocardial infarction: the MYSTAR prospective, randomized study." Nat Clin Pract Cardiovasc Med (2009); PMID:19002124

http://www.ncbi.nlm.nih.gov/pubmed/19002124

**Patients were randomly assigned stem cell delivery via intramyocardial injection and intracoronary infusion after acute myocardial infarction. A high number of cells was required for significant improvements in the primary end points. Combined cardiac stem cell delivery induce a moderate but significant improvement in myocardial infarct size and left ventricular function.

NEUROLOGICAL DISORDERS

Stem cell therapies have emerged as a promising option for treating many neurological conditions. Clinical trial data associated with mesenchymal stem cell transplantation is available for neurological conditions such as autism, stroke, cerebral palsy, spinal cord repair, multiple sclerosis, and Parkinson's disease.

Continuous improvement after multiple mesenchymal stem cell transplantation in a patient with complete spinal cord injury.

Jarocha D, Milczarek O, Wedrychowicz A, Kwiatkowski S, Majka M. "Continuous improvement after multiple mesenchymal stem cell transplantation in a patient with complete spinal cord injury." Cell Transplant (2015); PMID:25807231

http://www.ncbi.nlm.nih.gov/pubmed/25807231

**Safety and efficacy of bone marrow nucleated cell and multiple mesenchymal stem cell transplantation in spinal cord injury was evaluated. There were no complications related to the transplantations and no side effects related to the therapy during 2 years of treatment. The patient had improved sensation, bladder control, and improvement in lower muscle control. Repeated intrathecal infusions of MSCs might have the potential to produce clinically meaningful improvements for SCI patients.

Intracerebral implantation of autologous peripheral blood stem cells in stroke patients: a randomized phase II study.

Chen DC, Lin SZ, Fan JR, Lin CH, Lee W, Lin CC, Liu YJ, Tsai CH, Chen JC, Cho DY, Lee CC, Shyu WC. "Intracerebral implantation of autologous peripheral blood stem cells in stroke patients: a randomized phase II study." Cell Transplant (2014); PMID:24480430

http://www.ncbi.nlm.nih.gov/pubmed/24480430

**Peripheral blood stem cells were implanted in stable stroke patients. No serious adverse events were observed and improvements in stroke scales and functional outcomes were greater in the PBSC group than in the control. Implantation of autologous CD34+ PBSC was safe, feasible, and effective in improving functional outcomes.

Transplantation of human cord blood mononuclear cells and umbilical cord-derived mesenchymal stem cells in autism.

Lv YT, Zhang Y, Liu M, Qiuwaxi JN, Ashwood P, Cho SC, Huan Y, Ge RC, Chen XW, Wang ZJ, Kim BJ, Hu X. "Transplantation of human cord blood mononuclear cells and umbilical cord-derived mesenchymal stem cells in autism." J Transl Med (2013); PMID:23978163

http://www.ncbi.nlm.nih.gov/pubmed/23978163

**The safety and efficacy of combined transplantation of human cord blood mononuclear cells and umbilical cord derived mesenchymal stem cells was evaluated in treating children with autism. There were no significant safety issues related to the treatment and no observed severe adverse effects. Differences were shown on childhood autism rating scale, aberrant behavior checklist, and clinical global impression. Transplantation of CBMNCs showed efficacy compared to the control group.

Human umbilical cord blood stem cells transplantation for the treatment of chronic spinal cord injury: Electrophysiological changes and long-term efficacy.

Yao L, He C, Zhao Y, Wang J, Tang M, Li J, Wu Y, Ao L, Hu X. "Human umbilical cord blood stem cells transplantation for the treatment of chronic spinal cord injury: Electrophysiological changes and long-term efficacy." Neural Regen Res. (2013); PMC:4146127

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4146127/

**Patients with traumatic spinal cord injuries were treated with human umbilical cord blood stem cells. Autonomic nerve functions were restored and latent period of sensory was reduced. No severe adverse effects following stem cell transplantation.

Autologous mesenchymal stem cells for the treatment of secondary progressive multiple sclerosis: an open-label phase 2a proof-of-concept study.

Connick P, Kolappan M, Crawley C, Webber DJ, Patani R, Michell AW, Du MQ, Luan SL, Altmann DR, Thompson AJ, Compston A, Scott MA, Miller DH, Chandran S. "Autologous mesenchymal stem cells for the treatment of secondary progressive multiple sclerosis: an open-label phase 2a proof-of-concept study." Lancet Neurol (2012); PMID:22236384

http://www.ncbi.nlm.nih.gov/pubmed/22236384

**Patients with secondary progressive multiple sclerosis involving visual pathways received autologous bone-marrow derived mesenchymal stem cells. No severe adverse events were reported. Improvement after treatment in visual acuity and visual evoked response latency was observed.

Treatment of one case of cerebral palsy combined with posterior visual pathway injury using autologous bone marrow mesenchymal stem cells.

Li M, Yu A, Zhang F, Dai G, Cheng, Wang X, An Y. "Treatment of one case of cerebral palsy combined with posterior visual pathway injury using autologous bone marrow mesenchymal stem cells." J Transl Med. (2012); PMID:22607263

http://www.ncbi.nlm.nih.gov/pubmed/22607263

**Autologous bone marrow mesenchymal stem cells were evaluated for treating cerebral palsy. No adverse reactions were observed. Patient was able to walk more smoothly and vision significantly improved 6ml after transplantation.

Administration of autologous bone marrow-derived mononuclear cells in children with incurable neurological disorders and injury is safe and improves their quality of life.

Sharma A, Gokulchandran N, Chopra G, Kulkarni P, Lohia M, Badhe P, Jacob VC. "Administration of autologous bone marrow-derived mononuclear cells in children with incurable neurological disorders and injury is safe and improves their quality of life." Cell Transplant (2012); PMID:22507683

http://www.ncbi.nlm.nih.gov/pubmed/22507683

**Children suffering from incurable neurological disorders or injury were evaluated with autologous bone marrow derived mononuclear cells. After transplantation there were improvements in neurological muscle power and shift on assessment scales such as Brooke and Vignos. No significant adverse events were noted. The results show that treatment is safe, efficacious, and also improves the quality of life in children with incurable neurological disorders and injury.

A 37-year-old spinal cord-injured female patient, transplanted of multipotent stem cells from human UC blood, with improved sensory perception and mobility, both functionally and morphologically: a case study.

Kang KS, Kim SW, Oh YH, Yu JW, Kim KY, Park HK, Song CH, Han H. "A 37-year-old spinal cord-injured female patient, transplanted of multipotent stem cells from human UC blood, with improved sensory perception and mobility, both functionally and morphologically: a case study." Cytotherapy (2005); PMID:16162459

http://www.ncbi.nlm.nih.gov/pubmed/16162459

** Human umbilical cord blood derived stem cells were directly transplanted into the spinal cord site of a 37-year old female patient with a spinal cord injury. HUCBSC improved sensory perception and movement in the SPI patients' hips and thighs. MRI and CT scans revealed regeneration of spinal cord at the injury site.

PARKINSON'S DISEASE

Stem cell therapy will emerge as an option for Parkinson's disease patients in the near future. Current clinical trials using mesenchymal stem cell transplantation show encouraging results.

Intraarterial autologous implantation of adult stem cells for patients with Parkinson disease.

Brazzini A, Cantella R, De la Cruz A, Yupanqui J, Leon C, Jorquiera T, Brazzani M, Ortega M, Saenz LN. "Intraarterial autologous implantation of adult stem cells for patients with Parkinson disease." J Vasc Interv Radiol. (2010); PMID:20346882

http://www.ncbi.nlm.nih.gov/pubmed/20346882

**Parkinson's disease patients were evaluated with autologous implantation of stem cells. Patients showed mean improvements in disability, activities of daily living, and depression. No complications were observed.

Open-labeled study of unilateral autologous bone-marrow-derived mesenchymal stem cell transplantation in Parkinson's disease.

Venkataramana NK, Kumar SK, Balaraju S, Radhakrishnan RC, Bansal A, Dixit A, Rao DK, Das M, Jan M, Gupta PK, Totey SM. "Open-labeled study of unilateral autologous bone-marrow-derived mesenchymal stem cell transplantation in Parkinson's disease." Transl Res. (2010); PMID:20129486

http://www.ncbi.nlm.nih.gov/pubmed/20129486

**Single dose, unilateral transplantation of autologous bone-marrow-derived mesenchymal stem cells were evaluated in Parkinson's disease patients. 3/7 patients had improvement in unified Parkinson's disease rating scale. Subjective improvement was found in symptoms like facial expression, gait, and freezing episodes. Number of patients and uncontrolled nature of the trial did not allow for the demonstration of effectiveness of the treatment involved.

OCULAR DISEASE/INJURY

Stem cells can act as a new source of cells to replace damaged cells in the eye. This is promising for the development of human cornea reconstruction therapies to treat damage due to limbal stem cell deficiencies, chemical injury of the eye, dry eye, and ageing. A number of clinical trial study are attempting to develop new therapies to treat and prevent loss of vision.

Intravitreal autologous bone marrow CD34+ cell therapy for ischemic and degenerative retinal disorders: preliminary phase 1 clinical trial findings.

Park SS, Bauer G, Abedi M, Pontow S, Panorgias A, Jonnal R, Zawadski RJ, Werner JS, Nolta J. "Intravitreal autologous bone marrow CD34+ cell therapy for ischemic and degenerative retinal disorders: preliminary phase 1 clinical trial findings." Invest Ophthalmol Vis Sci (2014); PMID:25491299

http://www.ncbi.nlm.nih.gov/pubmed/25491299

**Bone marrow CD34+ stem cells were used to access intravitreal therapy for patients with irreversible vision loss from retinal vascular occlusion, hereditary or nonexudative age-related macular degeneration, or retinitis pigmentosa. Transplantation was well tolerated with no inflammation or hyperproliferation.

SKELETAL DISEASE/INJURY

Stem cells found in cord blood, bone marrow, and peripheral blood have shown osteogenic differentiation capability when implanted in patients. Several early stage clinical trials have shown improvements in bone formation in human patients.

Pre- and postnatal transplantation of fetal mesenchymal stem cells in osteogenesis imperfect: a two-center experience.

Gotherstrom C, Westgren M, Shaw SW, Astrom E, Biswas A, Byers PH, Mattar CN, Graham GE, Taslimi J, Ewald U, Fisk NM, Yeoh AE, et al. "Pre- and postnatal transplantation of fetal mesenchymal stem cells in osteogenesis imperfect: a two-center experience." Stem Cells Transl Med (2014). PMID: 24342908

http://www.ncbi.nlm.nih.gov/pubmed/24342908

**Two patients with osteogenesis imperfect received prenatal human fetal mesenchymal stem cells transplantation. Normal growth trajectory was observed. No adverse effect was observed with MSC. Prenatal transplantation of allogenic MSC appears safe and likely to offer a clinical benefit.

Three years after transplants in human mandibles, histological and in-line holotomography revealed that stem cells regenerated a compact rather than a spongy bone: biological and clinical implications.

Giuliani A, Manescu A, Langer M, Rustichelli F, Desiderio V, Paino F, De Rosa A, Laino L, d'Aquino R, Tirino V, Papaccio G. "Three years after transplants in human mandibles, histological and in-line holotomography revealed that stem cells regenerate a compact rather than a spongy bone: biological and clinical implications." Stem Cells Transl Med (2013). PMID: 23502599

http://www.ncbi.nlm.nih.gov/pubmed/23502599

**Regenerated tissue composed of seeded DPSC's from the graft sites was composed of a fully compact bone with a higher matrix density than control human alveolar spongy bone from the same patient. It creates steadier mandibles, may well increase implant stability, and, additionally, may improve resistance to mechanical, physical, chemical, and pharmacological agents.

Stem cell therapy for craniofacial bone regeneration: a randomized, controlled feasibility trial.

Kaigler D, Pagni G, Park CH, Braun TM, Holman LA, Yi E, Tarle SA, Bartel RL, Giannobile WV. "Stem cell therapy for craniofacial bone regeneration: a randomized, controlled feasibility trial." Cell Transplant (2013). PMID: 22776413

http://www.ncbi.nlm.nih.gov/pubmed/22776413

**In this study tissue repair cells (isolated from bone marrow) were investigated to reconstruct localized craniofacial bone defects. No study related serious adverse events were reported. It was shown that tissue repair cells accelerated bone regeneration in jawbone defects compared to guided bone regeneration. Tissue repair cell transplantation appears safe and accelerated bone regeneration.

Injectable bone tissue engineering using expanded mesenchymal stem cells.

Yamada Y, Nakamura S, Ito K, Umemura E, Hara K, Nagasaka T, Abe A, Baba S, Furuichi Y, Izumi Y, Klein OD, Wakabayashi T. "Injectable bone tissue engineering using expanded mesenchymal stem cells." Stem Cells (2013). PMID: 23225744

http://www.ncbi.nlm.nih.gov/pubmed/23225744

**This investigation focused on whether injectable tissue-engineered bone made up of mesenchymal stem cells and platelet-rich plasma was able to regenerate functional bone in alveolar deficiencies. All patients had improved bone volume with no side effects. Newly formed bone areas had significant increase over preoperation baseline.

Human mandible bone defect repair by the grafting of dental pulp stem/progenitor cells and collagen sponge biocomplexes.

d'Aquino R, De Rosa A, Lanza V, Tirino V, Laino L, Graziano A, Desiderio V, Laino G, Papaccio G. "Human mandible bone defect repair by the grafting of dental pulp stem/progenitor cells and collagen sponge biocomplexes." Eur Cell Mater. (2009) Nov 12;18:75-83. PMID: 19908196

http://www.ncbi.nlm.nih.gov/pubmed/19908196

** This clinical study demonstrates that a DPC/collagen sponge biocomplex can completely restore human mandible bone defects and indicates that this cell population could be used for the repair and/or regeneration of tissues and organs.

Injectable tissue-engineered bone using autogenous bone marrow-derived stromal cells for maxillary sinus augmentation: clinical application report from a 2-6-year follow up.

Yamada Y, Nakamura S, Ito K, Kohgo T, Hibi H, Nagasaka T, Ueda M. "Injectable tissue-engineered bone using autogenous bone marrow-derived stromal cells for maxillary sinus augmentation: clinical application report from a 2-6-year follow up." Tissue Eng Part A. (2008). PMID: 18823276

http://www.ncbi.nlm.nih.gov/pubmed/18823276

**Bone marrow derived stromal cells and platelet-rich plasma were used to augment by placement of bone graft and dental implants in 12 patients. No adverse effects were reported and bone absorption were seen in the 2-6 year follow up time.

Repair of large bone defects with the use of autologous bone marrow stromal cells.

Quarto E, Mastrogiacomo M, Cancedda R, Kutepov SM, Mukhachev V, Lavroukov A, Kon E, Marcacci M. "Repair of large bone defects with the use of autologous bone marrow stromal cells." N Engl J Med (2001). PMID: 11195802

http://www.ncbi.nlm.nih.gov/pubmed/11195802

**Progenitor cells were isolated from bone marrow and expanded. Three patients with large bone defects were treated with a these cells implanted in a scaffold. Results reveal abundant callus formation in implants and good integration with host bones.

WEB PUBLICATIONS USING MESENCHYMAL STEM CELLS IN HUMANS

Stem cell treatment for patients disabled by stroke shows promise.

ReNeuron stem cell therapy shows long-term promise for stroke.

http://news.yahoo.com/reneuron-stem-cell-therapy-shows-long-term-promise-125033885--finance.html

Stem cells used to treat rare blood condition in the UK.

Stem cell treatment may signal cure for genetic diseases.

http://www.thestarphoenix.com/health/Stem+cell+treatment+signal+cure+genetic+diseases/10994349/story.html

MSC's used to repair cartilage, collagen, tendon, or bone in orthopedics.

Stem-cell therapy shows promise in orthopedic treatment.

http://www.washingtontimes.com/news/2015/apr/20/stem-cell-therapy-shows-promise-in-orthopedic-trea/

MSC from bone marrow are used to relive back pain.

Stem Cell Treatment for Back Pain Shows Success.

http://www.stemcellsportal.com/stem-cell-treatment-back-pain-shows-success

FDA approved start of clinical trial using MSC to treat patients after heart attack.

Capricor Announces FDA Approval to Inititate ALLSTAR Trial of Allogeneic Stem Cell Therapy in Patients Following Heart Attack.

http://www.fiercebiotech.com/press-releases/capricor-announces-fda-approval-initiate-allstar-trial-allogeneic-stem-cell

Cord blood stem cell product, Allocord, has received approval by FDA for use in patients with blood disorders

Stem-Cell Therapy Approved for Blood Disorders.

http://www.ashp.org/menu/News/PharmacyNews/NewsArticle.aspx?id=3908

Patients with amyotrophic lateral sclerosis (ALS) has received stem cells and it slowed muscle degeneration

FDA-approved Stem Cell Trial Dramatically Slows ALS.

http://www.biosciencetechnology.com/articles/2013/05/fda-approved-stem-cell-trial-dramatically-slows-als

Stem cells improve life of boy with cerebral palsy

Boy, 2, is the first to have cerebral palsy 'successfully treated' using stem cells, taking him from a vegetative state to walking and talking.

http://www.theguardian.com/science/2014/oct/15/stem-cell-success-in-treating-macular-degeneration

Stem cells improve vision in patients with eye degeneration.

Stem cell therapy success in treatment of sight loss from macular degeneration.

http://www.theguardian.com/science/2014/oct/15/stem-cell-success-in-treating-macular-degeneration

Stem cells from teeth grow into cornea like structures.

Stem cells from wisdom teeth could help repair corneas.

https://www.sciencenews.org/blog/science-ticker/stem-cells-wisdom-teeth-could-help-repair-corneas

Stem cells: First therapy approved by EU.

The European Medicines Agency has approved the use of stem cell therapy for Holocar, a rare eye conditions that lead to blindness. It works around 80% of cases.

http://www.bbc.com/news/health-30550113

World's first successful stem cell treatment of autoimmune diseases

Patient with multiple sclerosis, autoimmune hearing loss, atopic dermatitis and rheumatoid arthritis had symptoms that became manageable after stem cell treatment.

http://www.sclerodermatt.org/articles/news/422-the-worlds-first-successful-stem-cell-treatment-of-autoimmune-diseases

FDA approves stem cell treatment for heart disease: Mayo clinic to test technique in human trial

Stem cells will be used to fix damaged heart tissue, promising results in cardiac outflow were seen in patients tested in Europe.

http://www.medicaldaily.com/fda-approves-stem-cell-treatment-heart-disease-mayo-clinic-test-technique-human-trial-267408

Stem cell knee injection shown to regenerate meniscus, reduce pain.

Stem cells were used for meniscal regeneration and the control of knee pain. Treatment was with allogeneic human mesenchymal stem cells.

http://www.healio.com/orthopedics/biologics/news/online/%7B0cd61592-5eed-4b52-a868-e7576aab3fdf%7D/stem-cell-knee-injection-shown-to-regenerate-meniscus-reduce-pain

A woman's own MSC's were used to grow a transplant trachea.

1st Trachea Transplant From Stem Cells
Doctors Use Patient's Stem Cells to Prepare Donor's Trachea

WebMD Health News; By Miranda Hitti

http://www.webmd.com/news/20081119/1st-trachea-transplant-from-stem-cells

MSC's are used to grow replacement cartilage for damaged shoulders in humans.

Adult Stem Cells for Shoulder Injuries

On Target

http://blog.targethealth.com/?p=3802

MSC's are used for difficult wound healing and skin growth in human patients.

New Study Using Combination of Bioengineered Skin and Stem Cells Shows Promise in Treatment of Non-Healing Wounds

By: PR Newswire

http://uk.sys-con.com/node/866081

MSC's are used to treat multiple sclerosis

FDA Approves MSC-NP Therapy as Investigational New Drug in MS Clinical Trial: A Research Milestone

http://www.tischms.org/news/fda-approves-msc-np-therapy-investigational-new-drug-ms-clinical-trial-research-milestone

ANY QUESTIONS?

Like most parents you may have some questions about banking your child's stem cells. One of our specialist team would be more than happy to address any questions you may have on what we do and how. We also have a team of dedicated scientists that can help address the more technical details.

Please do not hesitate to get in touch with one of our team on **0208 4770 336** or via our contact form.

Alternatively, you can request a free information pack from us to discover more about BioEden.

The purpose of this document is to educate the reader on recent advances in the field of cell research and application. BioEden Ltd. does not take credit for or imply that we were connected with this research in any way. We do not endorse any of the authors or verify the authenticity of any of their published results.