

Document details

Back to results | < Previous 3 of 24 Next >

Full Text

View at Publisher

Export

Download


Add to List

More...

Tissue and Cell

Volume 47, Issue 4, 1 August 2015, Pages 420-430

The potential of 3-dimensional construct engineered from poly(lactic-co-glycolic acid)/fibrin hybrid scaffold seeded with bone marrow mesenchymal stem cells for in vitro cartilage tissue engineering (Article)

Abdul Rahman, R.^a, Mohamad Sukri, N.^a, Md Nazir, N.^a, Ahmad Radzi, M.A.^a, Zulkifly, A.H.^b, Che Ahmad, A.^b, Hashi, A.A.^c,
Abdul Rahman, S.^a, Sha'ban, M.^a 

^a Department of Biomedical Science, Kulliyah of Allied Health Sciences, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, Kuantan, Pahang Darul Makmur, Malaysia

^b Department of Orthopaedics, Traumatology and Rehabilitation, Kulliyah of Medicine, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, Kuantan, Pahang Darul Makmur, Malaysia

^c Department of Biotechnology, Kulliyah of Science, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, Kuantan, Pahang Darul Makmur, Malaysia

 View additional affiliations

 View references (72)

Abstract

Articular cartilage is well known for its simple uniqueness of avascular and aneural structure that has limited capacity to heal itself when injured. The use of three dimensional **construct** in tissue engineering holds great **potential** in regenerating cartilage defects. This study evaluated the in vitro cartilaginous tissue formation using rabbit's bone marrow mesenchymal stem cells (BMSCs)-seeded onto poly(lactic-co-glycolic acid) PLGA/fibrin and PLGA scaffolds. The in vitro cartilaginous **engineered** constructs were evaluated by gross inspection, histology, cell proliferation, gene expression and sulphated glycosaminoglycan (sGAG) production at week 1, 2 and 3. After 3 weeks of culture, the PLGA/fibrin **construct** demonstrated gross features similar to the native tissue with smooth, firm and glistening appearance, superior histoarchitectural and better cartilaginous extracellular matrix compound in concert with the positive glycosaminoglycan accumulation on Alcian blue. Significantly higher cell proliferation in PLGA/fibrin **construct** was noted at day-7, day-14 and day-21 ($p < 0.05$ respectively). Both constructs expressed the accumulation of collagen type II, collagen type IX, aggrecan and sox9, showed down-regulation of collagen type I as well as produced relative sGAG content with PLGA/fibrin **construct** exhibited better gene expression in all profiles and showed significantly higher relative sGAG content at each time point ($p < 0.05$). This study suggested that with optimum in vitro manipulation, PLGA/fibrin when seeded with pluripotent non-committed BMSCs has the capability to differentiate into chondrogenic lineage and may serve as a prospective **construct** to be developed as functional tissue **engineered** cartilage. © 2015 Elsevier Ltd.

Author keywords

Bone marrow mesenchymal stem cells; Cartilage tissue engineering; Fibrin; Poly(lactic-co-glycolic acid); Scaffold

Indexed keywords

EMTREE drug terms: aggrecan; alcian blue; collagen type 1; collagen type 2; collagen type 9; fibrin; glycosaminoglycan polysulfate; polyglactin; collagen type 2; fibrin; lactic acid; polyglycolic acid; polylactic acid-polyglycolic acid copolymer

EMTREE medical terms: animal cell; animal tissue; Article; articular cartilage; bone marrow derived mesenchymal stem cell; cell activity; cell culture; cell proliferation; controlled study; down regulation; gene; gene expression; histology; in vitro study; nonhuman; rabbit; tissue engineering; tissue scaffold; animal; articular cartilage; bone marrow cell; chemistry; chondrogenesis; drug effects; female; mesenchymal stem cell transplantation; mesenchymal stroma cell; metabolism; tissue scaffold

Species Index: *Oryctolagus cuniculus*

MeSH: Animals; Bone Marrow Cells; Cartilage, Articular; Chondrogenesis; Collagen Type II; Female; Fibrin; Lactic Acid; Mesenchymal Stem Cell Transplantation; Mesenchymal Stromal Cells; Polyglycolic Acid; Rabbits; Tissue Engineering; Tissue Scaffolds

Medline is the source for the MeSH terms of this document.

Chemicals and CAS Registry Numbers: alcian blue, 12040-44-7; fibrin, 9001-31-4; glycosaminoglycan polysulfate, 63449-40-1; polyglactin, 26780-50-7, 34346-01-5; lactic acid, 113-21-3, 50-21-5; polyglycolic acid, 26009-03-0, 26124-68-5, 26202-08-

Cited by 9 documents

Protective effects of baicalin on rabbit articular chondrocytes in vitro
Huang, X., Wu, H., Wang, L.
(2017) Experimental and Therapeutic Medicine

Evaluation of magnetic nanoparticle-labeled chondrocytes cultivated on a type II collagen-chitosan/poly(Lactic-co-glycolic) acid biphasic scaffold
Su, J.-Y., Chen, S.-H., Chen, Y.-P.
(2017) International Journal of Molecular Sciences

Application of platelet-rich plasma with stem cells in bone and periodontal tissue engineering
Fernandes, G., Yang, S.
(2016) Bone Research

[View all 9 citing documents](#)

Inform me when this document is cited in Scopus:

 Set citation alert

 Set citation feed

Related documents

Evaluation of three dimensional construct engineered from poly(Lactic-co-glycolic acid)/fibrin hybrid scaffold using rabbit bone marrow mesenchymal stem cells for osteochondral defect repair
Rahman, R.A., Mohamad Sukri, N., Md Nazir, N.
(2015) Jurnal Teknologi

Insulin-like growth factor 1 promotes in vitro proliferation of chondrocytes in traumatic arthritis
Zhao, G., Jing, J.-F., Zhang, Z.-Y.
(2014) Chinese Journal of Tissue Engineering Research

Fibrin promotes proliferation and matrix production of intervertebral disc cells cultured in three-dimensional poly(lactic-co-glycolic acid) scaffold
Sha'ban, M., Yoon, S.J., Ko, Y.K.
(2008) Journal of Biomaterials Science, Polymer Edition

[View all related documents based on references](#)

Find more related documents in Scopus based on:

 Authors

 Keywords

Metrics

 **9** Citations 90TH PERCENTILE

 **1.77** Field-Weighted Citation Impact

 **21** Mendeley Readers 75TH PERCENTILE

 View all metrics