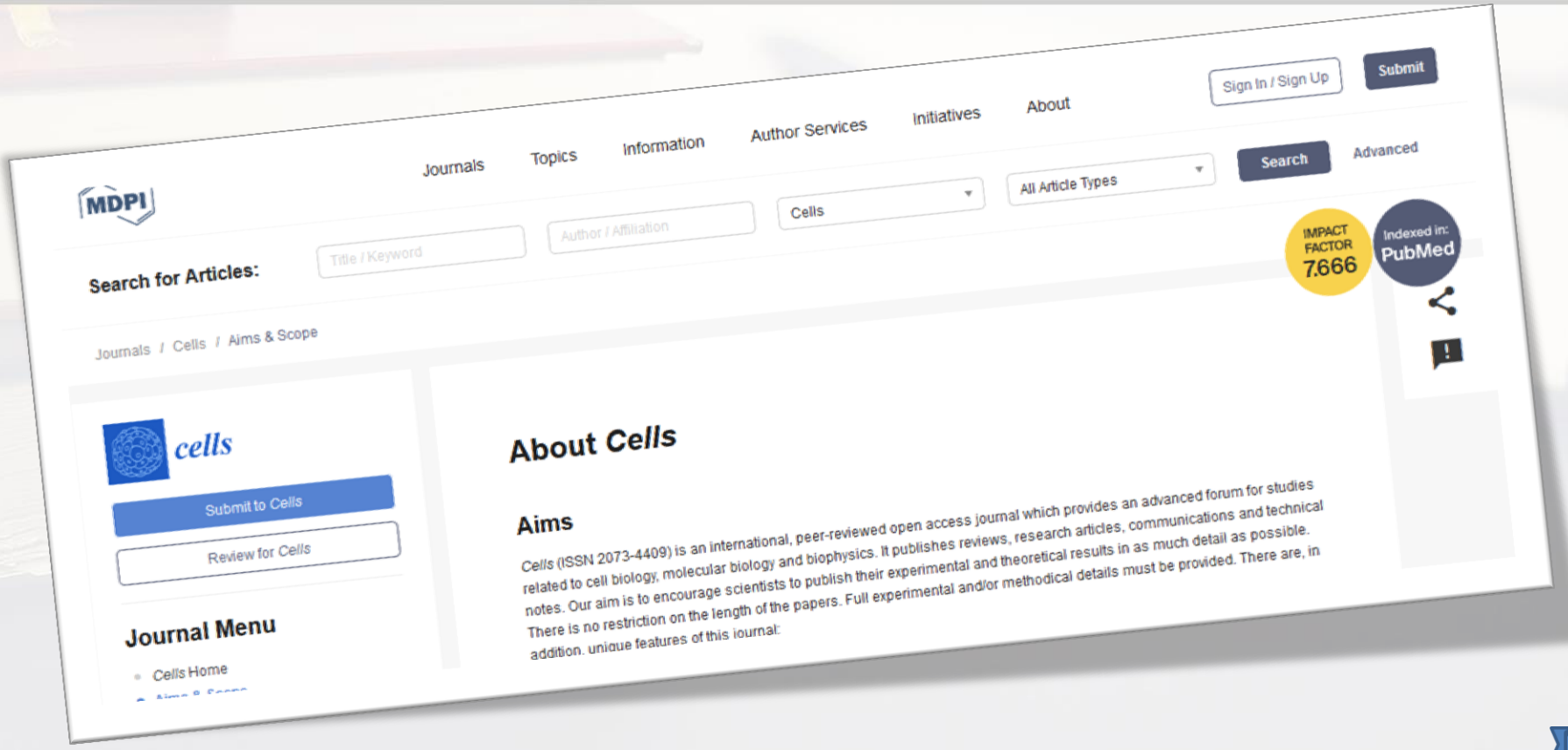
Hematology Journal Club

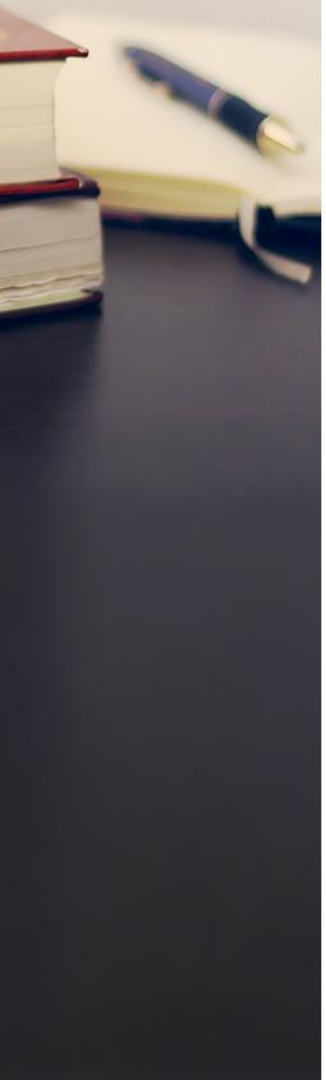
Progenitor Cells Activated by Platelet Lysate in Human Articular Cartilage as a Tool for Future Cartilage Engineering and Reparative Strategies

Advised by:
Dr.Farsinejad

Presented by:
S.Salek

CELLS

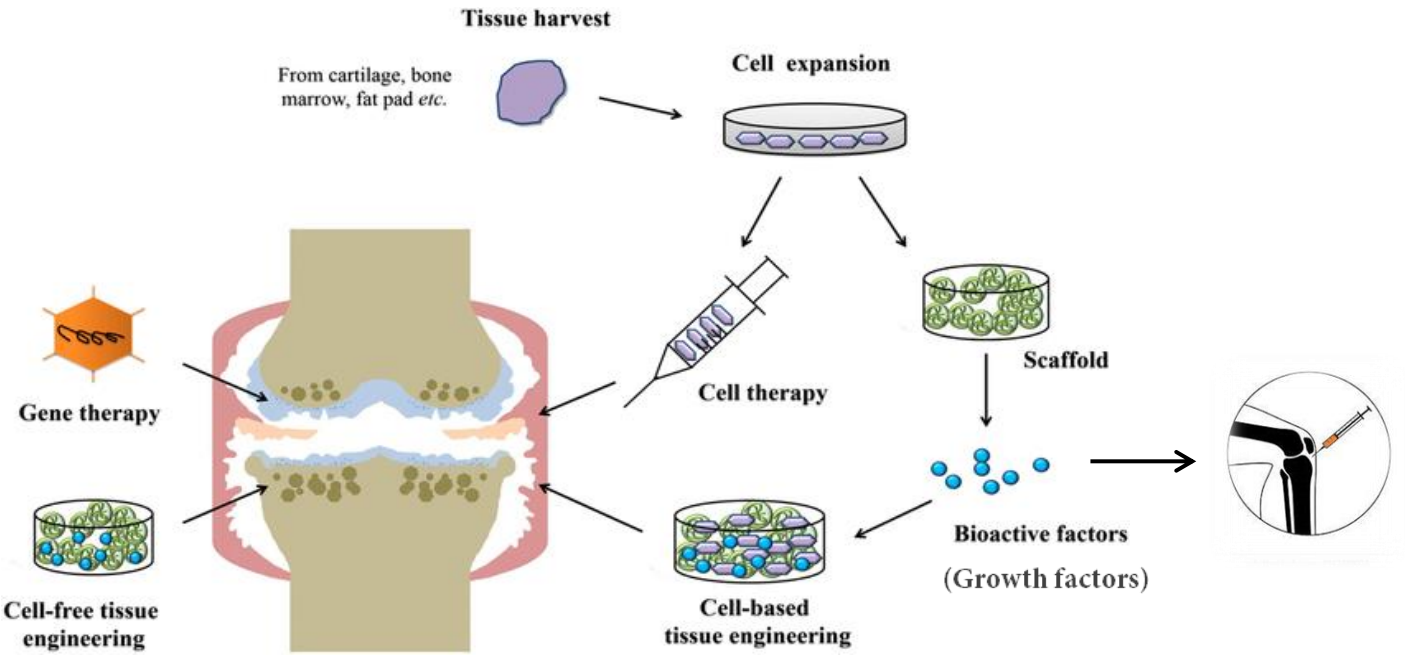

MDPI
Journals
Topics
Information
Author Services
Initiatives
About
Sign In / Sign Up
Submit
Search for Articles:
Title / Keyword
Author / Affiliation
Cells
All Article Types
Search
Advanced
IMPACT FACTOR 7.666
Indexed in: PubMed
Journals / Cells / Aims & Scope
cells
Submit to Cells
Review for Cells
Journal Menu
Cells Home
About Cells
Aims
Cells (ISSN 2073-4409) is an international, peer-reviewed open access journal which provides an advanced forum for studies related to cell biology, molecular biology and biophysics. It publishes reviews, research articles, communications and technical notes. Our aim is to encourage scientists to publish their experimental and theoretical results in as much detail as possible. There is no restriction on the length of the papers. Full experimental and/or methodical details must be provided. There are, in addition, unique features of this journal:



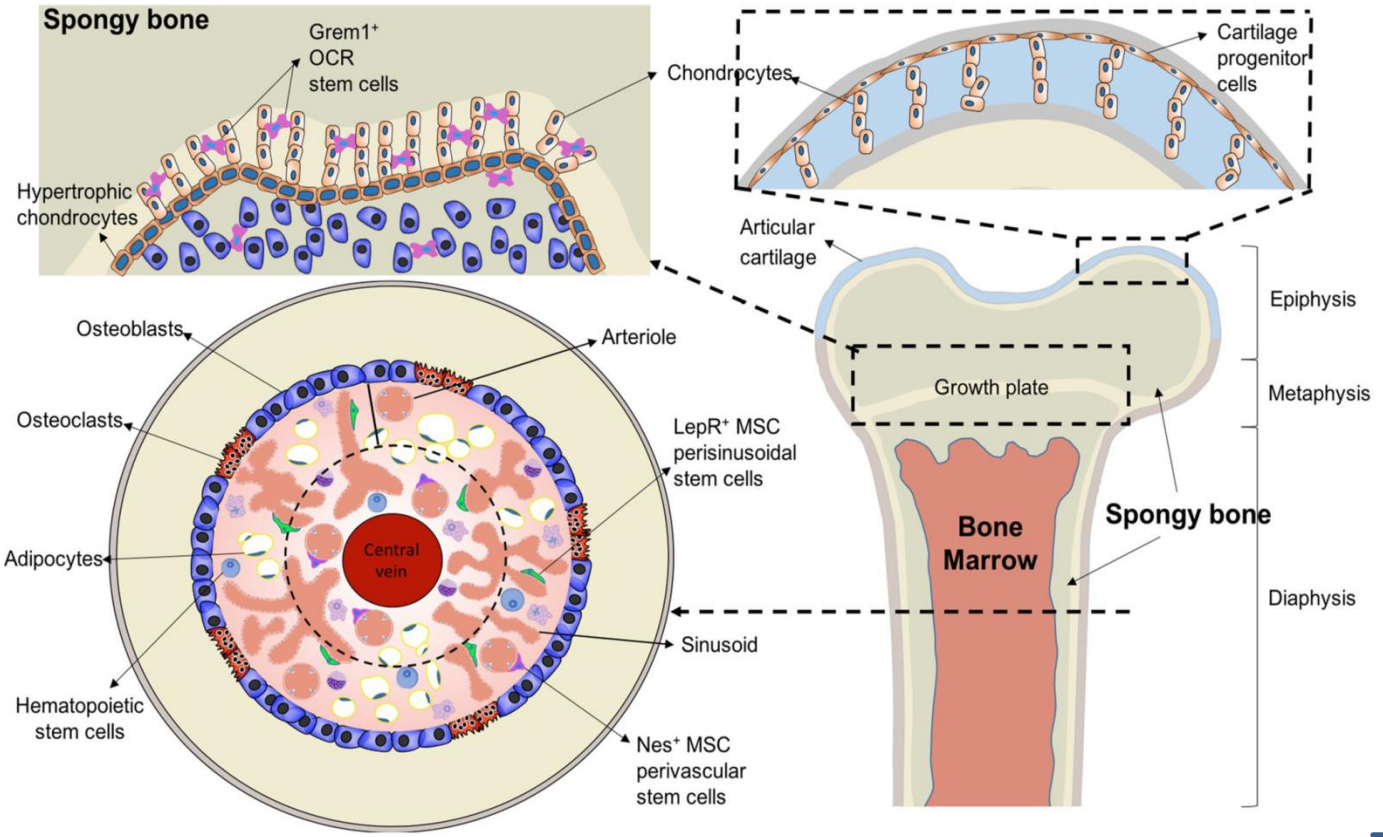
Introduction:

osteoarthritis (OA)

Introduction:

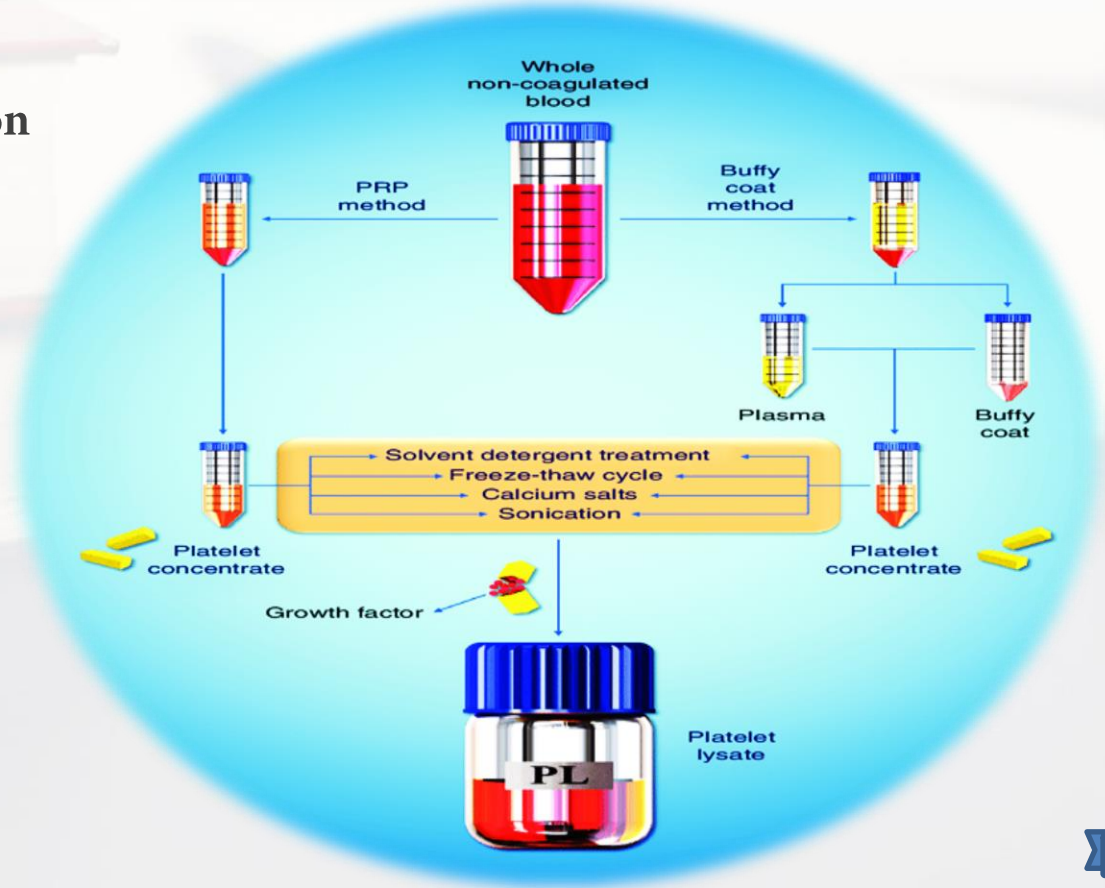


Introduction:



Materials and Methods:

1. Platelet Lysate (PL) Preparation

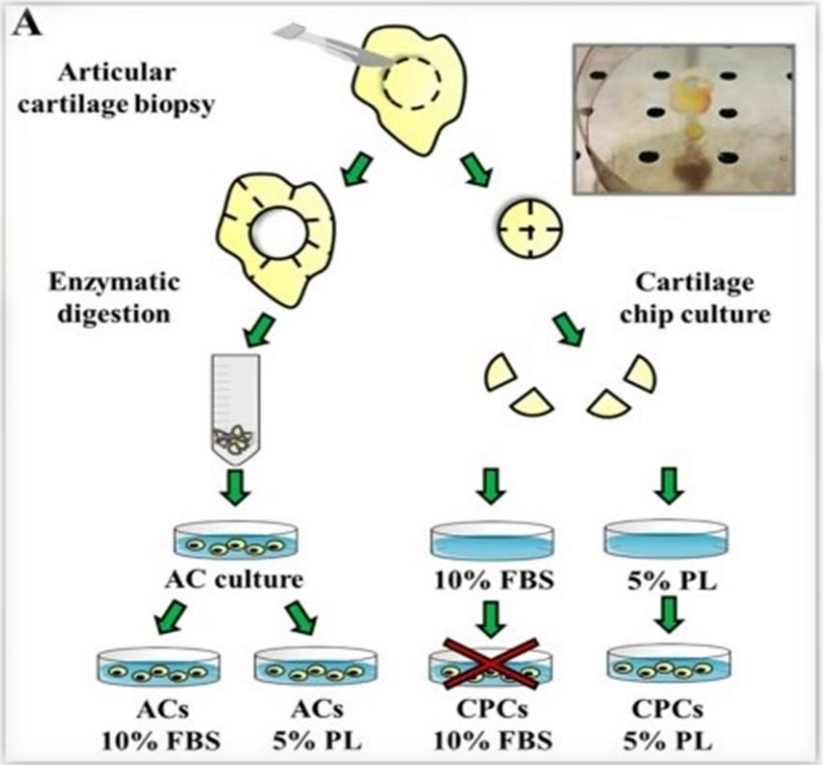


Materials and Methods:

2. Cell Primary Cultures

- Chondro-Progenitor Cells (CPCs)
- Primary Articular Chondrocytes (ACs)

3. Growth Kinetics

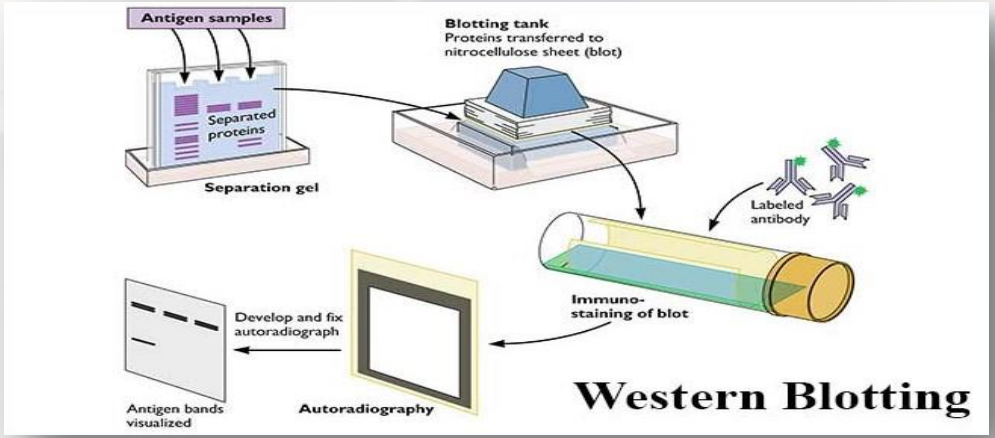


Materials and Methods:

4. Western Blot Analysis

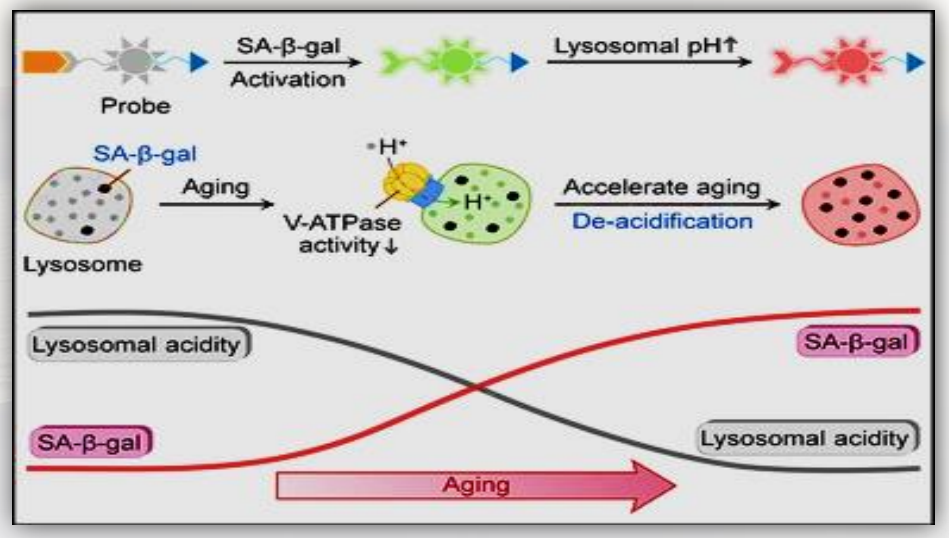
Bradford assay

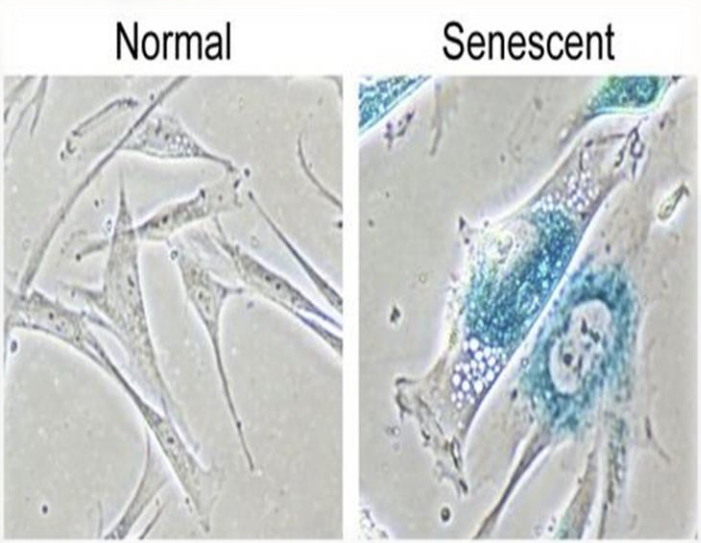
Western blot



Materials and Methods:

5. Evaluation of Cell Senescence ⟶ senescence-associated β-galactosidase (SA-βgal)



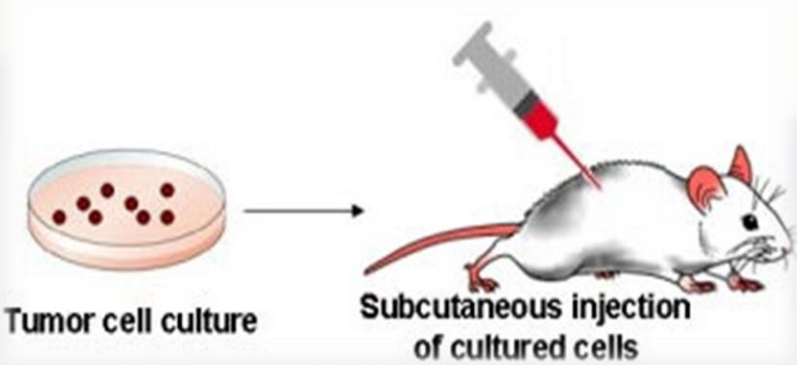


Materials and Methods:

6. Assay for In Vitro and In Vivo Neoplastic Transformation of CPCs

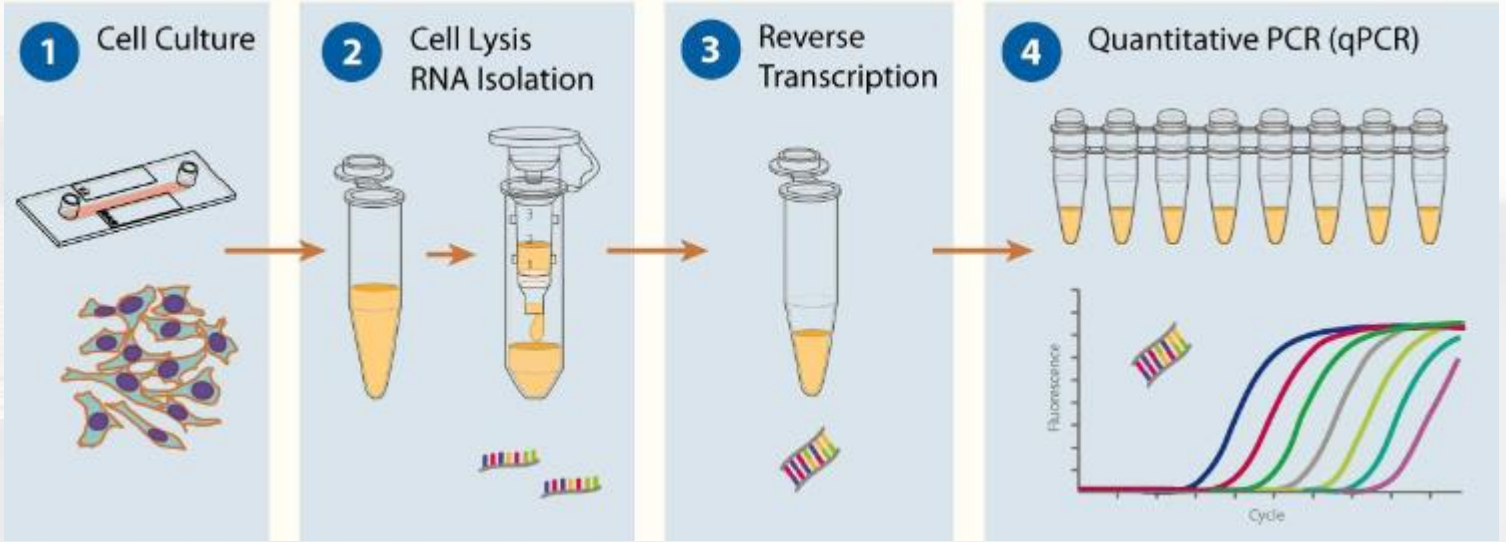
In vitro

In vivo



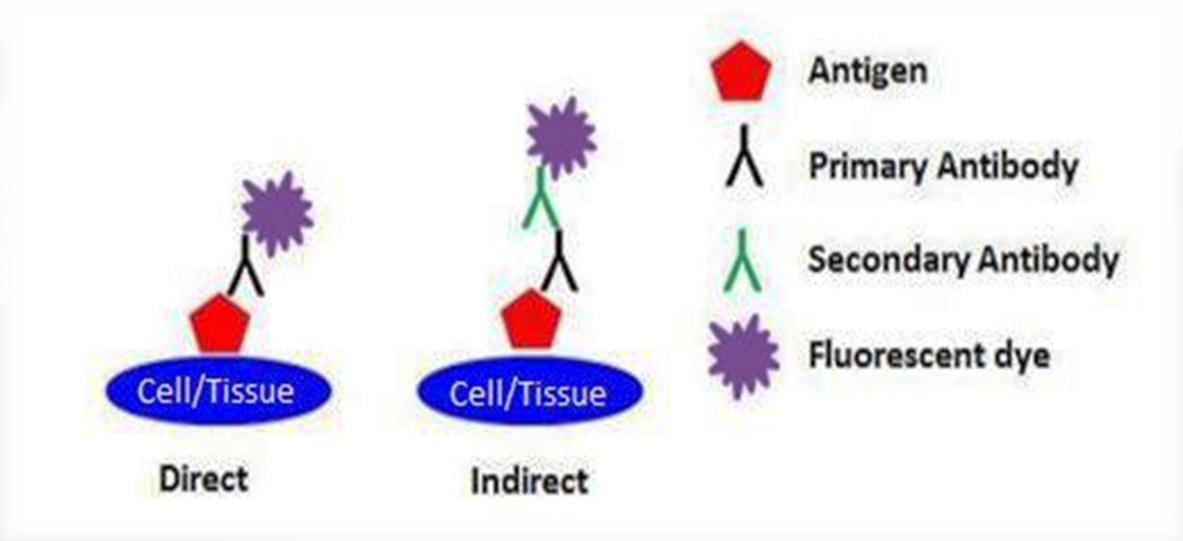
Materials and Methods:

7. RNA extraction, reverse transcription, (qPCR) ⟶ COL2A1, COL1A1, SOX9, Nestin, GAPDH



Materials and Methods:

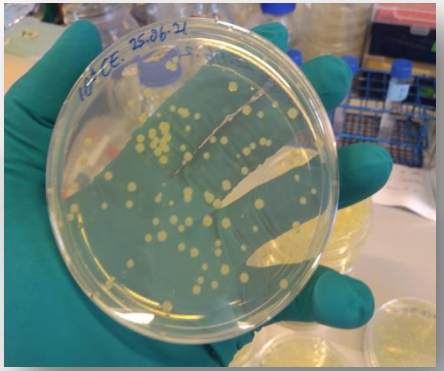
8. Immunophenotypic Characterization by Flow Cytometry ⟶ CD44-FITC, CD166-PE, HLA-ABC-PE, HLA-DR-FITC ,CD90-PE, CD105-PE, CD73-FITC, CD146-FITC, CD106-PE, CD45-FITC, CD34-PE, CD29-PE



Materials and Methods:

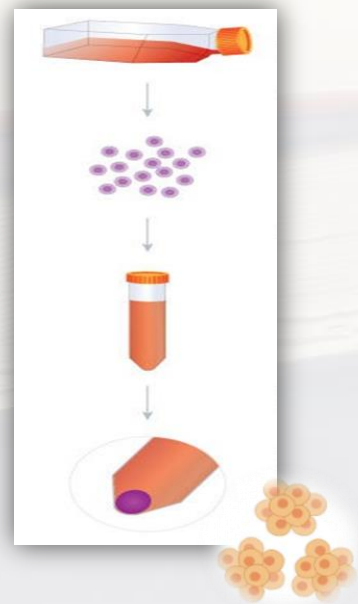
9. Colony-Forming Unit Fibroblast (CFU-F) Assay

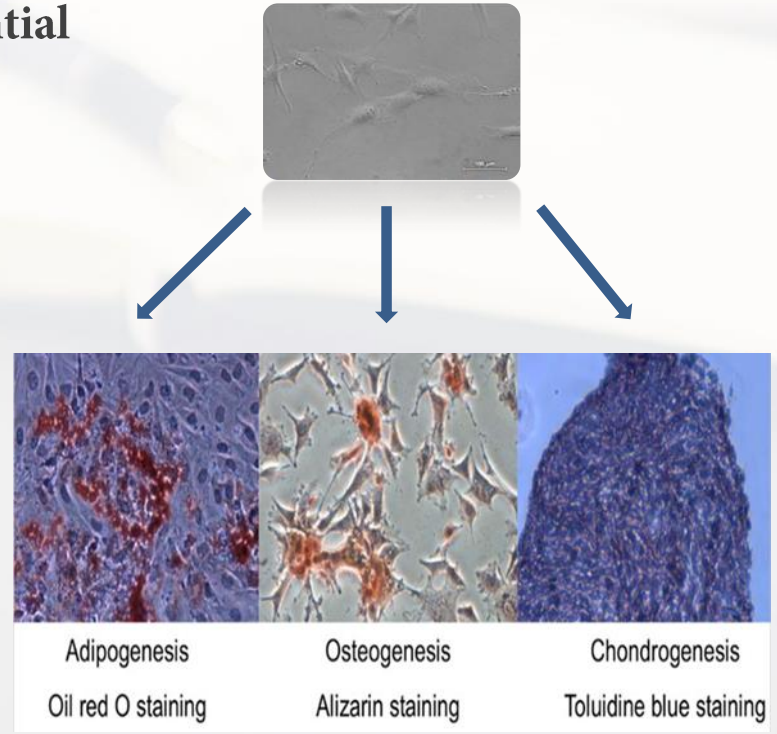
number of colonies formed/number of plated cells × 100



Materials and Methods:

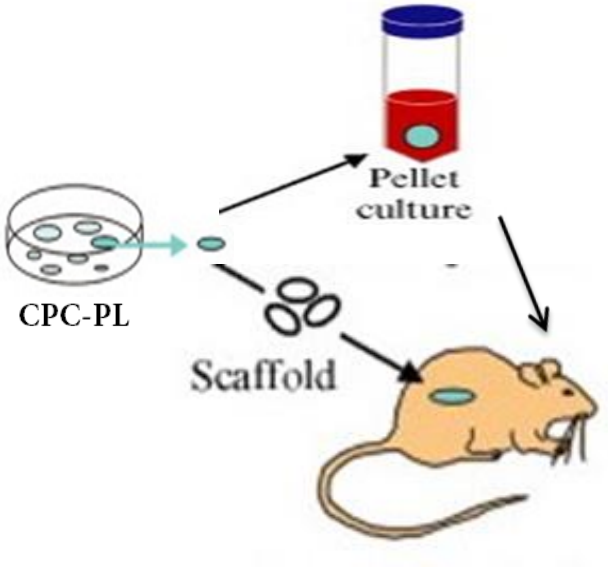
10. In Vitro Multilineage Differentiation Potential





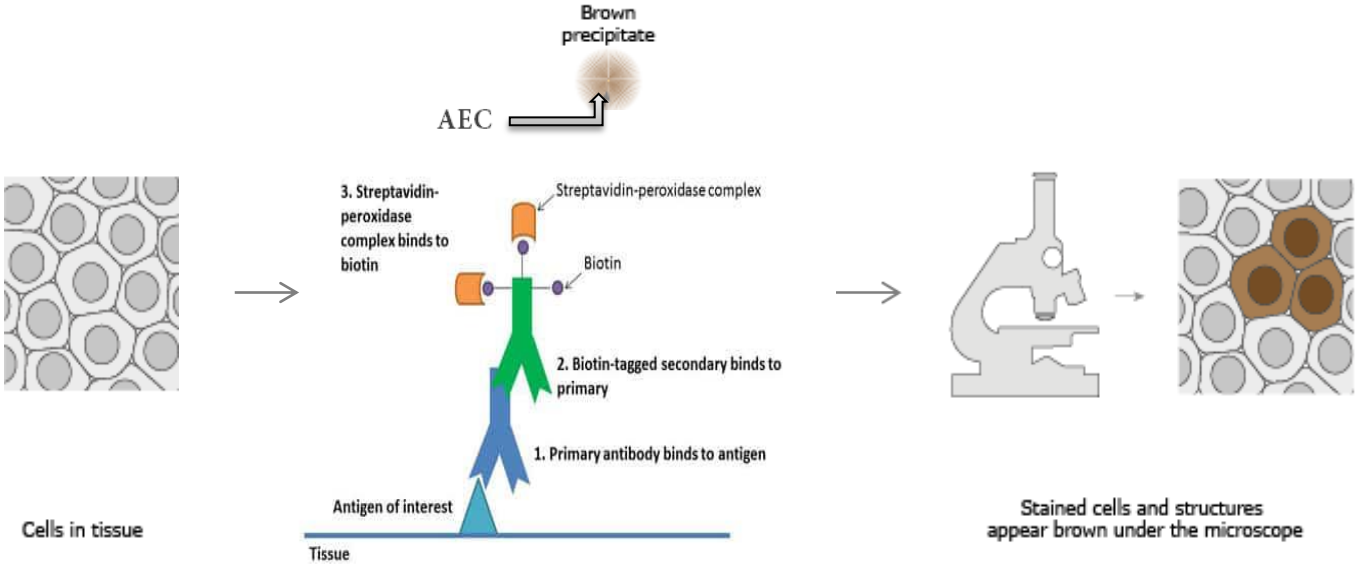
Materials and Methods:

11. In Vivo Cartilage and Bone Formation



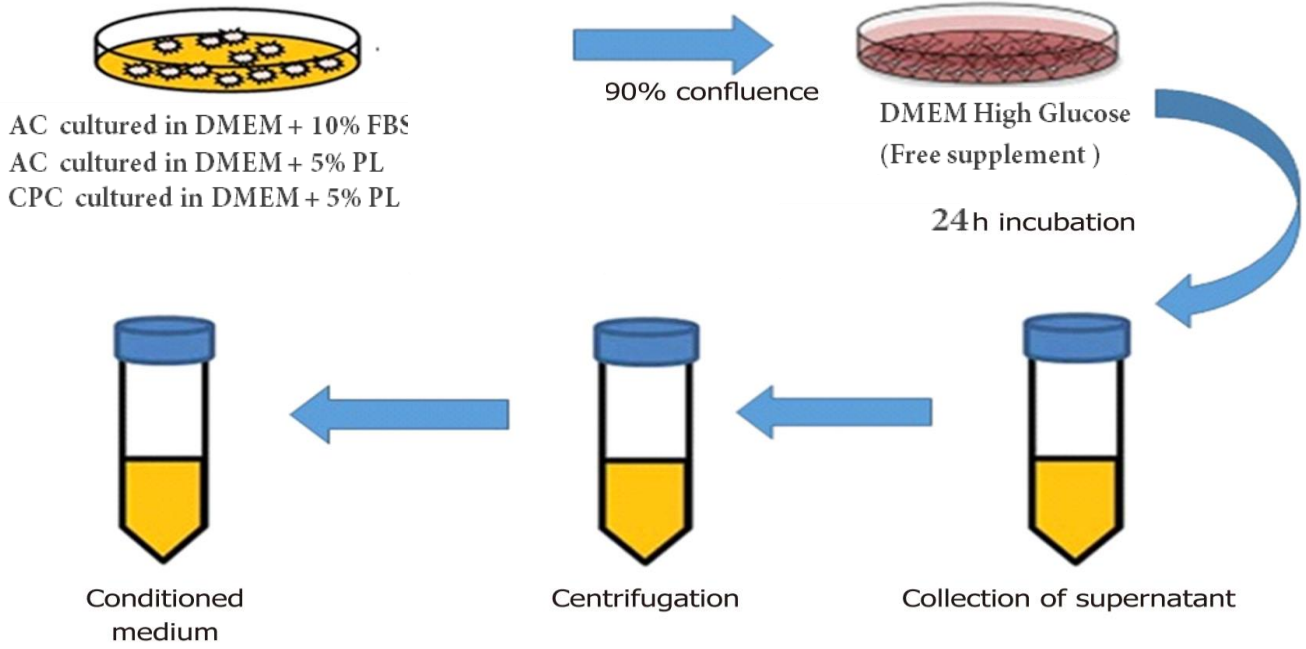
Materials and Methods:

12. Histology and Immunohistochemistry



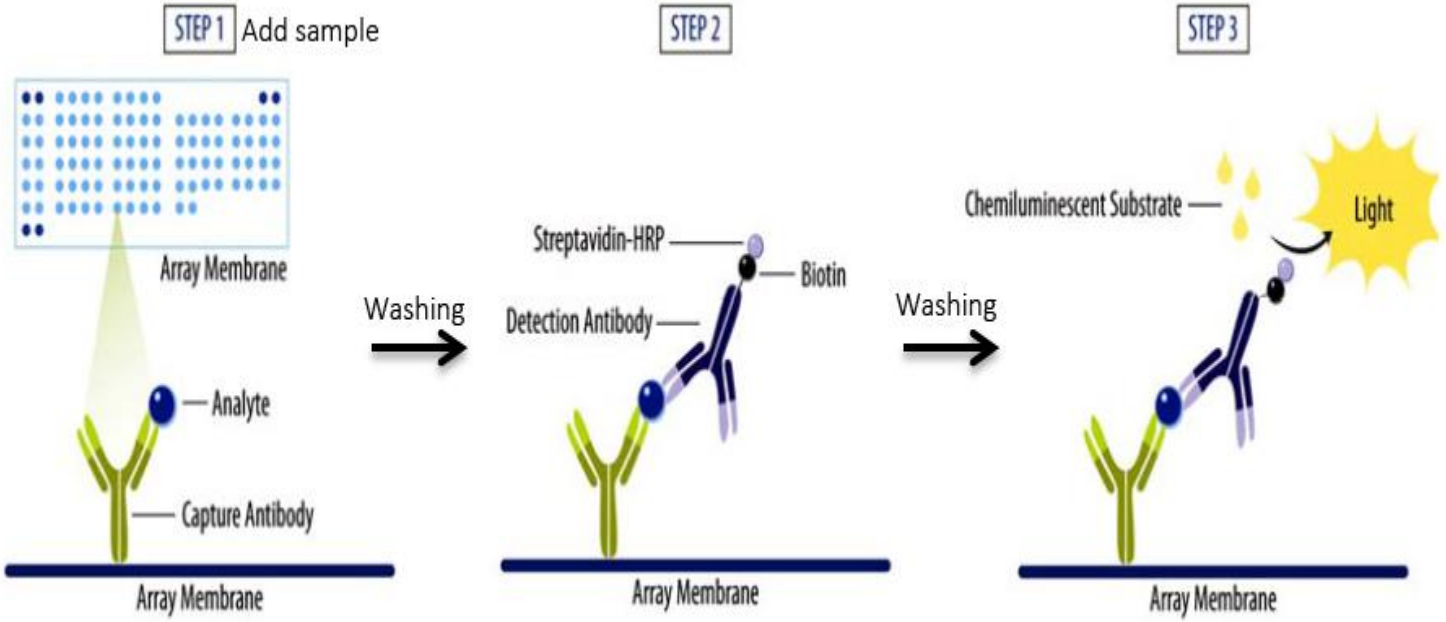
Materials and Methods:

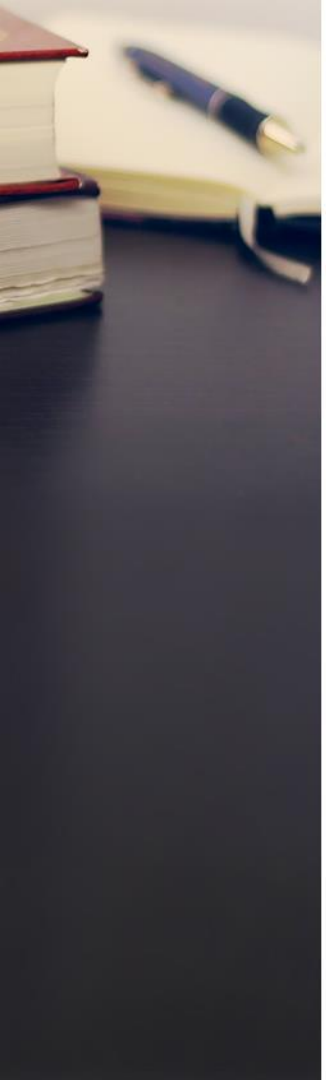
13. Production of Cell-Conditioned Media



Materials and Methods:

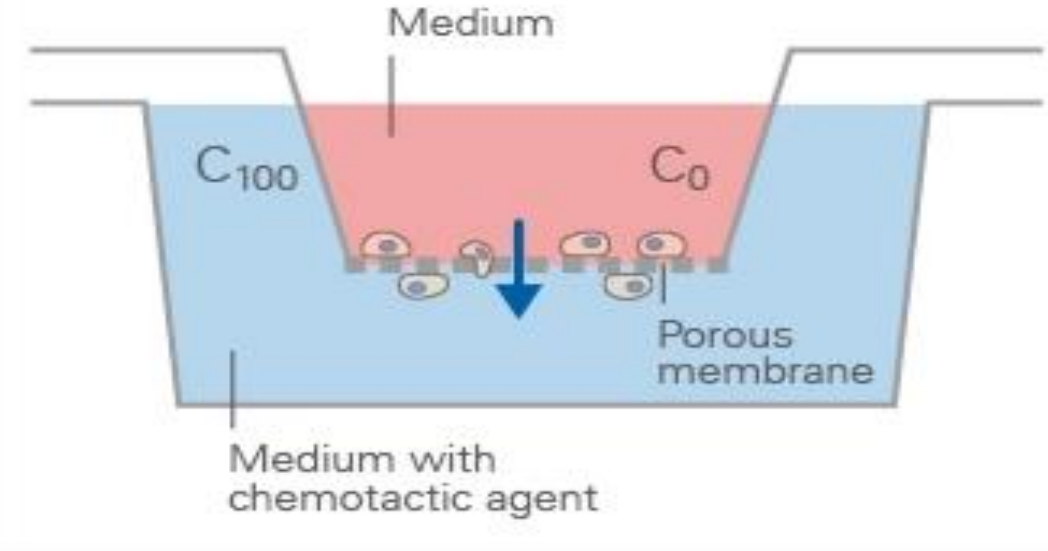
14. Cytokine Identification in Cell Secretome





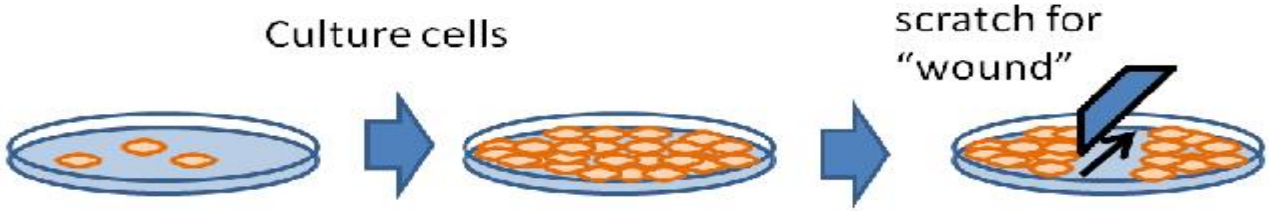
Materials and Methods:

15. In Vitro Chemotaxis of CPCs

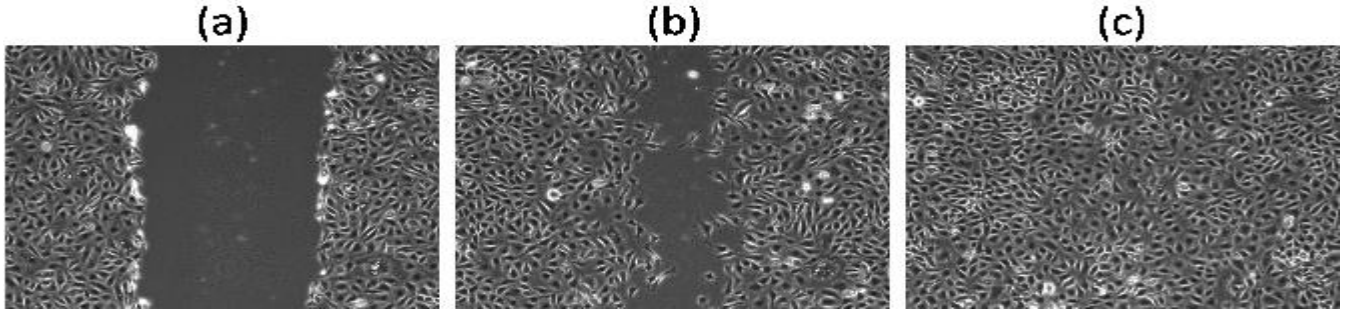


Materials and Methods:

16. In Vitro Scratch Assay

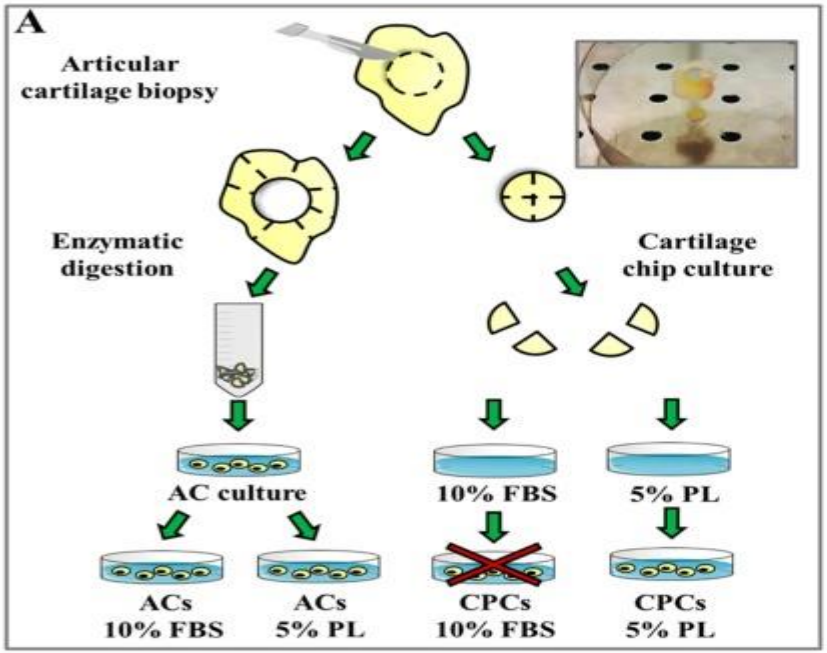


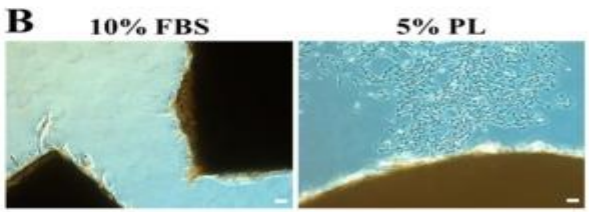
The process of making wound

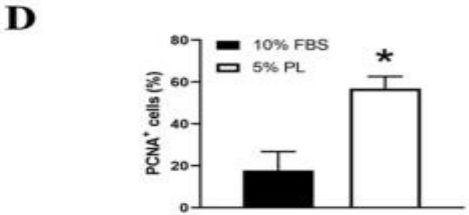


Result:

1. PL Induced Release of Cells with Fibroblastic-Like Phenotype from Ex Vivo Cultured Cartilage Chips and Promoted Their Proliferation

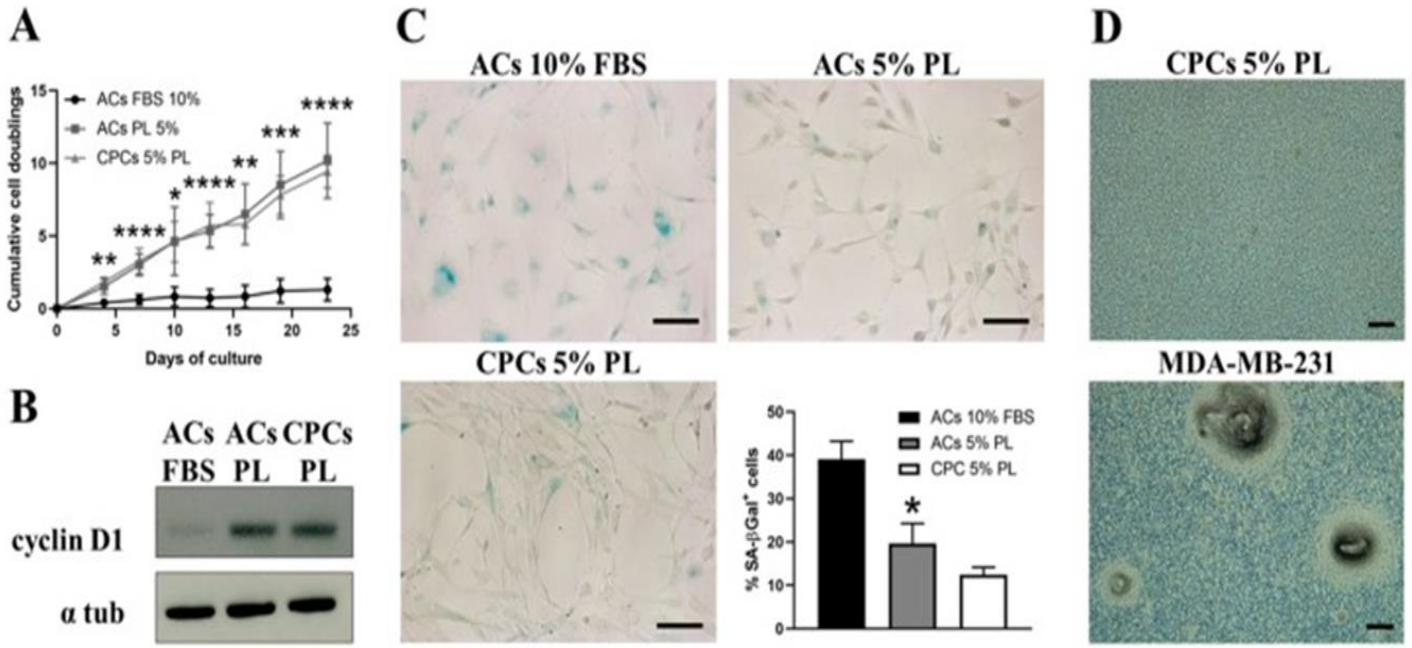






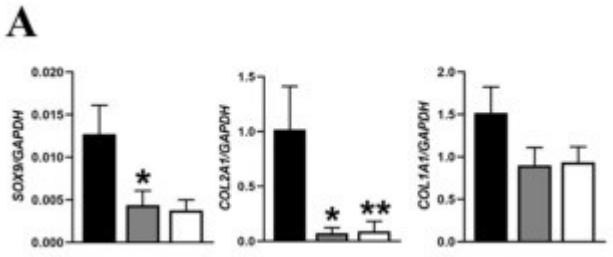
Result:

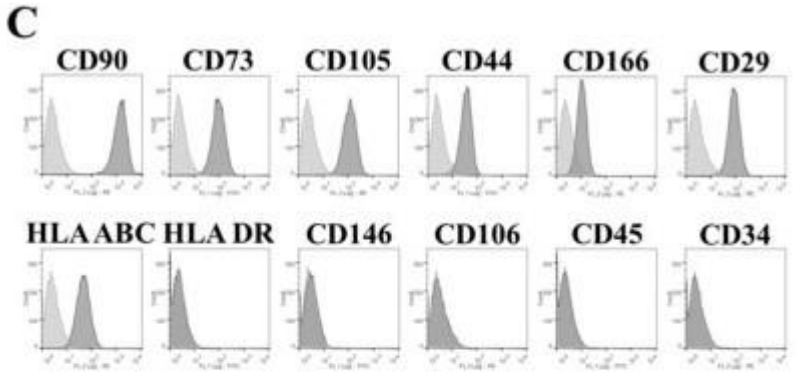
2. PL Increased the Proliferation of ACs and Reduced Their Senescence

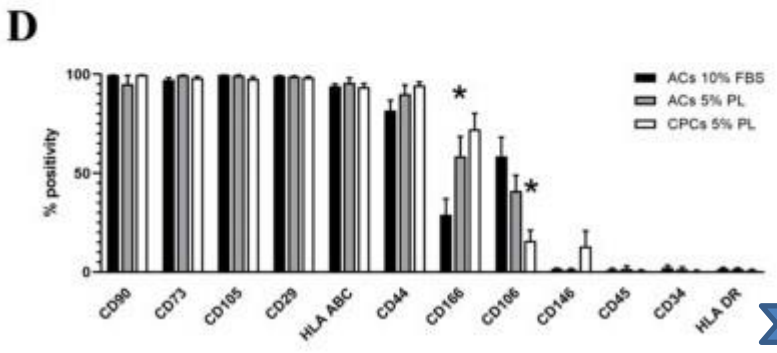


Result:

3. Effect of PL on Gene Expression and Phenotype in Cartilage-Derived Cells

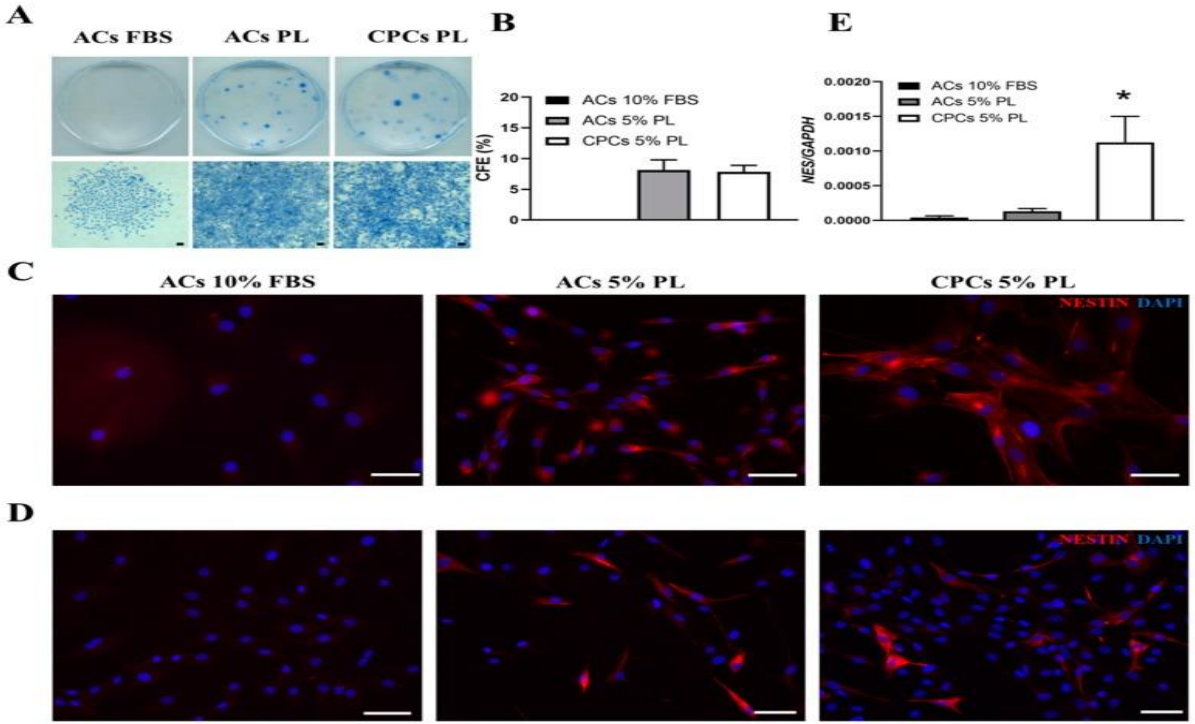






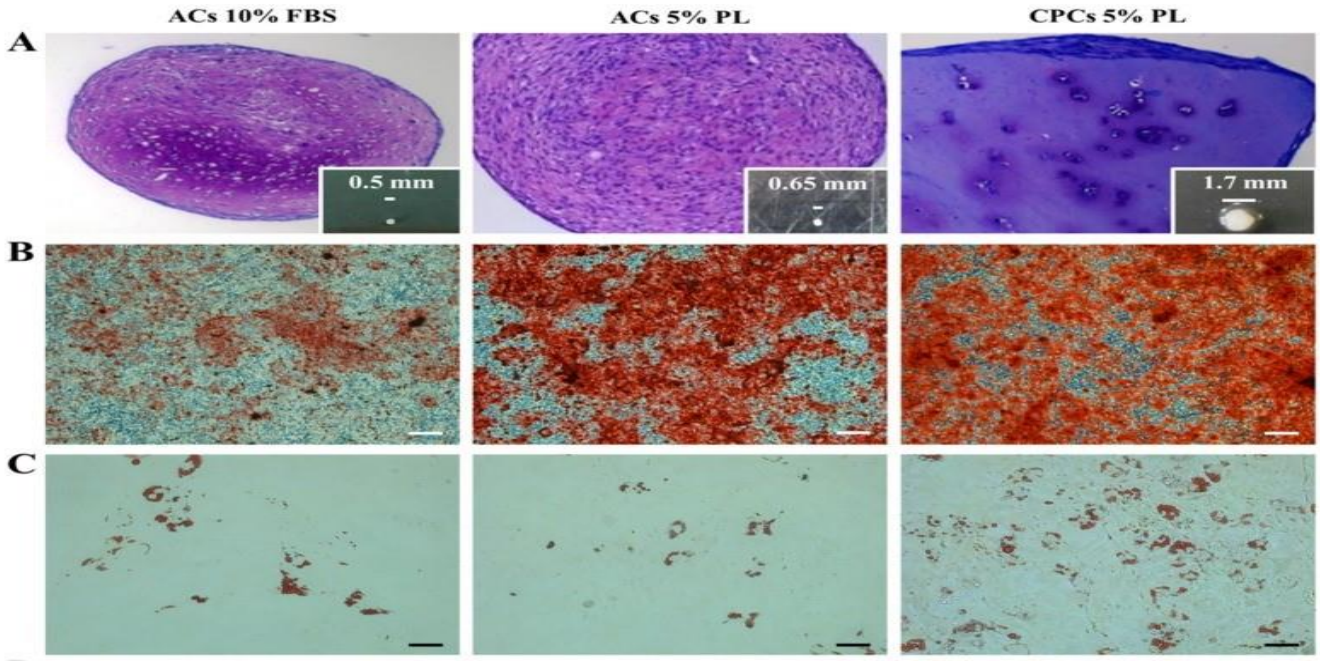
Result:

4. PL Modulated the Clonogenic Potential and Expression of Nestin Stem Marker in Cartilage-Derived Cells



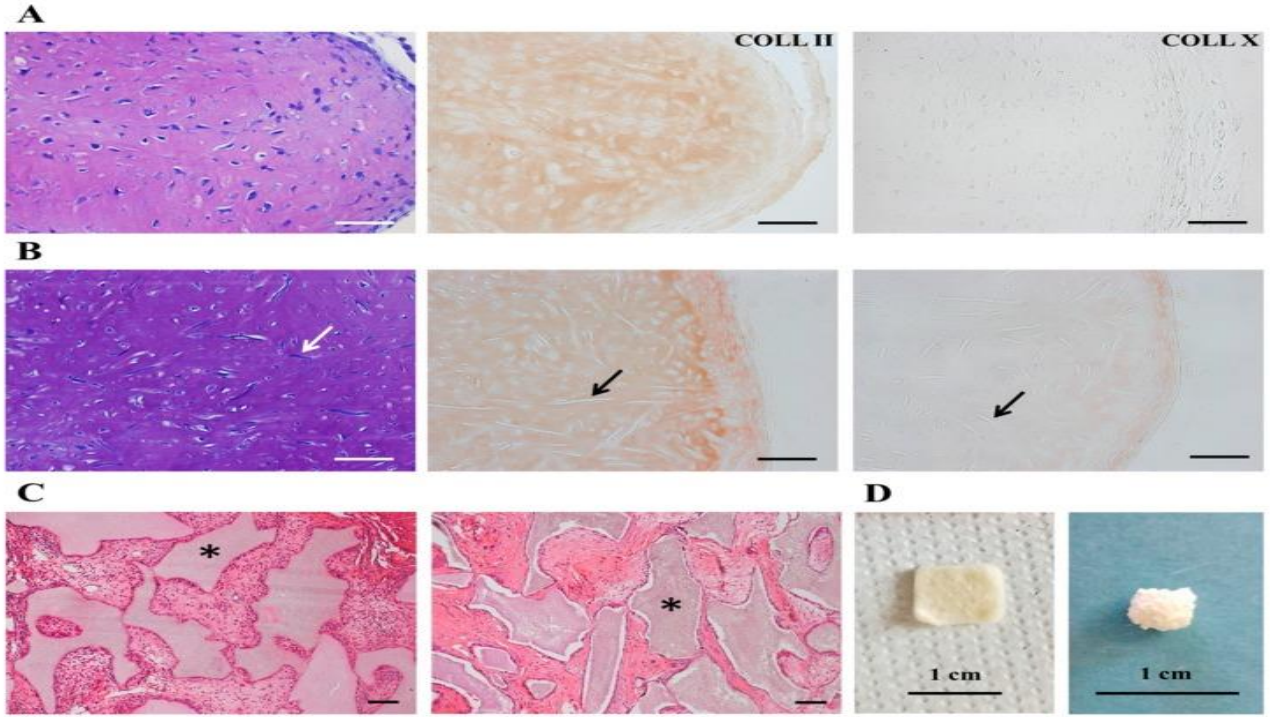
Result:

5. Comparison of In Vitro Multilineage Differentiation Potential Between CPCs and ACs



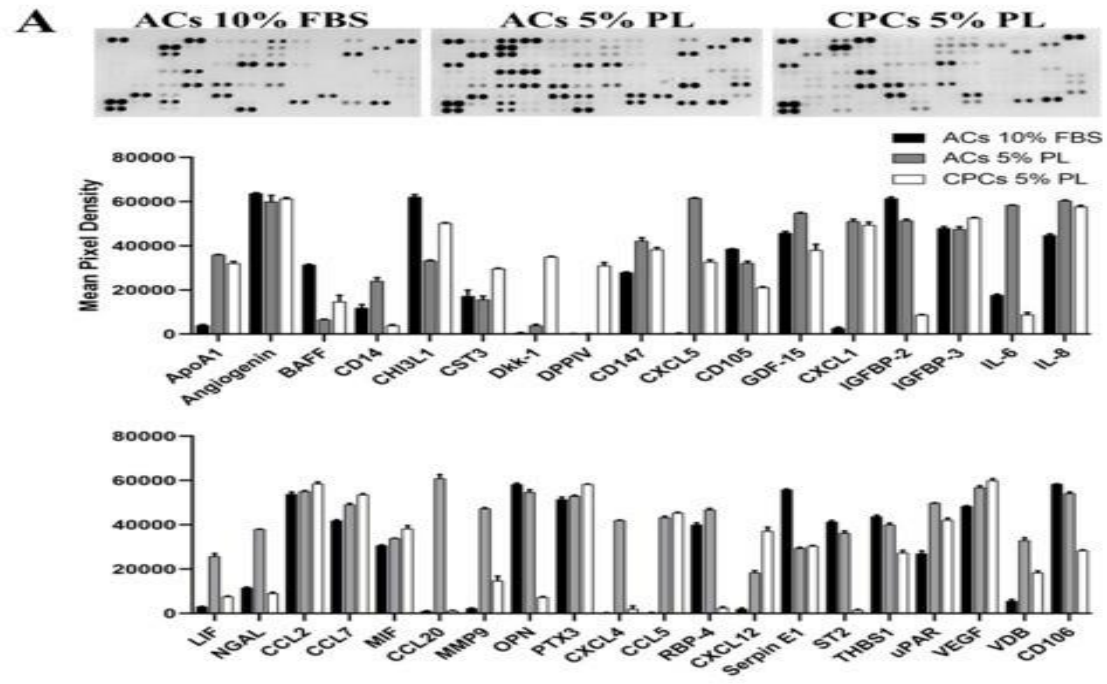
Result:

6. CPCs-PL Produced Hyaline-Like Cartilage In Vivo Suitable for Tissue Engineering Strategies



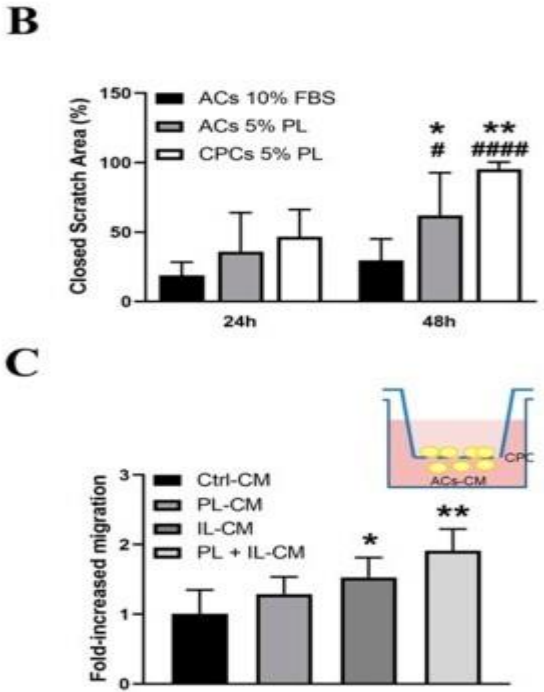
Result:

7. Secretory Profile of CPCs and ACs Revealed an Intricate Scenario Including Tissue Turnover, Hypertrophy Counteraction, PL-Induced Pro-Inflammatory Effects and Chemoattractive Capability



Result:

8. PL-Recruited CPCs Showed Enhanced Motility Under Inflammatory Conditions



Discussion:

- this study sustains that articular cartilage from joints of patients with ongoing OA contains chondro-progeni tor cell population that can be mobilized and subsequently ex vivo recruited from intact tissue by treatment with PL.
- PL is suitable for expansion of chondrocytes intended for therapeutic applications, especially since senescent cartilage cells are involved in the development of OA in joints and their clearance may attenuate its progressi on promoting a pro-regenerative milieu.
- Nestin-expressing cells compose a quiescent reserve in adults that, if properly reactivated, is able to proliferat e, differentiate and migrate. These events are triggered after injury, implying the involvement of these cells in processes of tissue regeneration.
- PL-induced activation of such CPC population able to counteract cell hypertrophy within articular cartilage c ould be considered beneficial in therapeutic treatments for OA, Furthermore they are able not only to release into the surrounding environment chemoattractant factors but also to actively migrate in response to signals coming from inflamed chondrocytes.
- Finally, PL exerted a general strong chemotactic action on the entire cartilage cell population, including matu re chondrocytes (ACs) that usually are considered not provided with a mobile phenotype.

Conclusion:

PL exerts stimulant effects on articular cartilage, such as the promotion of chondrocyte proliferation, cell mobilization and activation of nestin-expressing progenitors. In particular, PL-recruited progenitor cells (CPCs-PL) are able to migrate in response to inflammatory stimuli, show paracrine activity in attracting other cells (ideally toward injured sites) and display high chondrogenic potential and resistance to hypertrophy. Thus, they might replace damaged chondrocytes in a compromised cartilage environment, thus representing a promising target for future therapeutic approach for cartilage disorders.