

Effects of Basic Fibroblast Growth Factor on Mesenchymal Stem/Stromal Cell Phenotype & Sheet Fabrication

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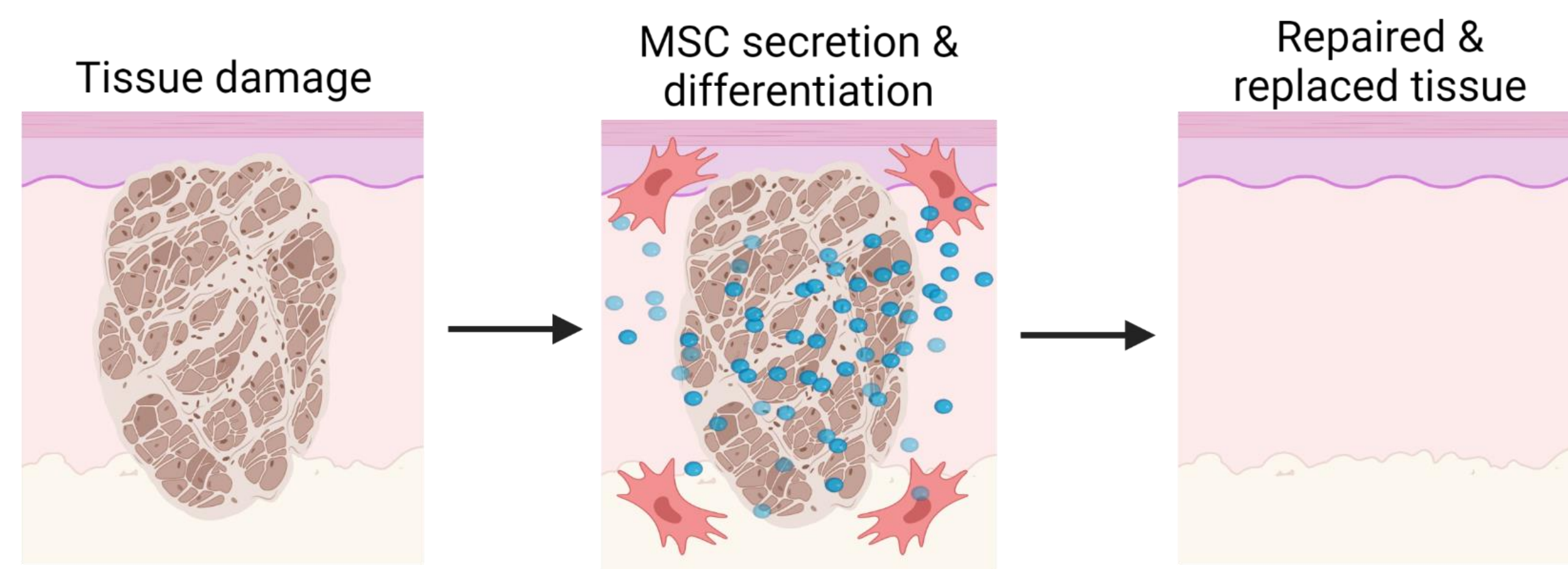
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Introduction

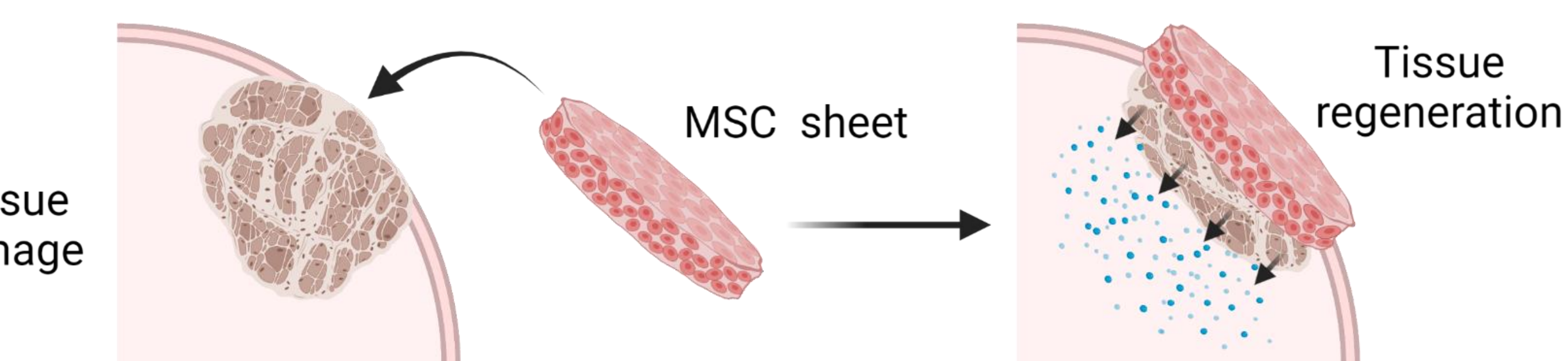
Human bone marrow mesenchymal stromal cells (hBMSCs) attract significant clinical interest for their ability to modulate the host immune system via the secretion of paracrine factors and repair/replace damaged tissue through multipotent differentiation¹

MSC Regeneration



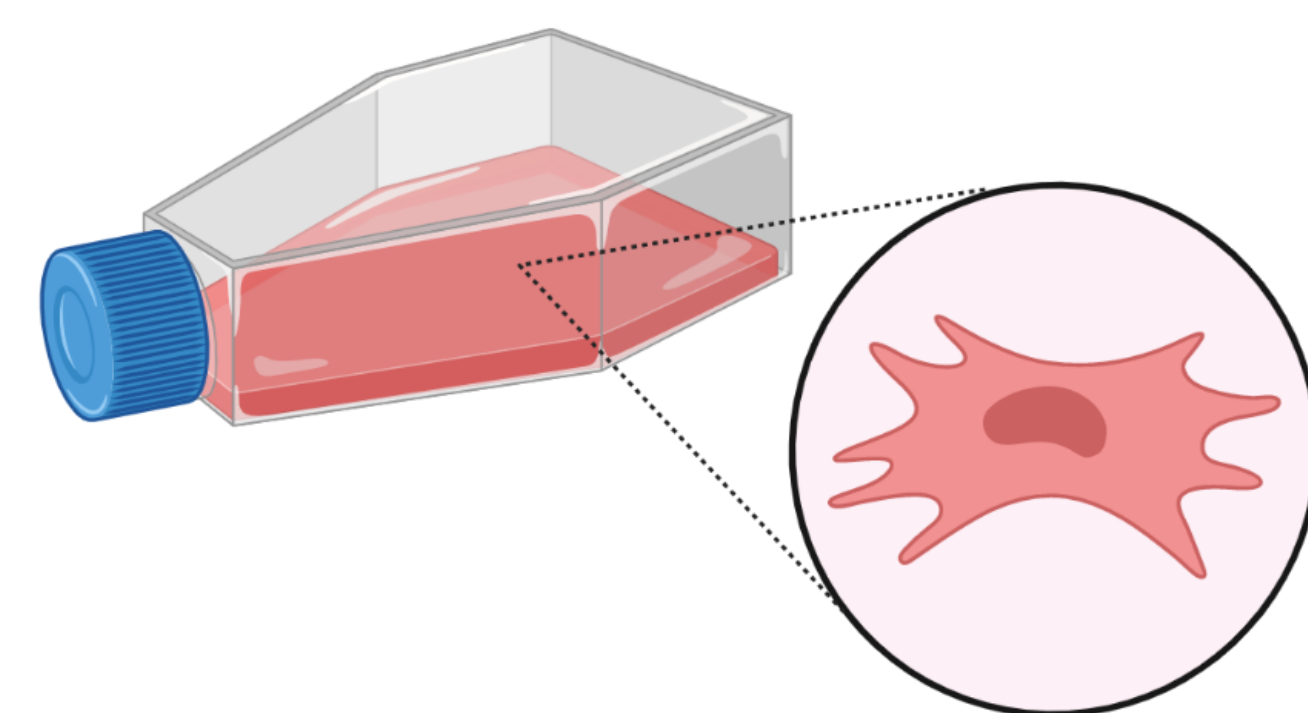
MSC sheets are a promising alternative to injected suspensions, the current clinical standard for cell therapy, demonstrating improved tissue engraftment, retention, survival, and therapeutic efficacy²

MSC Sheets

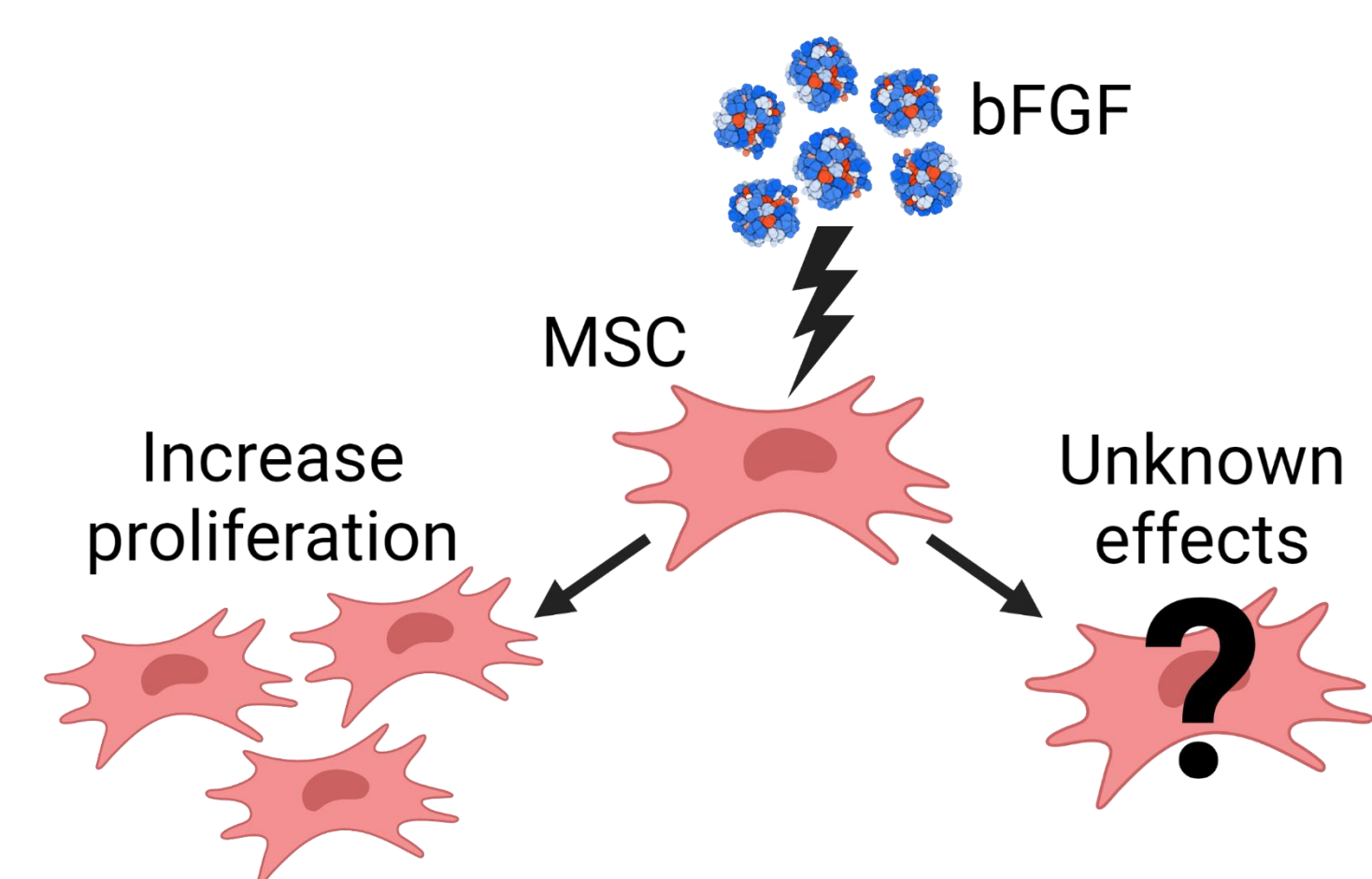


hBMSCs require *in vitro* expansion, manipulation, and banking for use in cell therapies such as MSC sheets, necessitating optimized culture conditions

MSC *in vitro* Culture



bFGF & MSCs



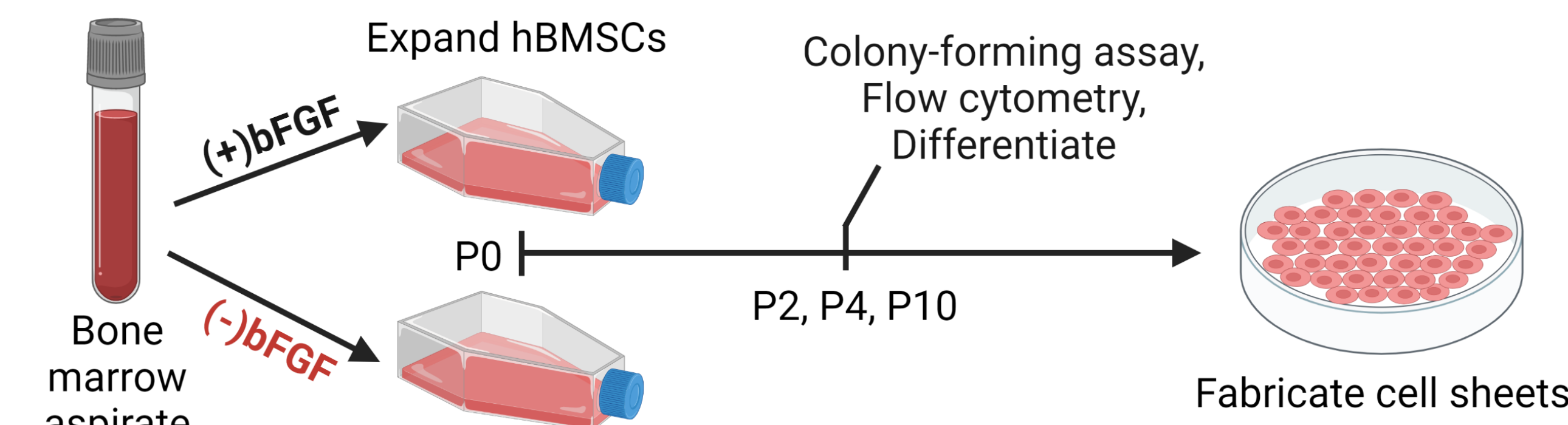
Basic fibroblast growth factor (bFGF) is the most common supplement used in MSC culture media to promote proliferation³, but its effects on hBMSCs are not fully characterized

The goal: Maximize MSC proliferation, maintain intrinsic MSC phenotype & characteristics

Aim: Determine effects of bFGF on (1) phenotype and (2) sheet fabrication ability of hBMSCs

Materials & Methods

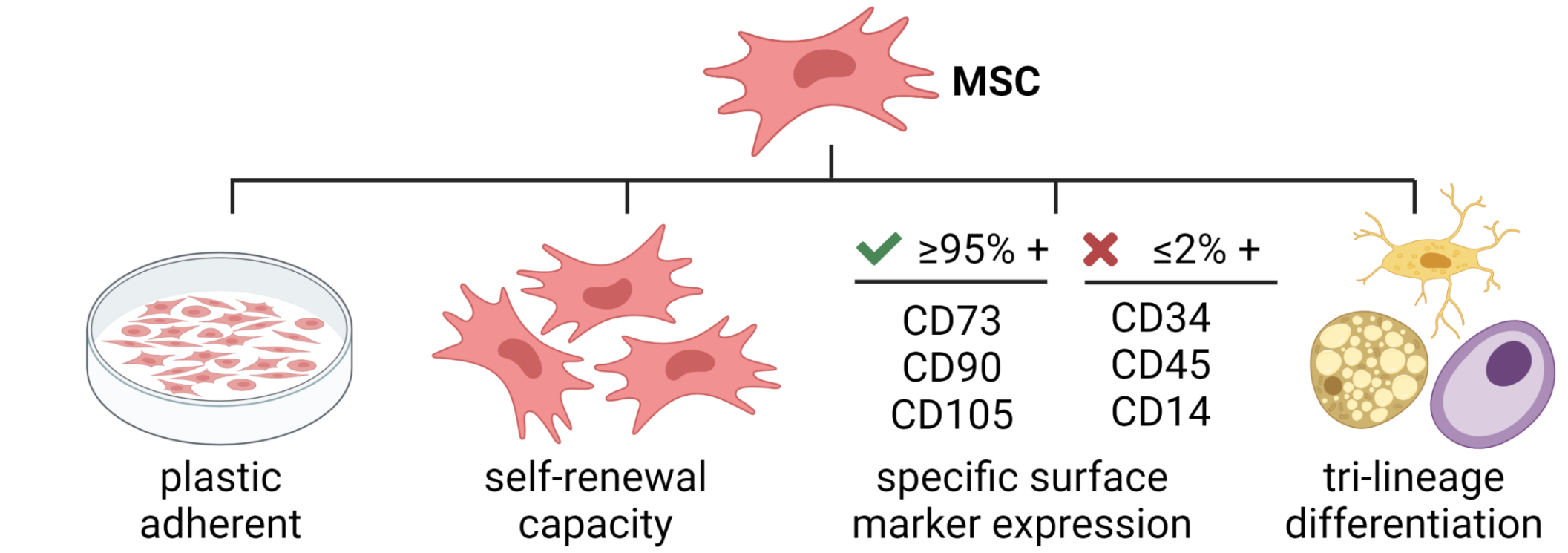
A. Experimental flow



B. hBMSC culture media

- Low glucose DMEM with Phenol Red
- 10% Fetal Bovine Serum
- 1% Penicillin/Streptomycin
- 250µL / 500mL MycoZap
- (+) or (-) 1 ng/mL bFGF

C. hBMSC phenotypic verification



Results

Figure 1. MSC morphology & proliferation

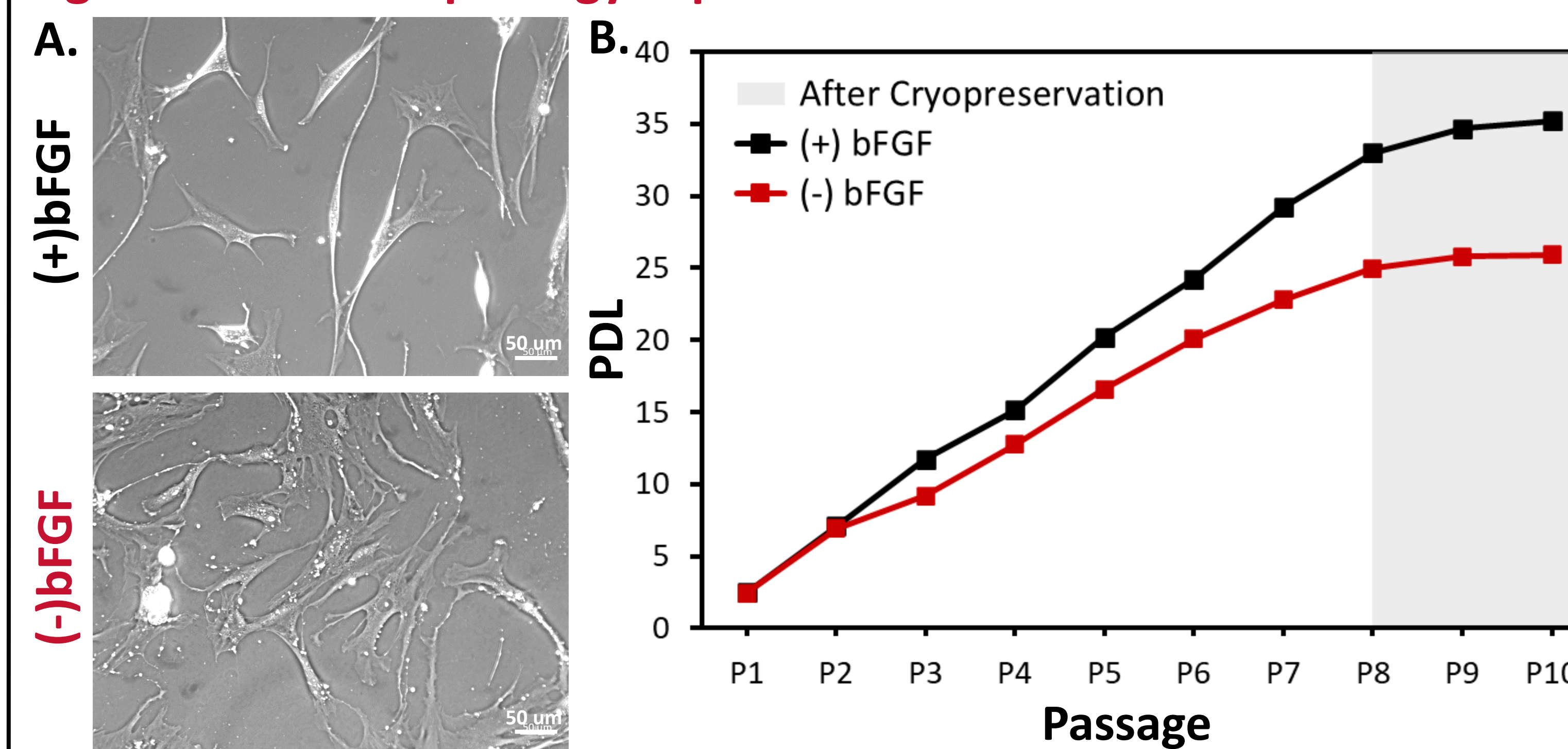


Figure 1. A) (+)bFGF hBMSCs: elongated & spindle-like, (-)bFGF hBMSCs: flattened & star-shaped. B) (+)bFGF hBMSCs exhibit a higher population doubling level (PDL) after P2.

Figure 2. MSC surface marker expression

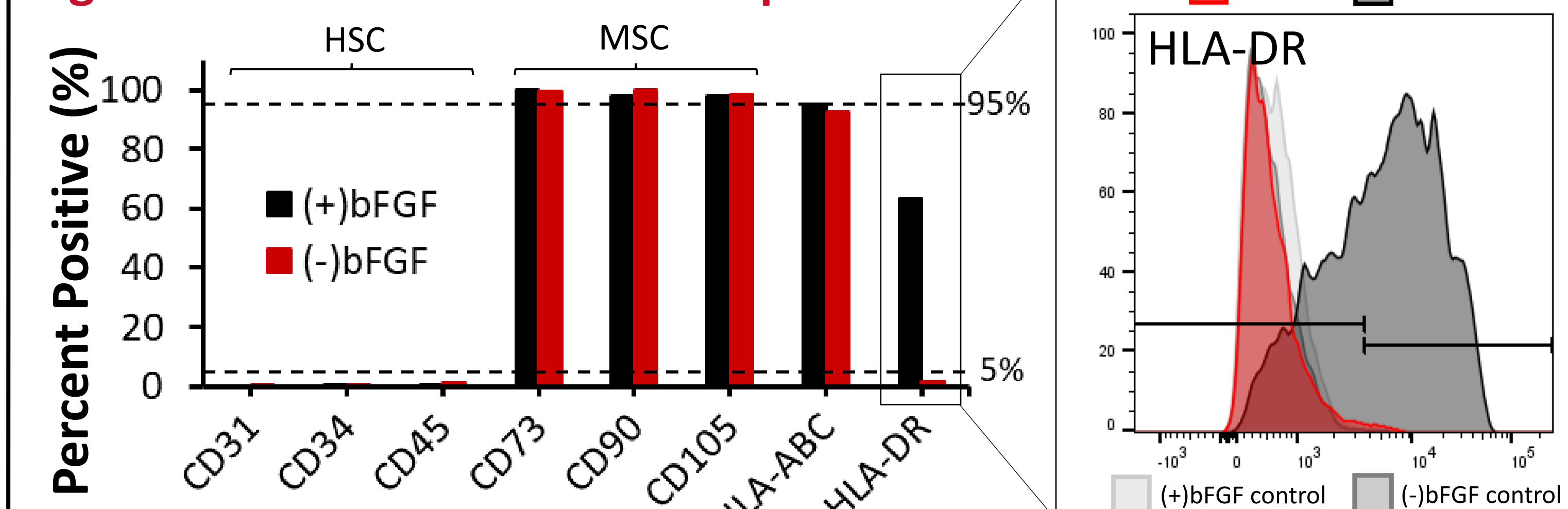


Figure 2. Both groups express characteristic MSC surface markers. bFGF significantly upregulates human leukocyte antigen DR (HLA-DR).

Figure 3. MSC tri-lineage differentiation potential

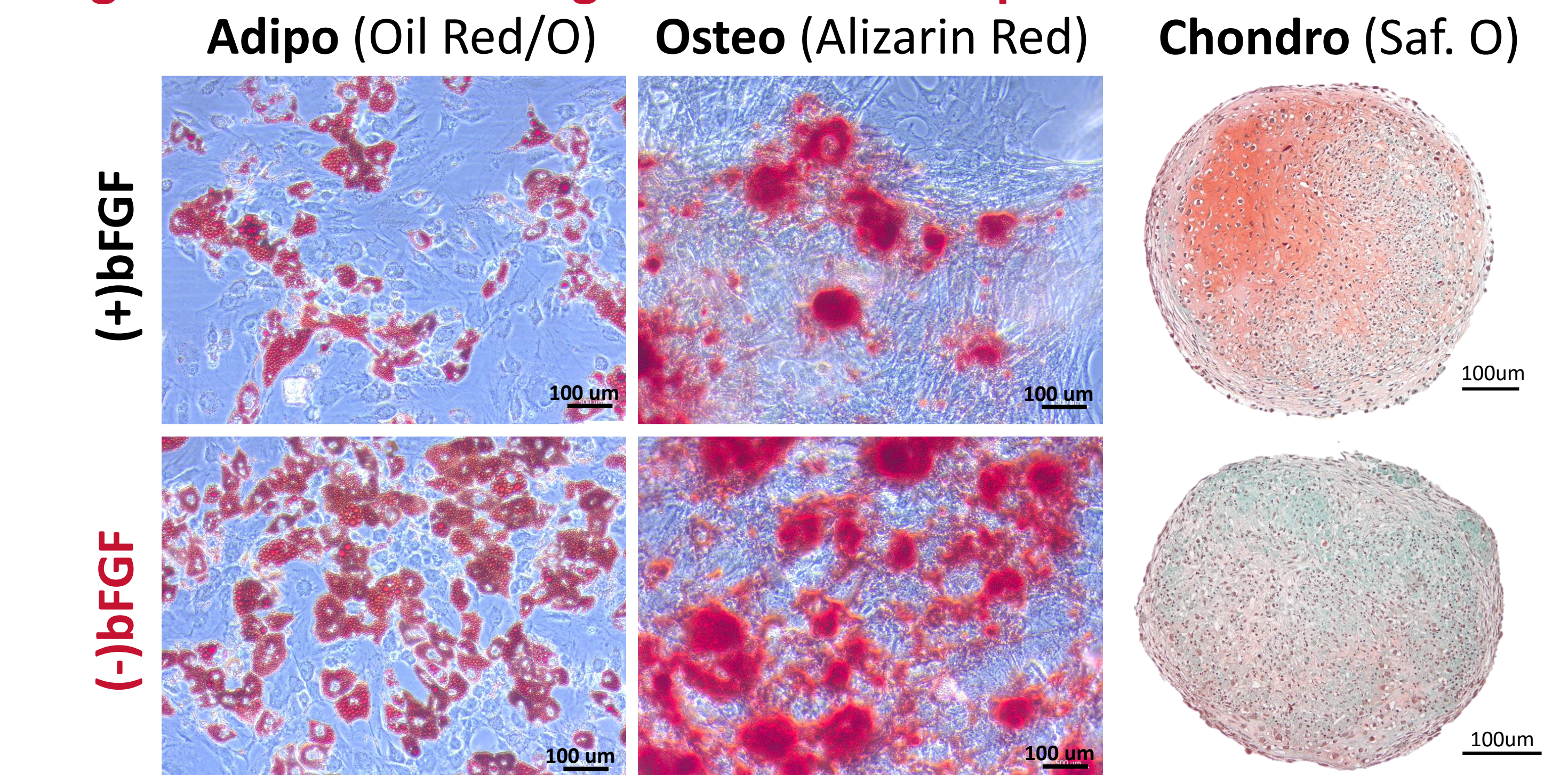


Figure 3. Both (+)bFGF & (-)bFGF hBMSCs exhibit adipogenic & osteogenic differentiation potential. bFGF appears to enhance chondrogenic differentiation potential. (Red coloration = positive).

Figure 4. MSC sheet fabrication

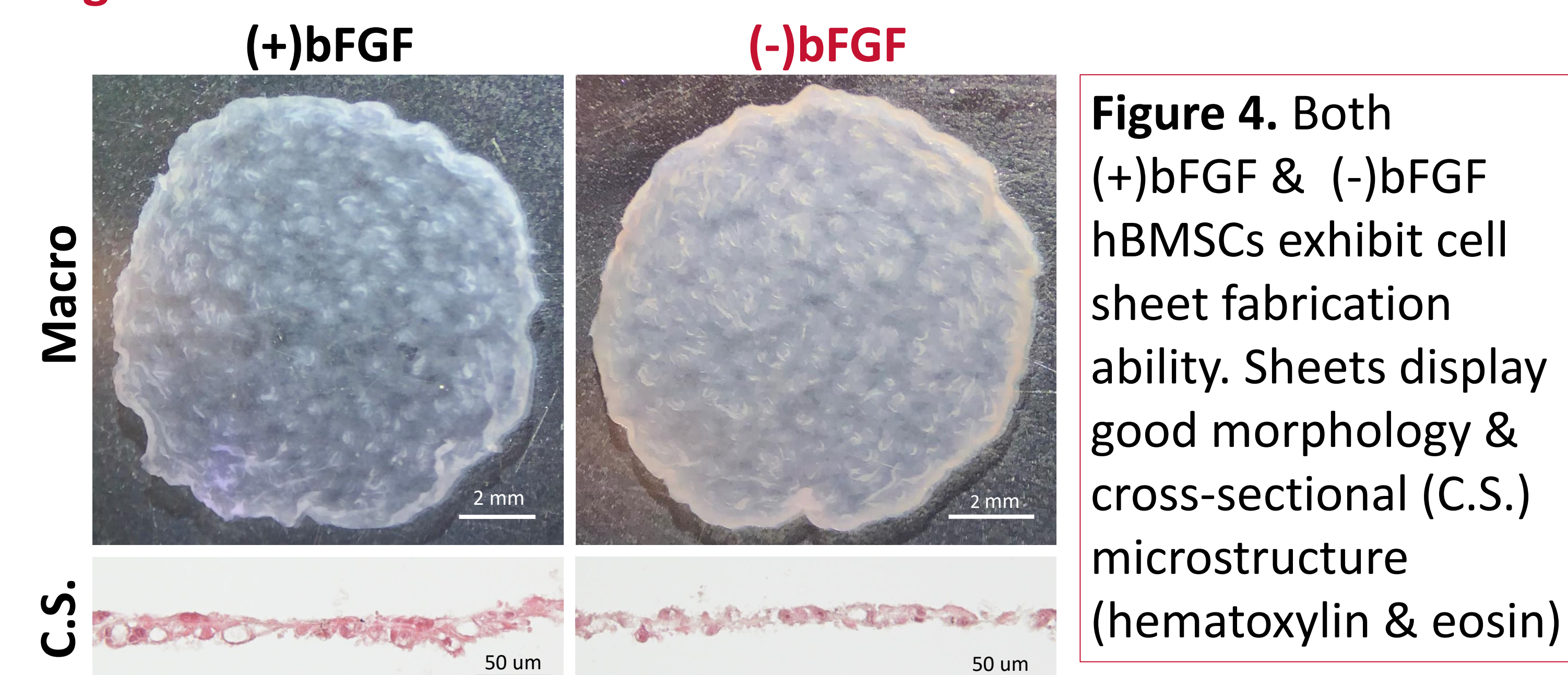


Figure 4. Both (+)bFGF & (-)bFGF hBMSCs exhibit cell sheet fabrication ability. Sheets display good morphology & cross-sectional (C.S.) microstructure (hematoxylin & eosin)

Acknowledgements & References

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Discussion

- bFGF has a noticeable effect on hBMSC morphology & differentiation
- hBMSCs cultured with bFGF exhibit a higher proliferative capacity
- **bFGF significantly upregulates HLA-DR expression, potentially increasing the risk of immunogenicity & rejection**
- hBMSC sheets can be fabricated with or without bFGF