

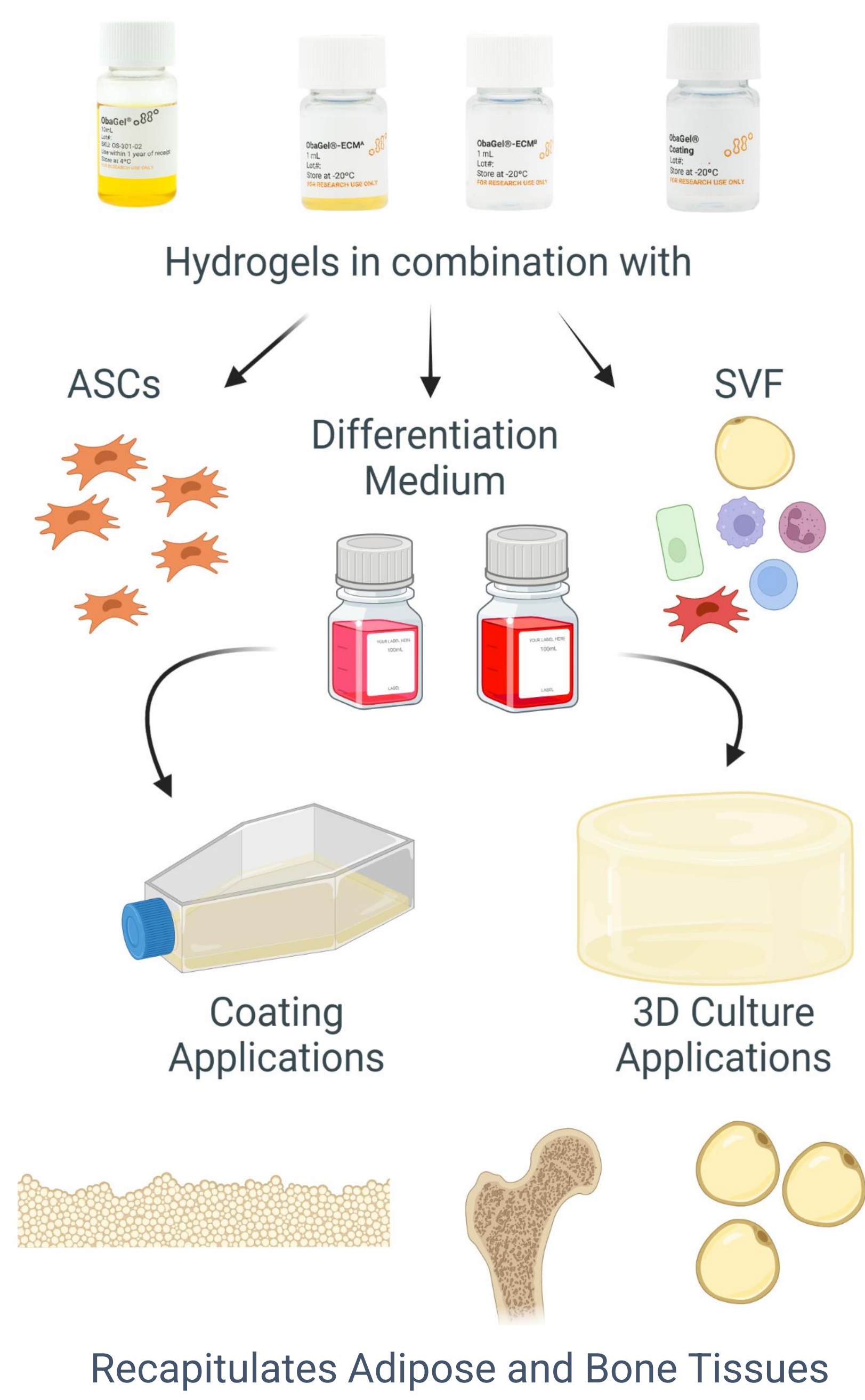
Human-Derived Hydrogels to Support Stem Cell Growth, Differentiation, and Metabolic Studies

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Introduction

Hydrogels are three-dimensional scaffolds used as alternatives to *in vivo* models for the understanding of human disease. They can also serve as scaffolds, delivery systems for cells and drugs, and as a 3D tissue system for drug screening. Here we are presenting ObaGel®, ObaGel®-Coating, and ObaGel®-ECM, demonstrating unique biocompatibility as alternatives to current murine-derived and synthetic recombinant hydrogels.

Concept



Methods

Thermoresponsive hydrogels were developed from human decellularized tissues through a series of processes optimized by Obatala Sciences. The human scaffolds were characterized for physical and biological properties using rheology, electron microscopy, proteomics, cellular proliferation, and differentiation.

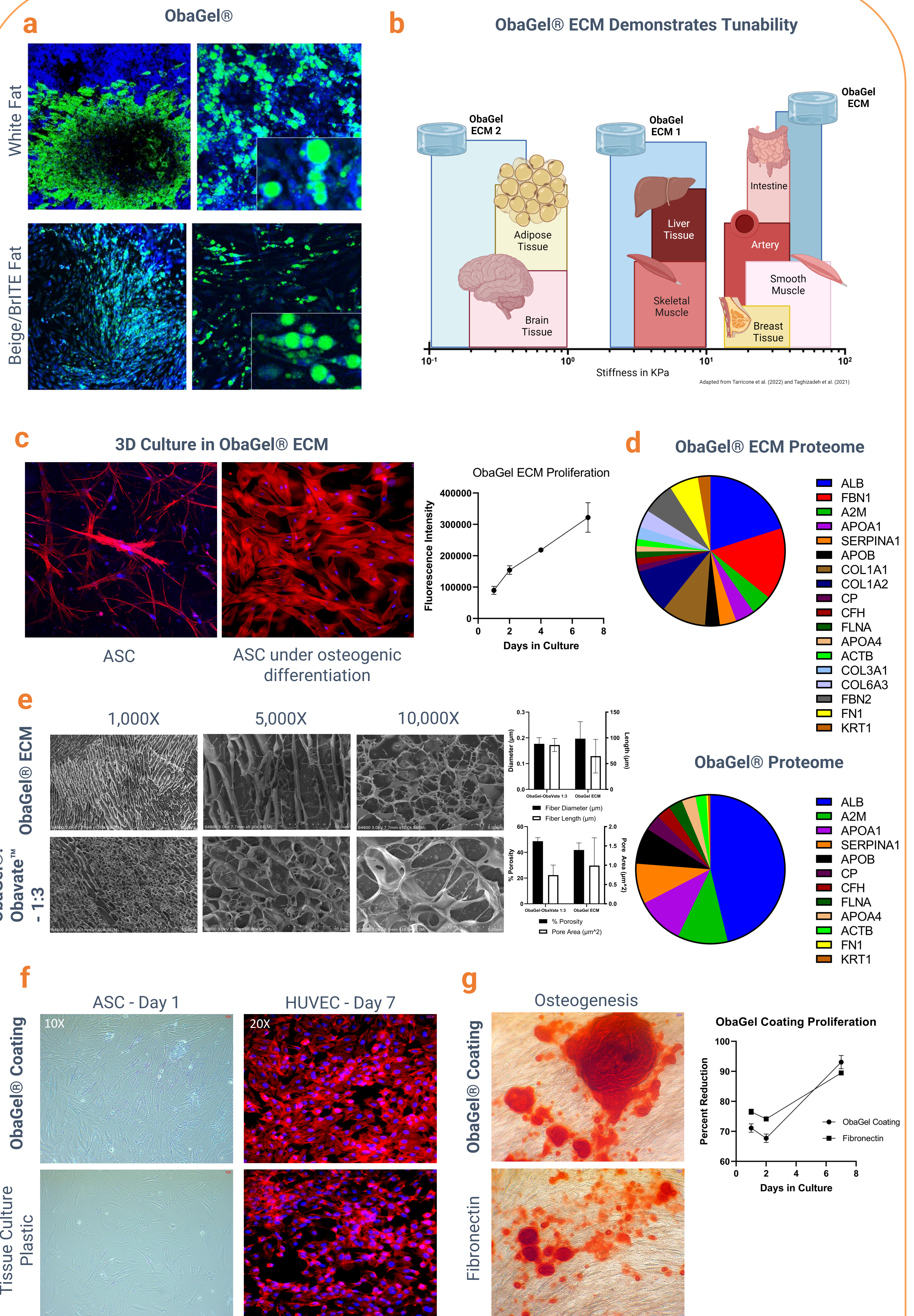
Conclusions and Future Directions

This study provides the characterization of hydrogels suitable for 3D and 2D coating applications including cell expansion and differentiation, microfluidic organ-on-a-chip devices, and bioprinting. As derivatives of human tissue, ObaGel® and ObaGel®-ECM can support the development of 3D models that not only recapitulate normal and diseased human tissue but may also be employed in regenerative medicine.

References

Belgodere, J.A., Lassiter, H.R. et al. (2023), Biomechanical and Biological Characterization of XGel, a Human-Derived Hydrogel for Stem Cell Expansion and Tissue Engineering. *Adv. Biology* 2200332.

Results



a) Functional 3D adipose tissue constructs, white fat vs. beige/brTE phenotype. Adipose stem cells (ASCs) cultured in ObaGel® 3D matrix and differentiated to mature fat constructs resembling white and beige/brTE phenotype as characterized by lipid droplet size and organization. Bodipy lipophilic staining, DAPI nuclear stain. **b)** ObaGel® ECM at 3 different concentrations characterized via rheology represents stiffness of various organs demonstrating tunability of the matrix. **c)** (left) ASC cultured in 3D in ObaGel® ECM with StromaQual™ or OsteoQual™ (3.5 weeks). Fixed in 10% neutral buffered formalin and stained with Hoechst 33342 (blue) and Alexa Fluor Phalloidin 594 (red). (right) Proliferation of ASC cultured in 3D in ObaGel® ECM over 7 days quantified by alamarBlue assay. **d)** Normalized total spectra of most representative proteins present in ObaGel® ECM and ObaGel®. **e)** (left) Scanning electron microscopy (SEM) images of ObaGel® and ObaGel® ECM display an interconnected, fibrous network of ECM components. (right) Graphs represent fiber diameter, fiber length, percent porosity, and pore area for each hydrogel. **f)** (left) Adipose-derived stem/stromal cells (ASC) seeded at 25,000 cells per well of a 24-well plate (at 24 h). (right) Human umbilical vein endothelial cells (HUVEC) cultured on ObaGel® coating and tissue culture plastic, stained with Alexa Fluor Phalloidin and Hoechst 33342 on day 7. **g)** (left) Osteogenic differentiation of ASC on ObaGel® Coating versus Fibronectin (13 d). (right) Proliferation trends of ASC on ObaGel® Coating versus Fibronectin quantified by alamarBlue assay over 7 days.