Engineering functional microvasculature: defined ECFCs/MSCs combinations outperform SVF, ASCs and MSCs preparations from human adipose tissue

Rafael Moreno-Luna[1], Ángela Santos-De-La-Mata[1], Mario Martínez-Torija[1], Fa Javier Espino-Rodríguez[2], Mª Angeles Ruiz de Infante[1], Matilde Castillo-Hermoso[1], Pedro F. Esteban[3], Eduardo Molina-Holgado[3]

[1]Pathophysiology and Regenerative Medicine Group, Hospital Nacional de Parapléjicos, IDISCAM, SESCAM, Toledo, Spain; [2]Plastic and Reconstructive Surgery Service, Hospital Nacional de Parapléjicos, SESCAM, Toledo, Spain; [3] Grupo de Neuroinflamación, Hospital Nacional de Parapléjicos, IDISCAM, SESCAM, Toledo, Spain

BACKGROUND

Functional vascularization remains a major challenge in **regenerative medicine.**

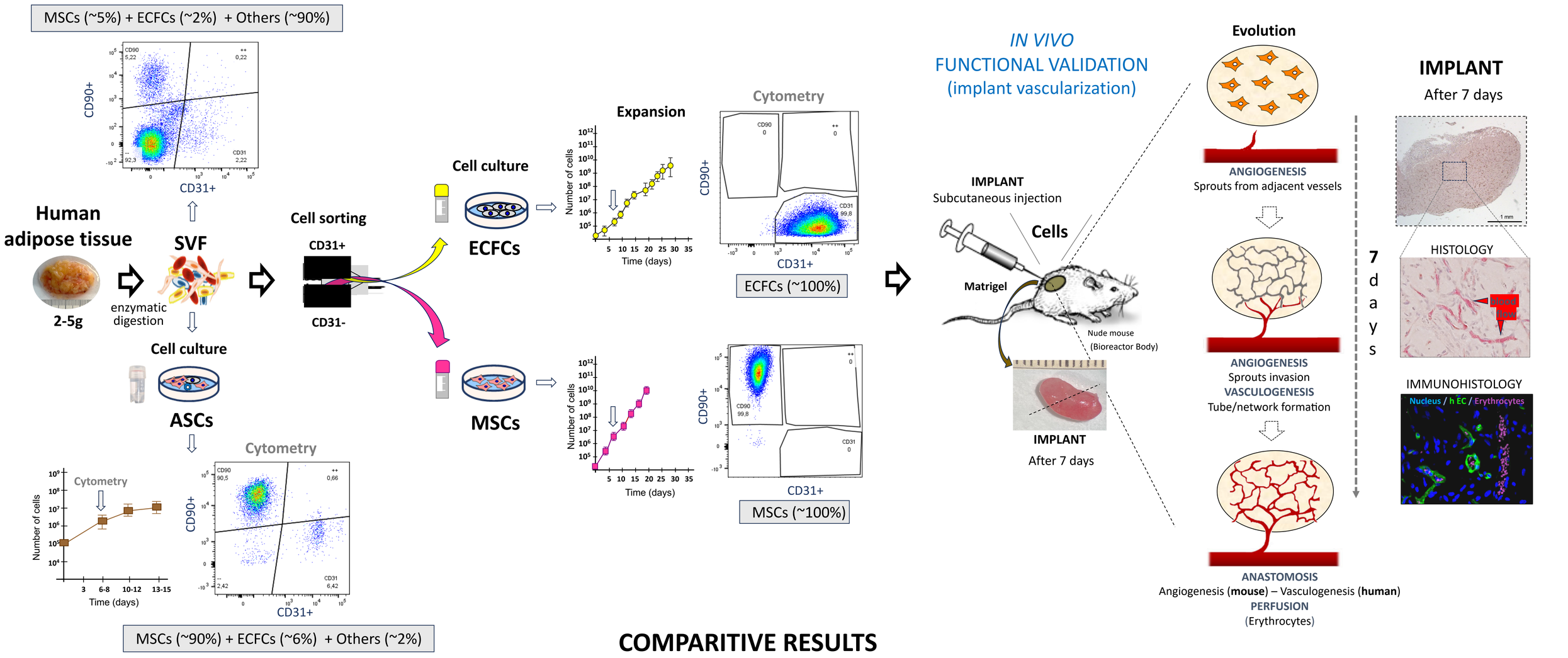
Adipose tissue is an accessible source of cells with angiogenic and vasculogenic potential.

In this study, we compared adipose-derived cell populations obtained from the same tissue in five donors to evaluate their ability to form **functional vascular networks.**

EXPERIMENTAL WORKFLOW

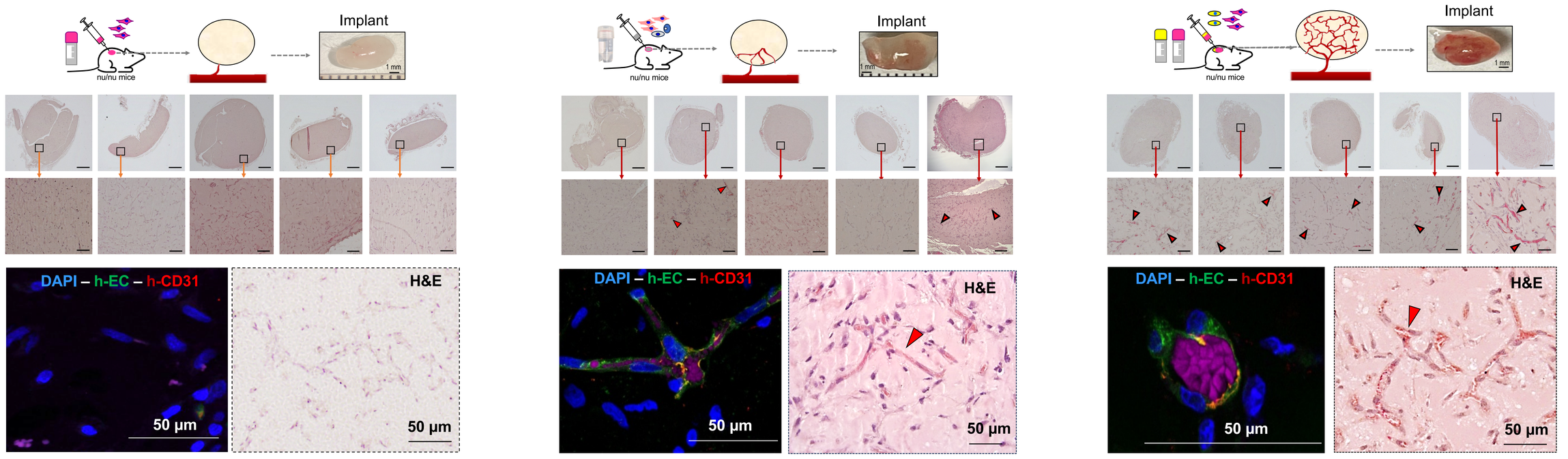
Same adipose tissue → different preparation strategies → different vascular outcomes

Stromal vascular fraction (**SVF**) was obtained by enzymatic digestion, adipose stem cells (**ASCs**) by culture of SVF, and endothelial colony-forming cells (**ECFCs**) and mesenchymal stem cells (**MSCs**) were purified from the same SVF and expanded separately. These populations were tested in vivo using Matrigel implants to evaluate **perfused vascular network formation**. Perfusion was confirmed by blood flow and human endothelial markers.



COMPARITIVE RESULTS

"*In vivo* potential at 7 days"



RESULTS: SVF was not further considered due to low early viability. **MSCs** alone did not form vessels in any implant. **ASCs** formed vessels, but only in 2 out of 5 implants, indicating variability between donors. In contrast, the **ECFC/MSC** combination consistently formed blood vessels in all implants across all donors.

CONCLUSION

Engineering functional microvasculature requires more than simply using adipose-derived cells.

Effective and robust vascularization depends on how these cells are isolated and prepared.

Defined **ECFC/MSC** combinations, obtained through controlled isolation and expansion, enable reproducible formation of perfused vascular networks **[1]**.

Not the cell source, but the preparation strategy determines vascular outcome.

FUNDING

- **Agencia Estatal de Investigación (2023-2026).** Ref.: PID2022-137080OB-I00.
- **Agencia de Investigación e Innovación de Castilla-La Mancha (2024-2027).** Ref.: SBPLY/23/180225/000083.

Cofinanciado por la Unión Europea · Ministerio de Hacienda · Fondos Europeos · Castilla-La Mancha · INNOCAM Agencia de Investigación e Innovación de Castilla-La Mancha

Reference: [1] Angiogenesis 2025.

Web: Moreno-Luna lab.

TERMIS EU-Chapter 2026 PALMA DE MALLORCA 21-24 APRIL / SPAIN

termis EUROPE