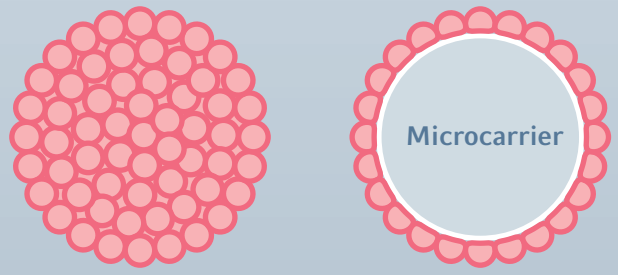
Stay Informed

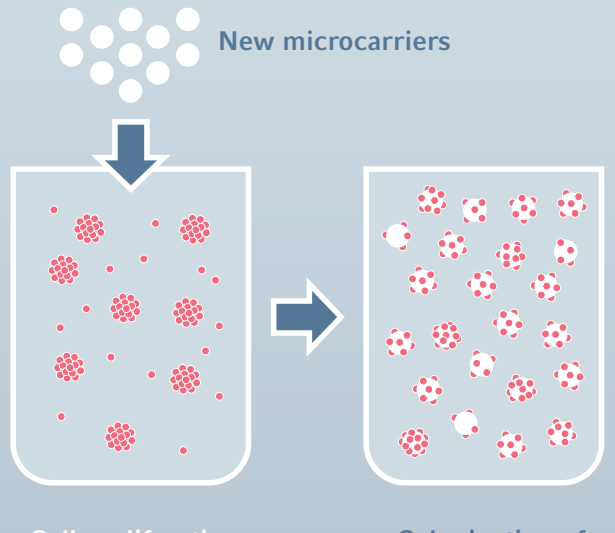
Stem Cell Expansion in Bioreactors

Stem cell culture in stirred-tank bioreactors makes scale-up easier and allows comprehensive monitoring and control of parameters like temperature, pH, and dissolved oxygen. Here are some tips to help you transfer your stem cell culture from dishes and flasks to bioreactors.



Cell-only aggregate

Cells grown on microcarriers



Cell proliferation on microcarriers

Colonization of fresh microcarriers

1 Culture surfaces

In bioreactors, adherent stem cells can be expanded in suspension as cell-only aggregates or on microcarriers. The size of cell-only aggregates can be influenced by seeding density, stirring speed, and the bioreactor impeller design. Culture on microcarriers under restrictive cell culture conditions (e.g. a serum-free medium) requires coating them with peptides or proteins like fibronectin or collagen.

2 Inoculation

Some guiding values for culture on microcarriers:*

Description	Value
Cell seeding density	2,000–10,000 hMSCs/cm²
Microcarrier loading density	1–4 g dry beads/L
Cell-to-bead ratio	min. 3–5 cells/bead

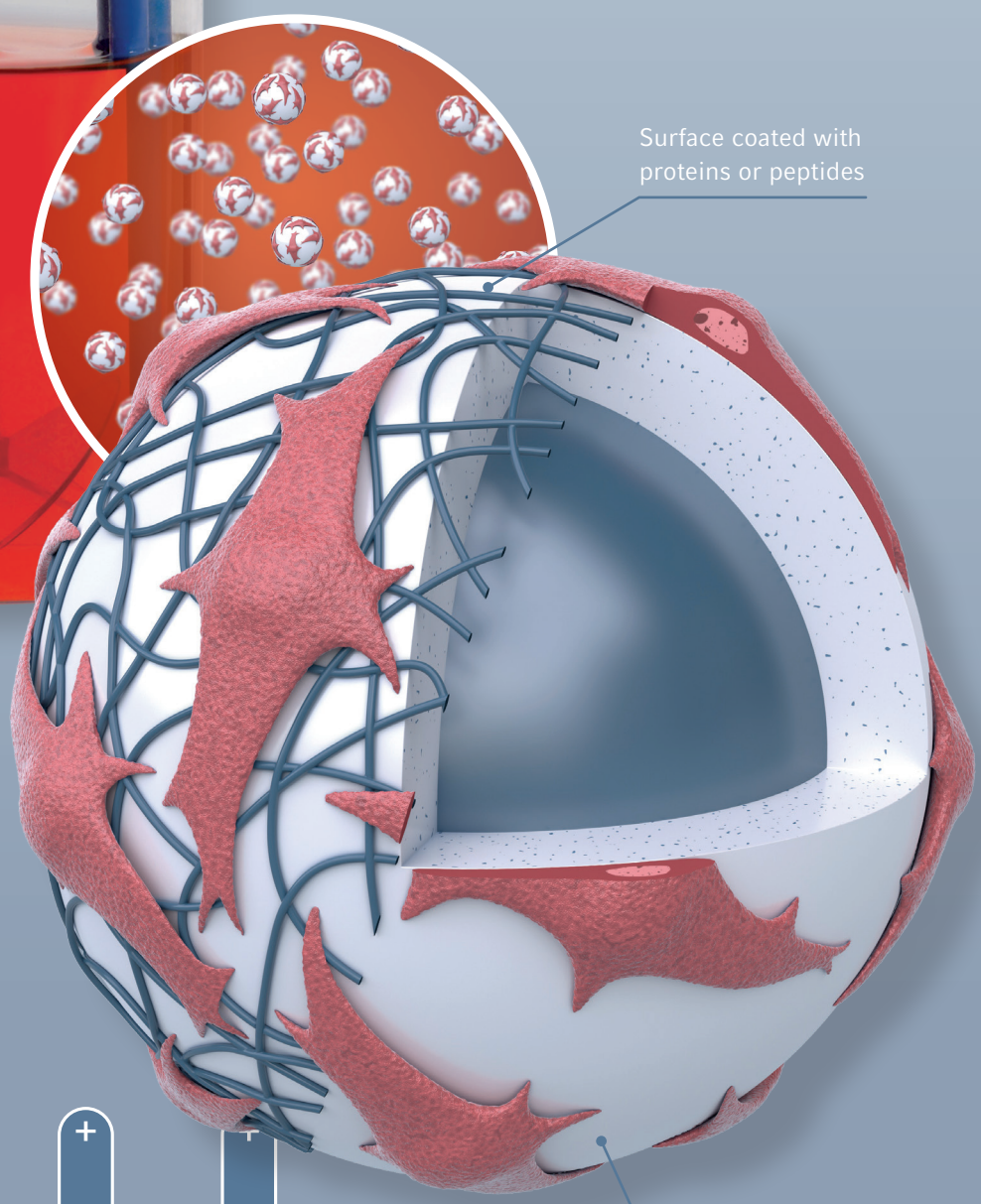
* Case-by-case optimization required

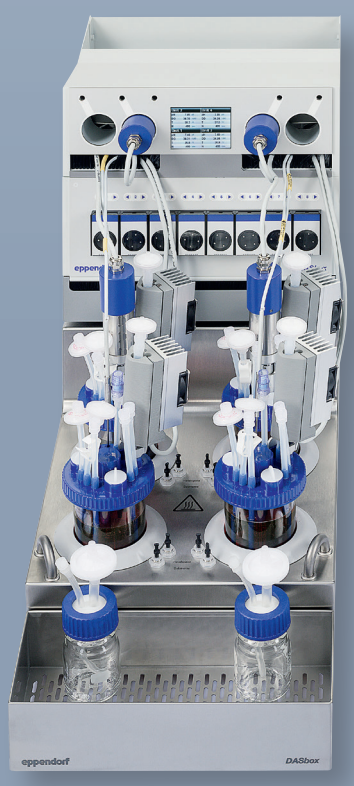
To improve cell attachment:
> Reduce initial culture volume
> Do not agitate during the first few hours

3 Cell expansion

Bead-to-bead transfer: The progressive addition of fresh microcarriers increases the surface area for growth while avoiding dissociating cells from the beads (passage step).

> Visually monitor the carrier occupation percentage closely to determine the optimal timing for addition of fresh carriers.

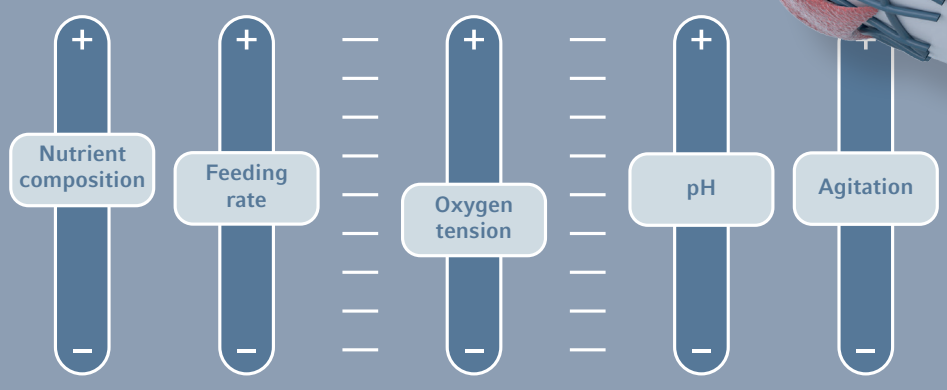




4 Case-by-case optimization needed

Due to cell heterogeneity (tissue sources, storage conditions, preexpansion conditions, culture medium, and others) and the large number of interactive process parameters (dissolved oxygen, pH, stirring speed, cell substrate, bioreactor type, and the like), each process will require individual optimization.

> Software-aided monitoring and control of critical process parameters helps to improve process stability and reproducibility.



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