

Key considerations when using recirculation and perfusion processes in the scale-X™ fixed-bed bioreactor

Recirculation and perfusion are two advantageous methods for supplying medium nutrients to the cells in the scale-X™ structured fixed-bed bioreactor and for harvesting the cell-mediated product.

Recirculation and perfusion processing with scale-X bioreactor

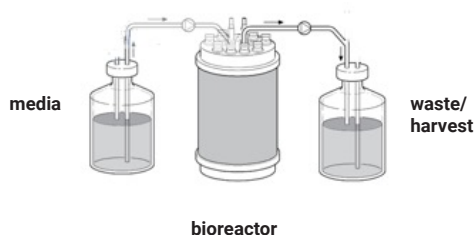
Recirculation

The connection (in & out) of the bioreactor in a loop to another vessel or container of media (in & out) for a continuous media circulation from vessel to bioreactor.



Perfusion

The single simultaneous directional flow of the media from the media container to the bioreactor, and from the bioreactor to a waste/harvest container to effectively replace the media in the bioreactor.



Key considerations when choosing your process

Different cell types have varying affinities and robustness for recombinant viability/gene expression, nutrient/oxygen demand, and cell morphologies in relation to the product. This influences the use of perfusion (in contrast to fed-batch) or recirculation (in contrast to batch) in the fixed-bed bioreactor for an overall system performance and yield.

The strategy for peak cell densities as well as cell line selection should be chosen and optimized for productivity and product quality. Choosing the right strategy for the cell line and product harvest is process dependent.

TIP: Our experienced **Bioprocess team** can help you with **Process Optimization** and Training

Recirculation key points

- ▶ Higher Oxygen Transfer Rate (OTR) to the cells than in static media (or in batch mode in other bioreactors).
- ▶ Increases the total amount of media being used for nutrient replenishment in relative to only the total bioreactor volume for non-limiting nutrient conditions.
- ▶ Slightly higher pump speeds are needed compared to perfusion but thanks to the design of the bioreactor, the shear stress remains low (although suspension cells may require no recirculation to avoid shear).
- ▶ Better control and distribution of nutrients, oxygenation (dissolved oxygen), and pH than in static flatware (or in batch mode in bioreactors for cellular impurity/waste accumulation).
- ▶ Ease of set-up and operation with fixed flow rates.

Perfusion key points

- ▶ An exocytotic product, which remains extracellular in the media (no cell lysis required), can be optimally harvested using multiple perfusions.
- ▶ A smaller bioreactor and shorter cultivation process time can be used in a system with perfusion.
- ▶ The pump speeds can be low to minimize shear, which is particularly advantageous for fragile products.
- ▶ Larger harvest volumes are less concentrated and may need to be pooled and concentrated for further downstream processing.

- ▶ Allows for a steady cellular metabolic state and potentially high cell concentration.

The scale-X has a varied range of manifolds to choose from according to your process, with the manifold designs being scalable to the commercial-scale NevoLine™ Upstream platform.

After choosing the appropriate manifolds, connecting them is easy!

The simple connections go right from your media container to the bioreactor then to your harvest or waste bottle with labelled IN & OUT bioreactor lid connecting ports.

Our experienced **Univercells Technologies** teams is ready to support you at customer_service@univercellstech.com

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