Matrix F.T. Microcarriers:

Product Feature: Comparing Matrix F.T. Microcarriers' Cell Culture Performance to Commercial Microcarriers

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Matrix F.T's microcarriers provide competitive cell culture performance with off-the-shelf microcarriers while providing an added benefit of edibility and animal-component free design.

Overview

Microbeads are a critical part of the mass expansion of adherent cells for use in cultivated meat. However, the vast majority of available microcarriers (MC) for cell culture are not edible and require extensive washing of cells from the microcarriers and then thorough separation of the microcarriers from the harvested cells. This washing and separation process is expensive and can significantly affect the harvest yield of a batch of cells. For this reason, it is crucial to have microcarriers that are edible to reduce the impact of microcarriers being incorporated into the final product or to eliminate the need to remove the cells from the microcarriers at all.

Matrix F.T. microbeads and commercially available, non-edible MC's are compared below:

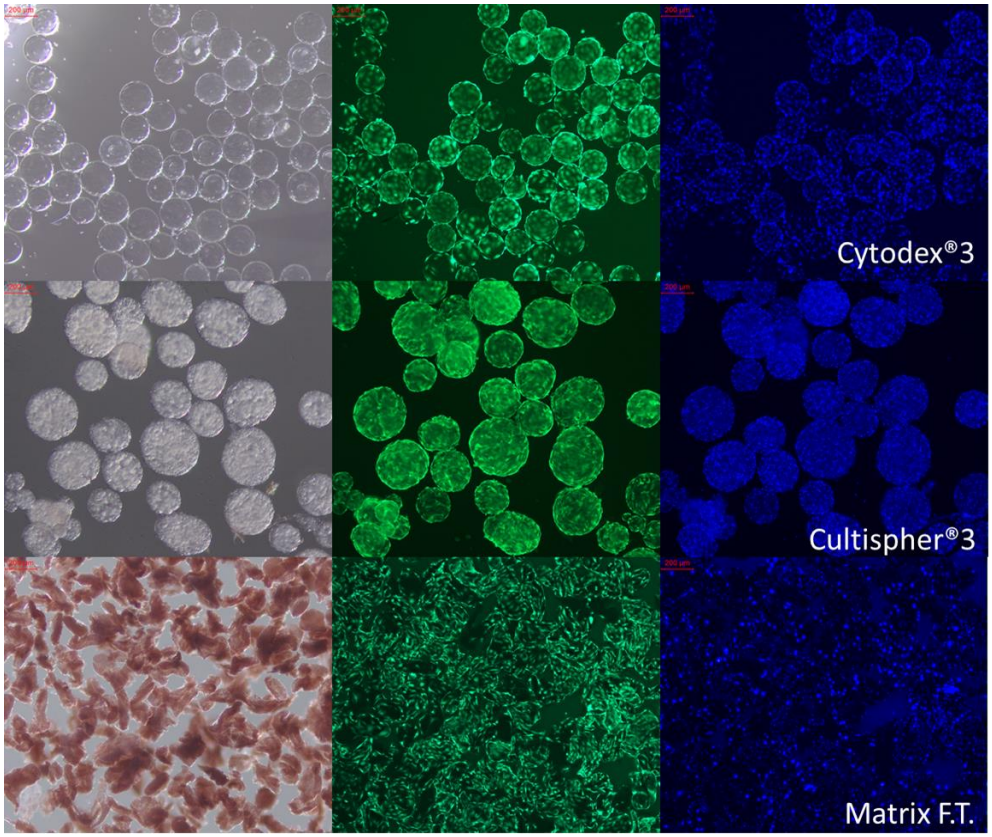

Figure 1. Cytodex(R)-3 microcarrier (top), Culispher(R)-G (center) and Matrix F.T. Soy-Alginate Microbead (bottom) microcarrier were seeded with C2C12 mouse myoblast cells at 1e5 cells/mL and grown in suspension for 3 days and then stained with Calcein live cell stain (green) and Hoechst nuclear stain (blue).

Table 1. Cell Culture performance metrics based on experimental and known values.

Metric	**Matrix F.T.**	**Cytodex(R)3**	**Cultispher(R)-G**
MC size	100-300 µm	150 µm	130-380 µm (wet)
Cells per MC	100-300	60-120	300-500
MC per kG (wet)	6.0E+08	2.4E+08	N/A
% cell mass contribution in 1kG seeded MC	8.6-36.0%	6.2%	N/A

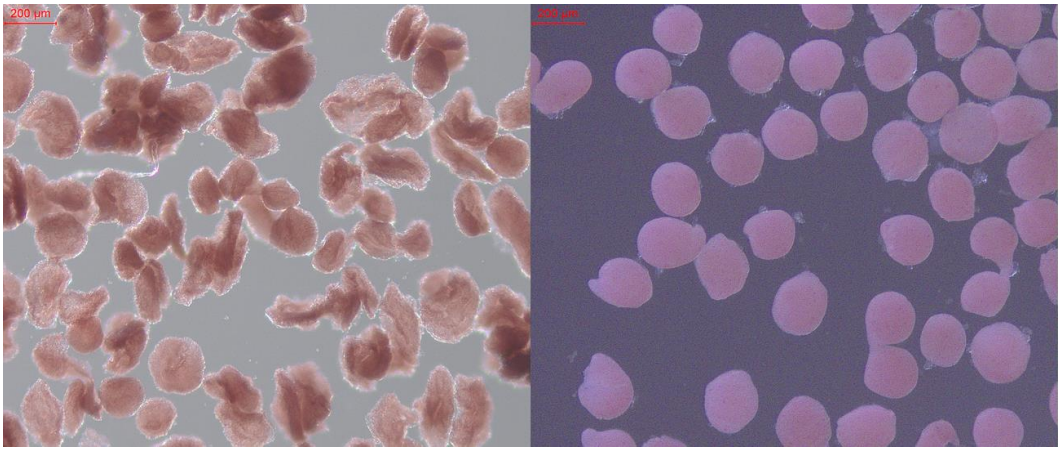

Figure 3. Matrix F.T. alginate microbeads can be textured (left) and round (right) which leads to some variation in parameter values.

Technical Notes

Values documented in Table 1. were derived from experimentation measured by Matrix F.T. informed by technical documentation from each MC company.

- Packing of Matrix F.T. MC are based on experimental and mathematical values of quantified MC per given mass and size and shape based on mathematical modeling. Wet weight of Cytodex(R)3 was also experimentally determined as the company specifications provide only the dry weight.
- Cell number and mass of cells alone can be quantified by cell counting and understanding the mass of a pellet of cells (1 gram cell mass is 3.2e8 cells)
- Cell number on a microcarrier can be estimated by nuclei (blue) staining showing how many nuclei and therefore cells have been able to adhere to the microcarrier. An average count from several fields of view is made to get upper and lower bounds.

Conclusion

Because Matrix F.T. microcarrier can yield more independent MC's per kG than both Cytodex(R)-3 and Culispher(R)-G and host more cells per MC than cytodex-3, overall cell yield and mass is presumed to be comparable if not better performing than other MC on the market. Of note, Culispher(R)-G have an irregular size (Table 2.) and high autofluorescence which makes them difficult to assess by the methods currently available.

Next Steps

Matrix F.T. microcarriers are designed to support cell attachment and growth for adherent cells grown in suspension. Cell seeding time and density, microbead loading concentration, media, and duration of growth can be optimized to increase performance and yield based on the cell type. Matrix F.T. evaluates microcarrier designs in-house in order to understand their performance and make recommendations based on the product type to streamline protocol development for customers according to the microcarrier format and composition. Cell culture evaluation methods include cell and microcarrier seeding and loading optimization, live/dead cell staining and cell quantification.

Matrix F.T. is continually adding to the portfolio of products available to customers. As novel materials and microcarrier formats become available and in-house testing capabilities increase, additional information will become available to inform expected yield, product metrics and expanded product usage.

Confidentiality Statement