Cytopore — macroporous microcarriers

CELL CULTURE

Cytopore™ macroporous microcarriers (Fig 1) are principally designed for use in suspension culture systems for growth of adherent recombinant Chinese Hamster Ovary (CHO) cells, and the production of recombinant proteins for therapeutic use. They are based on a natural microporous cellulose which is nontoxic and biodegradable.

Cytopore microcarriers:

- Are designed for use with adherent CHO cells, and can also be used to immobilize insect cells, yeast, and bacteria
- Allow cell culturing at high-density
- Allow long cell culturing times

Description

Cytopore microcarriers are designed for use in stirred suspension culture systems for the growth of adherent CHO cells and the production of recombinant proteins for therapeutic use. Cytopore can also be used to immobilize insect cells, yeast, and bacteria. There are two types of Cytopore: Cytopore 1 has a charge density of 1.1 meq/g, while Cytopore 2 has been optimized for anchorage-dependent cells requiring a charge density around 1.8 meq/g.

The microcarriers are composed of 100% cellulose, which is nontoxic to cells and biodegradable. The microcarriers tolerate mechanical stress and keep their shape even in swollen conditions. They are hygroscopic, displaying superior absorption in water and oil.

Table 1 shows characteristics of Cytopore. The microcarriers are positively charged due to the DEAE groups coupled to the cellulose matrix. The microcarriers have a very precise particle size distribution, and a network structure, where the ratio of surface area to particle material is more than 95 to 1. The network structure enables stained cells to be closely observed while they grow inside the microcarriers.

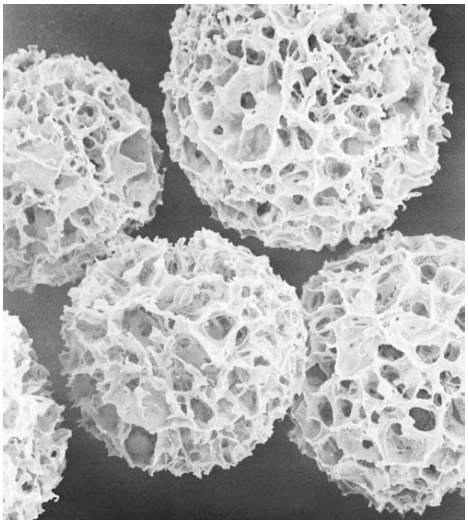

Fig 1. The macroporous structure and microporous matrix of the microcarriers.

Table 1. Cytopore characteristics

Particle diameter	200 to 280 µm**
Effective surface area	1.1 m^2/g dry**
Relative density*	1.03 g/mL**
Average diameter of pore openings	30 µm**
Volume	40 mL/g dry**

* In 0.9% NaCl.
** Data from Ashai Chemical Industry Co, Ltd.

The macroporosity of the microcarriers gives the cells easy access to the interior of the microcarrier after inoculation. Once inside, the cells are protected from the shear forces generated by the stirrer. Moreover, nutrient supply is not restricted to the apical side of the cells, as is the case with solid microcarrier culture. The microporosity of the base matrix gives unrestricted nutrient supply to the whole of the cell surface, even the basolateral side.

High-density cell culture

Using macroporous carriers has several advantages. Since the cells are inside the microcarriers, the majority of them are very well-protected. This permits an increase in aeration and stirrer speed, which in turn means a higher concentration of carriers can be used. Moreover, the fact that the cells sit inside the microcarriers increases the ratio of cell surface area to volume. In short, Cytopore microcarriers allow high-density cell culture.

Longer cell culturing with Cytopore

When culturing recombinant CHO cells using Cytodex™ microcarriers, the cells occasionally tend to detach from the carriers after about 10 days in culture. However, when culturing cells on Cytopore, the CHO cells show no signs of detaching from Cytopore even after 30 days in culture (Fig 2 and 3).

Ordering information

Product	Pack size	Code no.
Cytopore 1	20 g	17-0911-01
Cytopore 1	100 g	17-0911-02
Cytopore 1	500 g	17-0911-03
Cytopore 2	20 g	17-1271-01
Cytopore 2	100 g	17-1271-02
Cytopore 2	500 g	17-1271-03

(A) (B)

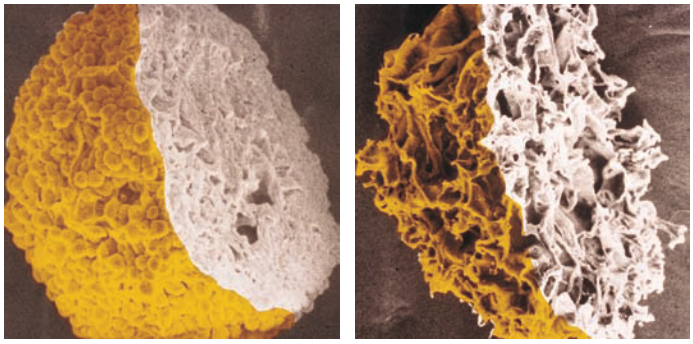

Fig 2. (A) An empty Cytopore microcarrier cut in half. (B) A Cytopore microcarrier cut in half after 30 days of culture of CHO cells.

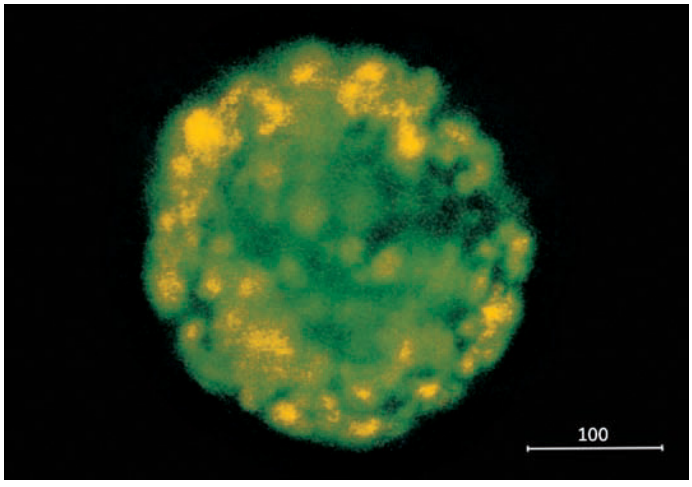

Fig 3. Viability staining (fluorescein-di-acetate) of CHO cells after 30 days in culture.

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