

# Cytopore – macroporous microcarriers

Cytopore™ macroporous microcarriers 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 non-toxic and biodegradable.

- Macroporous microcarriers
- High-density cell culture
- Designed for adherent recombinant CHO cell culture

## Macroporous microcarriers

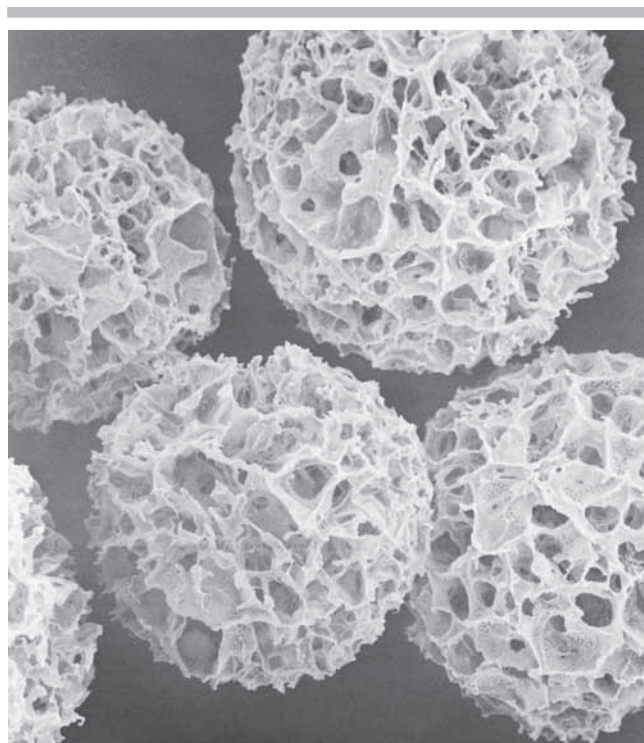
The macroporosity of the microcarriers gives the cells easy access to the interior of the microcarrier after inoculation. Once inside, the cells are protected from the shear forces generated by the stirrer. Moreover, nutrient supply is not restricted to the apical side of the cells, as is the case with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

## 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.

## Designed for adherent recombinant CHO cell culture

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. There are two types of Cytopore: Cytopore



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

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. Cytopore can also be used to immobilize insect cells, yeast and bacteria.

## Cytopore and an extended period of perfusion culture

When culturing recombinant CHO cells using Cytodex™ microcarriers, the cells occasionally tend to peel off 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.

### Characteristics of Cytopore

- Made of 100% cellulose, which is non-toxic to the cells and biodegradable.
- Positively charged, due to the N,N,-diethylaminoethyl groups.
- A very precise particle size distribution.
- A network structure, 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.
- Tough and keeps its shape even in swollen conditions. It can tolerate mechanical stress.
- Hygroscopic, it displays superior absorption in water and in oil.

### Properties of Cytopore

Particle diameter	200–280 $\mu\text{m}^{**}$
Effective surface area	1.1 $\text{m}^2/\text{g}$ dry $^{**}$
Relative density*	1.03 $\text{g}/\text{ml}^{**}$
Average diameter of pore openings	30 $\mu\text{m}^{**}$
Volume	40 $\text{ml}/\text{g}$ dry $^{**}$

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

### Preparation of Cytopore

Refer to the leaflet “Instructions”, code number 18-1060-64, before using Cytopore microcarriers.

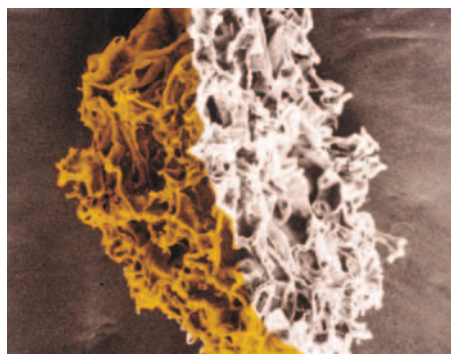
### Ordering information

Designation	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

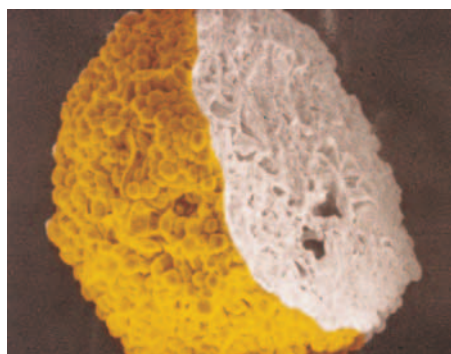
#### to order:

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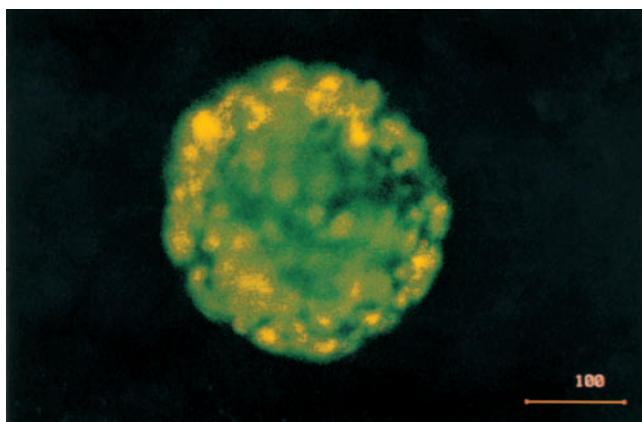
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**Fig. 2a.**  
An empty Cytopore microcarrier cut in half.



**Fig. 2b.**  
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.