

# RECENT DEVELOPMENT OF MICROCARRIER FOR CELL CULTURE ENGINEERING

*Edited By*  
Maizirwan Mel  
Yusilawati Ahmad Nor  
Iis Sopyan  
Ahmad Fadli



IIUM Press

Published by:  
IIUM Press  
International Islamic University Malaysia

First Edition, 2011  
© IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior written permission of the publisher.

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Recent Development Of Microcarrier For Cell Culture Engineering  
Maizirwan Mel  
Include Index

ISBN 978-967-418-009-6

Member of Majlis Penerbitan Ilmiah Malaysia - MAPIM  
(Malaysian Scholarly Publishing Council)

Printed by:  
IIUM PRINTING SDN. BHD.  
No. 1, Jalan Industri Batu Caves 1/3,  
Taman Perindustrian Batu Caves,  
Batu Caves Centre Point,  
68100 Batu Caves,  
Selangor Darul Ehsan

# Contents

---

<b>FOREWORD</b>	<b>vii</b>
<b>SYNOPSIS</b>	<b>ix</b>
<b>CHAPTER</b>	
<b>1 UV/Ozone Treatment System for Polystyrene Beads Modification</b>	<b>1</b>
<i>Yusilawati Ahmad Nor, Maizirwan Mel, Iis Sopyan, Hamzah Mohd Salleh, Ng Kim Hooi, Wong C.S</i>	
<b>2 Ultraviolet/Ozone Treatment for Polystyrene Beads Modification and Its Effect on Gelatin Coating</b>	<b>11</b>
<i>Yusilawati Ahmad Nor, Maizirwan Mel, Iis Sopyan, Hamzah Mohd Salleh, Ng Kim Hooi, Wong C.S</i>	
<b>3 The Study of Immobilized Bovine and Fish Gelatin on Carboxyl Containing Polystyrene Beads for Vero Cell Culture</b>	<b>23</b>
<i>Yusilawati Ahmad Nor, Maizirwan Mel, Hamzah Mohd Salleh, Ng Kim Hooi, Wong C.S</i>	
<b>4 The Effect of Hydroxyapatite Addition on Biocompatibility of Porous Alumina Microcarriers for Vero Cell Culture</b>	<b>33</b>
<i>Ahmad Fadli, Iis Sopyan, Maizirwan Mel</i>	
<b>5 Biocompatibility of Porous Hydroxyapatite Microcarrier for Vero Cell Culture Application</b>	<b>43</b>
<i>Maizirwan Mel, Iis Sopyan, Ahmad Fadli</i>	
<b>6 Evaluation on Biological Performance of Porous Pure and Magnesium-Doped Biphasic Calcium phosphate Ceramics using Vero Cell Culture</b>	<b>51</b>
<i>Toibah Abd Rahim, Iis Sopyan, Maizirwan Mel, Ahmad Fadli</i>	
<b>7 Locally Processed Serum Performance in Vero Cell Culture: Part I</b>	<b>61</b>
<i>Yusilawati Ahmad Nor, Jaafar Nuhu Jaafar, Maizirwan Mel</i>	

<b>8</b>	<b>Locally Processed Serum Performance in Vero Cell Culture: Part II</b>	<b>73</b>
	<i>Yusilawati Ahmad Nor, Jaafar Nuhu Jaafar, Maizirwan Mel</i>	
<b>9</b>	<b>The Vero Cells Growth in Different Type of Microcarriers</b>	<b>85</b>
	<i>Yusilawati Ahmad Nor, Nurul Hafizah Sulong, Maizirwan Mel, Hamzah Mohd Salleh, Iis Sopyan</i>	
<b>10</b>	<b>The Growth Culture of BRIN-BD11 Producing Insulin in Different Type of Microcarriers</b>	<b>97</b>
	<i>Maizirwan Mel, Mohamed Ismail Abdul Karim, Siti Aisyah Mohd Yusuf, Yumi Zuhanis Has-yun Hashim, Yusilawati Ahmad Nor</i>	
<b>11</b>	<b>The Growth Rate and Viability of DF1 Cell in Different Culture Media</b>	<b>111</b>
	<i>Mohd Azmir Arifin, Maizirwan Mel, Raha A.R, Sharifah Syed Hassan, Aini Ideris</i>	
<b>12</b>	<b>The Growth Study of DF1 Cell in Microcarrier Based Bioreactor</b>	<b>121</b>
	<i>Mohd Azmir Arifin, Maizirwan Mel, Raha A.R, Sharifah Syed Hassan, Aini Ideris</i>	
<b>13</b>	<b>Cell Attachment Study of Chicken Fibroblast Cell (DF-1) using Ceramic Microcarrier Granule in Bioreactors</b>	<b>131</b>
	<i>Maizirwan Mel, Iis Sopyan, Yusilawati Ahmad Nor</i>	
<b>14</b>	<b>Optimization of Process Conditions for High Cell Density Proliferation Of DF-1 Cells in Bioreactor</b>	<b>141</b>
	<i>Maizirwan Mel, Mohd Azmir Arifin, Hajar Naemah Sohif, Sharifah Syed Hassan</i>	
<b>15</b>	<b>The study of NDV Titer Using Different Cell Lines in T-Flask Culture</b>	<b>149</b>
	<i>Jaafar Nuhu Ja'afar, Maizirwan Mel, Mohd Ismail Abdul Karim, Sharifah Syed Hassan, Aini Ideris</i>	
<b>16</b>	<b>Newcastle Disease Virus Propagation in Stirred Tank Bioreactor: Part I</b>	<b>159</b>
	<i>Mohd Azmir Arifin, Siti Hajar Salim, Maizirwan Mel</i>	
<b>17</b>	<b>Newcastle Disease Virus Propagation in Stirred Tank Bioreactor: Part II</b>	<b>171</b>
	<i>Mohd Azmir Arifin, Siti Hajar Salim, Maizirwan Mel</i>	

# Chapter 8

## Locally Processed Serum Performance in Vero Cell Culture: Part II

*Yusilawati Ahmad Nor, Jaafar Nuhu Jaafar, Maizirwan Mel*

---

### 1. Introduction

Serum is blood without cells, platelets and clotting factors (Jochems et al., 2002). Serum is normally added to culture media at a concentration of 10% to promote cell growth. When used at appropriate concentrations it supplies many defined and undefined components that have been shown to satisfy specific metabolic requirements for the culture of cells in vitro (Butler, 1996). Serum can be obtained from a range of species, such as bovine (cow), chicken, caprine (goat), equine (horse), human, ovine (sheep), porcine (pig) and rabbit sera which has been produced and tested for use in cell culture applications. The best supplementation to a culture medium is fetal bovine serum (FBS) which is most frequently used for all types of cell cultures (Paranjape, 2004) because of its availability and ease of storage (Even et al., 2006), high contents of embryonic growth promoting factors as well as low gamma-globulin content (Shah, 1999).

Fetal bovine serum is widely used for monoclonal antibody (MAb) production, inactivation and neutralization assays, tissue culture, organ culture, used as a blocking agent in serological and