

The background of the cover features a composite image. The upper portion shows a microscopic view of cells, with a large, elongated, purple-stained cell on the left and a dense cluster of smaller, red-stained cells on the right. The lower portion shows a petri dish containing a yellowish liquid, with a glass pipette tip visible on the left side, dispensing a small drop of liquid.

# **CELL and TISSUE CULTURE**

**RESEARCH and TECHNOLOGY  
from ISLAMIC PERSPECTIVE**

*Edited by*

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**Mohammad Syaiful Bahari Abdull Rasad**

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**IUM Press**

CONTENTS

# CELL and TISSUE CULTURE

## RESEARCH and TECHNOLOGY from ISLAMIC PERSPECTIVE

*Edited by*

**Mohammad Syaiful Bahari Abdull Rasad**



IIUM Press

Gombak • 2014



First Edition, 2013  
© IIUM Press, IIUM

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

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Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

Cell/tissue culture research and technology from Islamic perspective /  
edited by Mohammad Syaiful Bahari Abdull Rasad  
ISBN 978-967-418-269-4

1. Cells. 2. Tissue culture. I. Mohammad Syaiful Bahari Abdull Rasad.  
571.844

Copy no: 11100321707  
Initial: AZS  
Date: 22/05/2014  
Location: MAIN/PJ/ISTAC/III/BF

Published by:  
IIUM Press

International Islamic University Malaysia  
P.O. Box 10, 50728 Kuala Lumpur, Malaysia  
Tel: +603-6196 5014; Fax: +603-6196 6298

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  
Malaysia

8/1/15 atf  
3/9/15 LFR

fp  
QH  
585.2  
C393M  
2014

# CONTENTS

<i>List of Figures</i>	xi
<i>List of Tables</i>	xiii
<i>List of Abbreviations</i>	xv
<i>Transliteration Table</i>	xix
<i>Preface</i>	xxi
<i>Introduction</i>	xxiii

## CHAPTER 1 ✓ 4594 / 36988

### INTEGRATION OF ISLAMIC PRINCIPLE IN MODERN SCIENCE: ITS PHILOSOPHY AND METHOD

*Ibrahim A. Shogar*

Introduction .....	1
Background of Modern Science .....	4
The Epistemological Aspects of Modern Science .....	6
The Nature, Method and Final Objectives .....	8
Challenge of Knowledge and Necessity for Integration .....	10
The Process of Integration .....	12
The Conceptual Analysis Approach .....	15
The Methodological Approach .....	17
Conclusion .....	18
Reference .....	20

## CHAPTER 2 ✓ 4701 / 43067

### CELL AND TISSUE CULTURE: AN OVERVIEW

*Mohammad Syaiful Bahari Abdull Rasad, Nur Aizura Mat Alewi, RahmatulWahida Ahmad*

History and Overview .....	23
Basic Laboratory Set-up and Procedures .....	26
Basic equipment .....	27
<i>Animal Cell Culture Laboratory</i> .....	27
<i>Biosafety Cabinet</i> .....	28
<i>CO<sub>2</sub> Incubator</i> .....	30



## Contents

<i>Incubator</i> .....	31
<i>Inverted Microscope</i> .....	31
<i>Centrifuge</i> .....	32
<i>Autoclave</i> .....	32
<i>Refrigerator</i> .....	33
<i>Freezer</i> .....	33
<i>Water Bath</i> .....	35
<i>Water Purification</i> .....	35
<i>Liquid Nitrogen Tank / Freezer (Cryostorage Container)</i> .....	36
<i>Balance</i> .....	38
<i>Pipettor</i> .....	38
<i>Haemocytometer</i> .....	39
<i>Plate Reader</i> .....	39
<i>Disposables</i> .....	40
<i>Tissue Culture Flask</i> .....	40
<i>Microwell Plates</i> .....	41
<i>Filters</i> .....	41
<i>Petri Dishes</i> .....	43
<i>Tips</i> .....	43
<i>Chamber Slides</i> .....	43
<i>Safety</i> .....	45
<i>Cell Lines</i> .....	47
<i>Reference</i> .....	50

## CHAPTER 3

### RISK ASSESSMENT AND REGULATORY ASPECTS OF CELL CULTURE

*Rahmatul Wahida Ahmad*

<i>Introduction</i> .....	53
<i>Risk Assessment and Regulatory Aspects of Cell Culture</i> .....	54
<i>Conclusion</i> .....	59
<i>Reference</i> .....	60

## CHAPTER 4

### BASIC TECHNIQUES AND RESEARCH IN CELL CULTURE: INTEGRATION OF ISLAMIC APPROACH

*Mohammad Syaiful Bahari Abdull Rasad*

Basic Concepts and Techniques of Cell Culture .....	61
Fundamental Elements of Cell Growth Media .....	62
Media .....	62
Serum .....	65
Media supplements .....	69
Water .....	69
Maintaining Cultured Cells .....	70
Cell morphology .....	70
Cell quantification .....	70
Subculture .....	71
Cryopreservation .....	75
Cell Culture: Major Tools in Cell and Molecular Biology .....	76
Halal concept in cell/tissue culture research .....	76
Reference .....	78

## CHAPTER 5

### DIAGNOSTIC AND THERAPEUTIC APPLICATIONS OF CELL AND TISSUE CULTURE FROM ISLAMIC PERSPECTIVES

*Mohammad Syaiful Bahari Abdull Rasad, Nur Aizura Mat Alewi*

Introduction .....	81
The Use of Stem Cells in Cell Therapy * .....	83
Cell Culture in Tissue Engineering .....	89
Organ Transplants .....	92
Cell/Tissue Cloning .....	96
Cell Bank .....	97
Cell/Tissue Culture and Its Applications in Vaccination .....	98
Other Applications of Cell and Tissue Culture .....	101
Conclusion .....	103
Reference .....	105



## CHAPTER 6

### NEW ERA OF REGENERATIVE MEDICINE: AN ISLAMIC PERSPECTIVE

*Ahmad Sukari Halim, Lim Chin Keong, Mohd Hilmi Abu Bakar,*

*Arman Zaharil Mat Saad*

Introduction .....	110
Regenerative Medicine from Laboratory to Clinical Bedside .....	111
Induced Pluripotent Stem Cells: A New Source of Human Stem Cells .....	119
Tissue Engineering in Regenerative Medicine .....	121
Microtechnologies for TE .....	124
Nanotechnologies for TE .....	127
Centre for Cell Banking and Therapy: A Commercial Approach in Regenerative Medicine .....	129
Conclusion .....	130
Reference .....	131

## CHAPTER 7

### APPLICATIONS OF CULTURED CELLS IN GENETIC ENGINEERING: AN ISLAMIC PERSPECTIVE

*Mohd. Arifin Kaderi*

Introduction .....	143
Reference .....	150

## CHAPTER 8

### TISSUE ENGINEERING: AN ISLAMIC PERSPECTIVE

*Munirah Sha'ban, Norhamiza Mohamad Sukri*

Introduction .....	153
Understanding Tissue Engineering Approaches .....	154
History and Developments of Tissue Engineering .....	156
Tissue Engineering Applications .....	161
Tissue engineered skin .....	161

Tissue Engineered Cartilage .....	161
Tissue Engineered Cornea .....	162
Tissue Engineered Bone .....	162
Tissue Engineered Myocardium .....	163
Tissue Engineered Peripheral Nerves .....	163
Tissue Engineered Intestine .....	163
Tissue Engineering Initiatives in Malaysia .....	163
Islamic Perspectives of Tissue Engineering .....	165
Reference .....	178

## CHAPTER 9

### STEM CELLS RESEARCH: VALUE, ETHICAL AND RELIGIOUS VIEWS

*Muhammad Lokman Md. Isa*

Introduction .....	186
Indication of hESCs Research .....	187
Ethical Issue regarding hESCs Research .....	188
Religion Views regarding the Research .....	189
Greek Orthodox and Roman Catholic Churches .....	189
Protestant Churches .....	190
Judaism .....	190
Hinduism and Buddhism .....	191
Islam .....	192
Conclusion .....	193
Reference .....	193

## CHAPTER 10

### NANOBIOTECHNOLOGY AND NANOMEDICINE: THE IMPACT, IMPLICATION AND THE UNKNOWN

*Shaharum Shamsuddin*

Introduction .....	196
Nano-biotechnology .....	197
Nanoparticle .....	199
Emergence of Nanomedicine and Nanobiomedicine .....	199



## Contents

Nanotechnology and Its Impact to the Environment .....	201
Nanomaterial and Cellular Biology .....	204
Challenges and Problems for Nanomaterial in Cell Biology .....	205
Cellular Toxicity of Nanoparticle: Uses and Limitations of Cytotoxicity Assay .....	206
Cellular Penetration of Nanoparticles into the Cell .....	209
Cellular Uptake of Nanoparticle: Possibilities of Mechanisms Involved .....	213
Nanotechnology: An Islamic Perspective .....	215
Reference .....	219

<i>Contributors</i> .....	224
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<i>Index</i> .....	226
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## **CHAPTER 4**

# **BASIC TECHNIQUES AND RESEARCH IN CELL CULTURE: INTEGRATION OF ISLAMIC APPROACH**

*Mohammad Syaiful Bahari Abdull Rasad*

### **Basic Concepts and Techniques of Cell Culture**

The use of *in vitro* cell, tissue and organ culture methodologies in basic research and applied biomedical sciences is increasing exponentially. Developments such as in *in vitro* fertilization, cloning and the creation of genetically modified animals rely heavily on cell culture. In Islam, research must be linked to the broad ethical base set forth in the Qur'an and the *Sunnah*. Islam encourages scientific research as long as they benefit humankind and do not contradict basic Islamic ruling. Before performing any technique or action, Muslims have to distinguish whether it is *halāl* (permissible) or *harām* (not permissible) according to the *sharī'ah*.

Cell culture consists of a few basic concepts and techniques. These include sterile technique, subculture of cells, freezing and thawing cells and measuring cell growth. There are some essential requirements that should be observed before cell culture can be carried out efficiently, effectively and safely as cell culture critically depends on the quality of the components required such as culture medium, serum, growth supplements and water. Hence, to ensure the successful growth and maintenance of human or animal cells *in vitro*, either primary cultures or continuous cell lines, appropriate culture conditions that mimic the physiological conditions *in vivo* and comprises all types of soluble molecules are required (Freshney, 2000).



## Fundamental Elements of Cell Growth Media

### Media

Initially, cells were cultured in natural media based on tissue extracts and body fluids, such as chick embryo extract, serum, lymph, and etc. Later, chemically defined media, known as Eagle's Basal Medium (Eagle, 1955), was introduced in 1955 which was then followed by Eagle's Minimal Essential Medium (Eagle, 1959). Recently, diverse types of media are available, depending on the requirements of the cell intended to be cultured. All media were developed to support particular cell lines or conditions (Table 4.1). Information regarding the contents and selection of the appropriate medium for a given type of cell is usually available in the literature, the source of the cells or catalogue data sheets. For example, Dulbecco's Modification of Eagle's Basal Medium (DMEM) was developed for mouse fibroblasts for transformation and virus propagation studies (Freshney, 2000). Most cell lines can be maintained on a relatively simple medium such as DMEM supplemented with serum. The culture medium must supply all essential nutrients for cell metabolism, growth and proliferation. These include biosynthetic precursors for cell anabolism, catabolic substrates for energy metabolism, vitamins and trace elements whose function is primarily catalytic, and bulk inorganic ions (electrolytes) whose functions are both catalytic and physiological to maintain culture medium pH and osmolarity within acceptable limits (Gstraunthaler, 2003). There are also specially made media products available for neuronal cell, stem cell, primary cell, T-cell culture as well as specially made media for virus and protein production, cytogenetics research, and many more.