

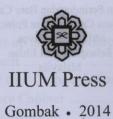
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

CELL and TISSUE CULTURE

RESEARCH and TECHNOLOGY from ISLAMIC PERSPECTIVE

Edited by

Mohammad Syaiful Bahari Abdull Rasad



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: 32/05/2014

Location: MAIN/PJ/ISTAC/IIiBF

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

585.2 2014

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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 *ḥalāl* (permissible) or *ḥarām* (not permissible) according to the *sharīʿah*.

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.