

EXPANSION OF SERUM-FREE MEDIUM
ADAPTED VERO CELLS USING
ULTRAVIOLET/OZONE (UVO) TREATED
POLYSTYRENE MICROCARRIERS

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor of Manufacturing Engineering Technology (Pharmaceutical).

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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LIST OF SYMBOLS

%	percentage
±	plus-minus sign
°C	degree Celsius

LIST OF ABBREVIATIONS

$\mu\text{g/L}$	microgram per litre
μm	micrometre
ATCC	American Type Culture Collection
BSA	Bovine serum albumin
BSE	Bovine spongiform encephalopathy
Ca^{2+}	Calcium ion
cells/mL	cells per millilitre
CHO	Chinese hamster ovary
Cl^-	Chloride ion
cm^2	square centimetre
CO_2	Carbon dioxide
DEAE	Diethylaminoethyl
DMEM	Dulbecco's Modified Eagle's medium
DMSO	Dimethyl sulfoxide
DNA	Deoxyribonucleic acid
EDTA	Ethylenediaminetetraacetic acid
EGFP	Enhanced green fluorescent protein
ESCs	Embryonic stem cells
FBS	Fetal bovine serum
FMD	Foot-and-mouth disease
g	gram
g/L	gram per litre
HCl	Hydrochloric acid
HCO_3^-	Bicarbonate ion
HIV	Human immunodeficiency disease
hMSCs	Human mesenchymal stem cell
hr	hour
HSA	Human serum albumin
K^+	Potassium ion
L	litre
M	molar

mAb	Monoclonal antibody
MEM	Minimum Essential Medium
Mg ²⁺	Magnesium ion
mL	millilitre
MSC	Mesenchymal Stem Cells
Na ⁺	Sodium ion
NaHCO ₃	Sodium bicarbonate
NaOH	Sodium hydroxide
o/w	Oil-in-water
O ₂	Oxygen
PBS	Phosphate buffered saline
PO ₄ ³⁻	Phosphate ion
PS	Polystyrene
PTFE	Polytetrafluoroethylene
PW	Purified water
rpm	revolutions per minute
RPMI	Roswell Park Memorial Institute
RSV	Respiratory Syncytial Virus
SFM	Serum-free medium
SM	Spent medium
SO ₄ ²⁻	Sulphate ion
SSM	Serum supplemented medium
T _d	Doubling time
U/mL	unit per millilitre
UVO	Ultraviolet/ozone
v/v	volume per volume
VP-SFM	Virus production – serum free medium
WFI	Water for injection