

Dedicated

to

Mummy, Papa, Didi,

Bhaiya

and

Pari



DECLARATION

I hereby declare that the thesis entitled “**A Study on the Effect of Sodium Chloride on Breast Cancer Cells and Tumor-Associated Macrophages**” submitted to the School of Sciences, Tezpur University in requirement of partial fulfilment for the award of the degree of Doctor of Philosophy in Molecular Biology and Biotechnology has been carried out by me at Department of Molecular Biology and Biotechnology, Tezpur University, Assam, India, under the supervision of Dr. Rupak Mukhopadhyay. The work is original and has not been submitted in part or full in any other University or Institute for any degree, diploma, associateship, fellowship or any other similar title or recognition.

Date: 17/10/24

Place: Tezpur

(Manoj Suresh Sharma)

Registration No: TZ201087 of 2019



TEZPUR UNIVERSITY
(A Central University by an Act of Parliament)
Napaam, Tezpur-784028
District: Sonitpur, Assam, India

CERTIFICATE OF SUPERVISOR

This is to certify that the thesis entitled “**A Study on the Effect of Sodium Chloride on Breast Cancer Cells and Tumor-Associated Macrophages**” submitted to the School of Sciences Tezpur University in part fulfilment for the award of the degree of **Doctor of Philosophy** in Molecular Biology and Biotechnology is a record of research work carried out by **Mr. Manoj Suresh Sharma** under my supervision and guidance.

All help received by him from various sources have been duly acknowledged.

No part of this thesis has been submitted elsewhere for award of any other degree.

(Signature of supervisor)

Place: Tezpur

Name: Dr. Rupak Mukhopadhyay

Designation: Associate Professor

School: Sciences

Department: Molecular Biology and Biotechnology, Tezpur University

Date: 17/10/2024

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List of abbreviations

Abbreviations Full form

~	Around
μ	Micron
μg	Microgram
μl	Micro Liter
μM	Micro Molar
μm	Micrometer
ADCC	Antibody-Dependent Cellular Cytotoxicity
APCs	Antigen-Presenting Cells
Arg-1	Arginase-1
bFGF	Basic Fibroblast Growth Factor
BSA	Bovine Serum Albumin
CAFs	Cancer-Associated Fibroblast
CCL2	C-C Motif Chemokine Ligand 2
CD206/MR	Mannose Receptor
CD8+	Cytotoxic T Cells
CM-H2DCFDA	2',7'-Dichlorodihydrofluorescein Diacetate
CSF1	Colony Stimulating Factor 1
CTLs	Cytotoxic T Lymphocytes
CXCL12	C-X-C Motif Chemokine Ligand 12
CXCL8	C-X-C Motif Chemokine Ligand 8
DCIS	Ductal Carcinoma In-Situ
DCs	Dendritic Cells
DMEM	Dulbecco's Modified Eagle's Medium
D-PBS	Dulbecco's Phosphate Buffered Saline
DWI	Diffusion-Weighted Imaging

ECM	Extracellular Matrix
EGF	Epidermal Growth Factor
ENaC	Epithelial Sodium Channels
ER+	Estrogen Receptor Positive
ER-	Estrogen Receptor Negative
ESC	Extracellular Sodium Concentration
FBS	Fetal Bovine Serum
FGF	Fibroblast Growth Factor
g	gram
GO	Gene Ontology
HER2+	Human Epidermal Growth Factor Receptor 2
hTERT	Human Telomerase Reverse Transcriptase
HSD	High Salt Diet
IDC	Invasive Ductal Carcinomas
IFNs	Interferons
IFN- γ	Interferon Gamma
IL-1 β	Interleukin 1 Beta
IL-8	Interleukin 8
IBD	Inflammatory Bowel Disease
ISC	Intracellular Sodium Concentration
LPS	Lipopolysaccharide
MCP-1	Monocyte Chemoattractant Protein-1
MDSCs	Myeloid-Derived Suppressor Cells
MHC-II	Major Histocompatibility Complex Class II
miRNAs	MicroRNAs
mg	Milligram
min	Minute(s)
ml	Milliliter

M	Molar
MMP-7	Matrix Metalloproteinase-7
MS	Multiple Sclerosis
mM	Millimolar
MTT	3-(4,5-Dimethylthiazol-2-Yl)-2,5-Diphenyltetrazolium Bromide
Na ⁺ /K ⁺ -ATPase	Sodium-Potassium Adenosine Triphosphatase
NaCl	Sodium Chloride
NCCS	National Centre for Cell Science
NCX	Sodium-Calcium Exchanger
NHE1	Sodium-Hydrogen Exchanger 1
NK	Natural Killer
NKT	Natural Killer T
NOS	Nitric Oxide Synthase
ORA	Over-Representation Analysis
PFA	Paraformaldehyde
PD-1	Programmed Cell Death Protein 1
PD-L1	Programmed Death-Ligand 1
PDGF	Platelet-Derived Growth Factor
PGE2	Prostaglandin E2
PIGF	Placental Growth Factor
PMA	Phorbol 12-Myristate 13-Acetate
PTEN	Phosphatase and Tensin Homologue Deleted on Chromosome 10
Rb	Retinoblastoma Protein
RIP buffer	Radioimmunoprecipitation Assay Buffer
RP	Ribosomal Protein
ROS	Releases Reactive Oxygen Species
RPMI-1640	Roswell Park Memorial Institute-1640 Medium
ssDNA	Single Stranded DNA

SDS-PAGE	Sodium Dodecyl Sulphate-Polyacrylamide Gel Electrophoresis
SEM	Standard Error of The Mean
SIKs	Salt-Inducible Kinases
SLE	Systemic Lupus Erythematosus
SR	Scavenger Receptor
STAT3	Signal Transducer and Activator of Transcription 3
TAM	Tumor-Associated Macrophages
TAME	Tumor Associated Macrophages
TCR	T Cell Receptor
TGF- β	Transforming Growth Factor- β
TNBC	Triple-Negative Breast Cancers
TNF- α	Tumor Necrosis Factor Alpha
TonEBP	Tonicity-Responsive Enhancer Binding Protein
Tregs	Regulatory T Cells
TSC	Total Sodium Concentration
TME	Tumor Microenvironment
VGSCs	Voltage-Gated Sodium Channels