Dedicated
To
My Grand Parents

DECLARATION

I declare that the thesis entitled **"Detection of Human Polyomavirus JC (JCV) and its Genotyping in Immunocompromised and Non-Immunocompromised Individuals from sub-Himalayan West Bengal"** has been prepared by me under the supervision of Prof. (Dr.) Soumen Bhattacharjee, Professor, Department of Zoology, University of North Bengal and co-supervision of Prof. (Dr.) Nirmal Kumar Bera, Department of Psychiatry, North Bengal Medical College and Hospital.

No part of this thesis has formed the basis for the award or any fellowship previously.

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CERTIFICATE

We certify that Miss Sutanuka Chattaraj has completed the thesis entitled, **"Detection of Human Polyomavirus JC (JCV) and its Genotyping in Immunocompromised and Non-Immunocompromised Individuals from sub-Himalayan West Bengal"** under our supervision for the award of Ph.D. degree at University of North Bengal. She has carried out her research work at the Cell and Molecular Biology Laboratory, Department of Zoology, University of North Bengal. No part of the thesis has formed the basis for the award or any fellowship previously.

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PREFACE

The present dissertation entitled "**Detection of Human Polyomavirus JC (JCV) and its Genotyping in Immunocompromised and Non-Immunocompromised Individuals from sub-Himalayan West Bengal**" has been done under the supervision of Prof. (Dr.) Soumen Bhattacharjee, Cell and Molecular Biology Laboratory, Department of Zoology, University of North Bengal and co-supervision of Prof. (Dr.) Nirmal Kumar Bera, Department of Psychiatry, North Bengal Medical college and Hospital.

Human Polyomavirus JC (JCPyV) is widely distributed throughout the world. Infection may occur during childhood but it can remain latent in certain tissues and organs for the entire span of life. It gets reactivated only under conditions of sustained immune suppression and can cause progressive multifocal leucoencephalopathy (PML).

There exists no information about the status of JCPyV in the sub-Himalayan part of the West Bengal, India. Therefore, the main aim of the research work has been to ascertain the present status of JCPyV and to check the viral load in individuals infected with the virus in this region of India. The study has generated an overall picture on the distribution pattern of JCPyV subtypes circulating in this part of India and among isolated tribes of this region. This region is inhabited by several tribal groups. In addition, detailed analysis on the NCCR, VP1 and large T-antigen sequences from the isolates of this region was also done.

The findings of the study are published in various research journals and are presented and discussed in details in the Results and Discussion part of this dissertation.

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I would also like to thank late Prof. Chandan Dutta, Department of Nephrology, North Bengal Medical College and Hospital for providing me patients during the course of my study.

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Sutanuka Chattaraj

Dated: 5/10/2021 **Sutanuka Chattaraj**

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LIST OF ABBREVIATIONS

5-HT_2A	→	5-hydroxytryptamine receptor 2A
AIDS	→	Acquired immunodeficiency syndrome
AP-1	→	Activator Protein 1
AP-1	→	Activator protein 1
ASF/SF2	→	Serine/arginine-rich splicing factor 1
ATP	→	Adenosine triphosphate
BAG-1	→	Bcl-2-associated athano gene-1
BKPyV	→	BK Polyomavirus
BLAST	→	Basic local alignment search tool
C/EBPβ	→	CAAT/enhancer binding protein beta
CMV	→	Cytomegalovirus
CNS	→	Central nervous system
CREB/ATF-1	→	cAMP-responsive element-binding protein and activating transcription factor 1
CSF	→	Cerebrospinal fluid
dATP	→	deoxy adenosine tri-phosphate
dCTP	→	deoxy cytidine tri-phosphate
DDX-1	→	DEAD-Box helicase 1
dGTP	→	deoxy guanosine tri-phosphate
DNA	→	Deoxyribonucleic acid
dsDNA	→	Double stranded DNA

dTTP	→	deoxy thymidine tri-phosphate
EBV	→	Epstein-Barr virus
EDTA	→	Ethylenediaminetetraacetic acid
Egr-1	→	Early growth response-1
EM	→	Electron microscopy
ER	→	Endoplasmic reticulum
ERAD	→	Endoplasmic reticulum associated protein degradation
GAGs	→	Glycosaminoglycans
GBP-i	→	GTPase human guanylate-binding protein 1
HAART	→	Highly active antiretroviral therapy
HBV	→	Hepatitis B virus
HCl	→	Hydrochloric acid
HI	→	Hemagglutination inhibition
HIF-1	→	Hypoxia inducible factor 1
HIV	→	Human Immunodeficiency Virus
HPV	→	Human papillomavirus
HSB	→	High Salt Buffer
Human polyomavirus 10	→	HPyV10
Human polyomavirus 12	→	HPyV12
Human polyomavirus 6	→	HPyV6
Human polyomavirus 7	→	HPyV7
Human polyomavirus 9	→	HPyV9

ICTV	→	International Committee on Taxonomy of Viruses
IRIS	→	Immune reconstitution inflammatory syndrome
IRS-1	→	Insulin receptor substrate 1
JCPyV	→	John Cunningham Polyomavirus
KCl	→	Potassium chloride
KH_2PO_4	→	Ptassium dihydrogen phosphate
KIPyV	→	KI Polyomavirus
LCP-1	→	Lymphocyte cytosolic protein 1
Lyon IARC polyomavirus	→	LIPyV
Malawi polyomavirus	→	MWPyV
MAPK	→	Mitogen-activated protein kinase
MCPyV	→	Merkel cell polyomavirus
$MgCl_2$	→	Magnesium chloride
miRNA	→	Micro RNA
MPyV	→	Murine Polyomavirus
MS	→	Multiple sclerosis
Na_2HPO_4	→	Sodium hydrogen phosphate
NaCl	→	Sodium chloride
NANA	→	N-acetylneuraminic acid
NCBI	→	National Center for Biotechnology Information

NCCR	→	Non-coding control region
New Jersey polyomavirus	→	NJPyV
NF-1	→	Nuclear factor 1
NFAT4	→	Nuclear factor of activated T cells
NF-κB	→	Nuclear factor kappa light chain enhancer of activated B cells
NLS	→	Nuclear localization sequence
OBD	→	Origin binding domain
PBS	→	Phosphate buffered saline
PCR	→	Polymerase chain reaction
PDI	→	Protein disulfide isomerase
PML	→	Progressive Multifocal Leucoencephalopathy
RBC	→	Red blood cell
RCLB	→	Red cell lysis buffer
RFLP	→	Restriction fragment length polymorphism
RNA	→	Ribonucleic acid
SDS	→	Sodium dodecyl sulphate
SLE	→	Systemic lupus erythromatous
Sp-1	→	Specificity protein 1
SSC buffer	→	Standard sodium citrate buffer
ssDNA	→	Single stranded DNA
St Louis polyomavirus	→	STLPyV
SV40	→	Simian virus 40

TAE buffer	→	Tris acetate EDTA buffer
T-Ag	→	Tumour antigen
TE buffer	→	Tris-EDTA buffer
TSPyV	→	Trichodysplasia spinulosa-associated Polyomavirus
up-TAR	→	Upstream Target
VP	→	Viral protein
VZV	→	Varicella-zoster virus
WUPyV	→	WU Polyomavirus
YB-1	→	Y-box binding protein 1