

*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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Document Information

Analyzed document	Sutanuka Chattaraj_Zoology.pdf (D111661983)
Submitted	8/25/2021 11:24:00 AM
Submitted by	University of North Bengal
Submitter email	nbuplg@nbu.ac.in
Similarity	6%
Analysis address	nbuplg.nbu@analysis.arkund.com

Sources included in the report

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Sutanuka Chattaraj
5/10/2021

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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.

ACKNOWLEDGEMENT

It's my honour to acknowledge my teachers, colleagues and many more persons with whom I interacted and shared ups and downs of my Ph.D. thesis work. It gives me great pleasure to express my gratitude and acknowledge all of them who made this thesis and research work possible directly or indirectly and made my journey easier.

*Foremost, I would like to express my sincere gratitude to my respected supervisor and guide **Prof. (Dr.) Soumen Bhattacharjee**, Professor, Department of Zoology, University of North Bengal for giving me the opportunity to carry out my research work under his kind supervision and for his valuable guidance, wise suggestions and encouragement as and when required throughout the entire period of investigation.*

*I would also like to express my deepest sense of gratitude and respect to my Co-Supervisor **Prof. Nirmal Kumar Bera**, Department of Psychiatry, North Bengal Medical College and Hospital for his valued consultation.*

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.

I am grateful to the Head, Department of Zoology, University of North Bengal for allowing me to use the central instrumentation facility during my research work.

*I would like to thank all my teachers of the Department, **Prof. Min Bahadur**, **Dr. Dhiraj Saha**, **Dr. Tilak Saha**, **Dr. Sourav Mukherjee**, **Dr. Arpan Kumar Maiti**, **Dr. Ritwik Mondal** and **Dr. Subhra Prakash Hui** for their valuable suggestions during the whole period of my study. I am also thankful to **Prof. Joydeb Pal**, **Prof. Ananda Mukhopadhyay**, **Prof. Tapas Kumar Chaudhuri** and **Prof. Sudip Barat**, former teachers*

of the Department of Zoology, University of North Bengal for their valuable suggestions.

I would also like thank non teaching staffs of the Department for kind cooperation and support during my work,

My sincere thanks also go to Arvind Kumar Jha, Sarbani Roy and Nasima Khan, for helping me with the sample collection during the study.

I would also like to thank my fellow labmates: Dr. Tanmay Mukhopadhyay, Miss Uttara Dey Bhowmick, Mr. Subhasis Paul, Mr. Tanmoy Dutta, Mrs. Najnin Islam, Mr. Debabrata Modak, Mr. Sudipta Kumar Roy and Mr. Sourav Sarkar for their good wishes and constant co-operation valuable criticism and constant encouragement for successful completion of my work,

I had the fortune to have wonderful seniors and friends Dr. Pokhraj Guha, Dr. Anjali Prasad, Dr. Sangita Khewa Subba, Dr. Ritesh Biswa, Dr. Dawa Bhutia, Dr. Kumar Basnet, Mr. Binoy Rai, Dr. Rudra Prasad Roy, Dr. Priyanka Dey, Dr. Subhrojyoti Roy, Dr. Avishek Das, Miss Ruksa Nur, Mr. Bappaditya Ghosh, Mrs. Swati Singh, Mrs. Trisita Mazumdar, Dr. Susmita Dutta, Dr. Somit Dutta and Dr. Minu Bharati and am thankful for their support when I needed the most.

I would also like to extend my thanks to my juniors, Miss Arpita Ray, Mr. Debojit Dutta, Miss Farha Yasmin, Mr. Sona Sutradhar, Miss Shaswati Ghosh, Mr. Rejuan Islam, Mr. Amlan Jyoti Ghosh, Mr. Sagar Sarkar, Mr. Manas Modak, Miss Priyanka Rai, Mr. Abhishek Subba, Mr. Bhaskar Paul, Miss Prerna Bhujel, Miss Nilu Limboo, Miss Prapti Das and Miss Esha Roy.

I would like to express my profound regards to my parents who have always imposed special interest in my scientific studies and without their endless blessing this would

have not been possible to bring it in light. Special and profound thanks to my brother who has supported me over the years. I am also indebted to my uncle for his support and enormous encouragement.

My Sincere thanks to all the participants for their patience and cooperation. Without them, the work would have been impossible.

I like to sincerely acknowledge Council for Scientific and Industrial Research (CSIR) and University Grants Commission (UGC) for providing the financial assistance to carry out my research work.

Dated: 5/10/2021

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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/EBP β	→	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 ₂ PO ₄		→	Potassium dihydrogen phosphate
KIPyV		→	KI Polyomavirus
LCP-1		→	Lymphocyte cytosolic protein 1
Lyon polyomavirus	IARC	→	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 ₂ HPO 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- κ B		→	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