



Biotechnology and Bioinformatics

Advances and Applications for Bioenergy,
Bioremediation, and Biopharmaceutical Research

Editors

Devarajan Thangadurai, PhD

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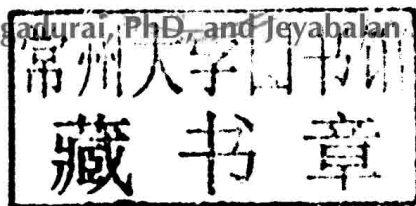
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LIST OF ABBREVIATIONS

A	Adenosine
AAc	Acrylic Acid
ABE	Acetone-Butanol-Ethanol
ADME	Absorption, Distribution, Metabolism and Excretion
AI	Artificial Intelligence
AIDS	Acquired Immune Deficiency Syndrome
AOD	Alcohol Oxidase
AOX	Alcohol Oxidase Activity
ARS	Autonomous Replication Sequence
AS	Aggregation Substance
ASO	Allele-Specific Oligonucleotide
ATP	Adenosine Triphosphate
ATPase	Adenosine Triphosphatase
BCI	Brain Computer Interfaces
BIOML	BIOpolymer Markup Language
BLAST	Basic Local Alignment Search Tool
BMA	Butylmethacrylate
BMU	Biosignal Monitoring Unit
BoNT	Botulinum Neurotoxin
BOSC	Bioinformatics Open Source Conference
BS	Binding Substance
BSML	Bioinformatic Sequence Markup Language
CAH	Chronic Active Hepatitis
CaMV	Cauliflower Mosaic Virus
CASP	Critical Assessment of Structural Prediction
CC	Combinatorial Chemistry
CDD	Conserved Domain Database
CDs	Cyclodextrins
CE	Capillary Electrophoresis
C-MFA	C-based metabolic flux analysis
CGD	Chronic Granulomatous Disease
CGTase	Cyclodextrin Glycosyl Transferase
CGH	Comparative Genomic Hybridization

ChIP	Chromatin Immunoprecipitation
CHO	Chinese Hamster Ovary
CLogP	Calculated Log P
CMP	Calcium Metaphosphate
CNA	Copy Number Alterations
CP	Coupling Protein
CPH	Chronic Persistent Hepatitis
CPT	Camptothecin
CPU	Central Processing Unit
CT	Computer-Assisted Tomography
CTL	Cytotoxic T Lymphocytes
CUEs	Commercially Useful Enzymes
DCP	Dichlorophenol
DDBJ	DNA Data Bank of Japan
DDS	Drug Delivery System
DDT	Dichlorodiphenyl Trichloroethane
DEAM	Diethylacrylamide
DHA	Docosahexaenoic Acid
DHAS	Dihydroxyacetone Synthase
DHBV	Duck Hepatitis B virus
DMAc	Dimethylacetamide
DMF	Dimethylformamide
DMSO	Dimethyl sulfoxide
DNA	Deoxyribonucleic Acid
Dox	Doxorubicin
DR	Direct Repeats
DSC	Differential Scanning Calorimeter
DSP	Digital Signal Processing
DT	Disodium Terephthalate
DTD	Document Type Definition
Dtr	DNA Transfer and Replication
EBIS	Electrical Bioimpedance Spectroscopy
EGFR	Epidermal Growth Factor Receptors
EHEC	Enterohaemorrhagic <i>Escherichia coli</i>
ELISA	Enzyme-Linked Immunosorbent Assays
ELP	Elongator Holozyne Complex
EM	Expectation-Maximization
EMBL	European Molecular Biology Laboratory
EMG	Electromyogram

EPA	Eicosapentaenoic Acid
EPFL	École Polytechnique Fédérale de Lausanne
EPR	Enhanced Permeability and Retention
ER	Endoplasmatic Reticulum
ESBL	Extended-Spectrum Beta-Lactamase
ESC	Embryonic Stem Cell
ESI	Electrospray Ionization
EST	Expressed Sequence Tag
e-TAGs	e-Textile Attached Gadgets
ETU	Ethylene Thiourea
FAS	Fatty Acid Synthase
FASTA	Fast-all Sequence Alignment Algorithm
FBA	Flux Balance Analysis
Fd	Ferredoxin
FDA	Food and Drug Administration
FEV1	Forced Expiratory Volume in One Second
FFPE	Formalin-Fixed Paraffin Embedded
FLD	Formaldehyde Dehydrogenase
FMN	Flavinmonooxygenases
FPGAs	Field Programmable Gate Arrays
FVC	Forced Vital Capacity
G	Guanosine
G6P	Glucose-6-Phosphate
GAME	Genome Annotation Markup Elements
GC	Gas Chromatography
GDB	Genome Database
GEO	Gene Expression Omnibus
GI	Gastrointestinal
GMMs	Gaussian Mixture Models
GPCRs	G-Protein Coupled Receptors
GRAS	Generally Recognized As Safe
GRE	Glucocorticoid-Responsive Element
GSHV	Ground Squirrel Hepatitis Virus
GSMM	Genome-Scale Mathematical Model of the Metabolism
GSMMs	Genome-Scale Metabolic Models
GSR	Galvanic Skin Response
Has	Hydroxyacids
HB	Hydroxybutyrate
HBIG	Hepatitis B Immunoglobulin

HBV	Hepadnaviruses
HCC	Hepatocellular Carcinoma
HCH	Hexa Chlorocyclo Hexane
HDI	Hexamethylene Di Isocyanate
HER	Human Growth Factor Receptor
HGT	Horizontal Gene Transfer
HHBV	Heron Hepatitis B Virus
HIV	Human Immunodeficiency Virus
HMF	Hydroxy Methyl Furfural
HMM	Hidden Markov Model
HOPE	Hepes-glutamic acid buffer-mediated Organic solvent Protection Effect
HPLC	High Performance Liquid Chromatography
HRC	Heat Release Capacity
HRMA	High Resolution Melting Analysis
HSV	Herpes Simplex Virus
HTS	High Throughput Screening
HV	Hydroxyvalerate
IB	Inclusion Bodies
IFN	Interferon
IGF	Insulin Growth Factor
IHC	Immunohistochemistry
IMS	Imaging Mass Spectrometry
INPNC	Ice Nucleation Protein
IPA	Ingenuity Pathway Analysis
IPKB	Ingenuity Pathways Knowledge Base
IPP	Isopentenyl Pyrophosphate
IS	Insertion Sequences
IT	Information Technology
Kb	Kilobase
kDa	kilodalton
KEGG	Kyoto Encyclopedia of Genes and Genomes
LACS	Long Chain Acyl-CoA Synthases
LCM	Laser Capture Microdissection
LCST	Lower Critical Solution Temperature
LD	Linkage Disequilibrium
LDH	Layered Double Hydroxide
LGT	Lateral Gene Transfer

LNA	Locked Nucleic Acid
mAb	Monoclonal Antibodies
MCL	Medium-Chain-Length
MCMC	Markov Chain Monte Carlo
MCP	Monocrotophos
MDa	Megadalton
MeSH	Medical Subject Headings
MFA	Metabolic Flux Analysis
MGD	Mouse Genome Database
MGEs	Mobile Genetic Elements
MLPA	Multiple Ligation-dependent Probe Amplification
Mpf	Mating pair formation
MRI	Magnetic Resonance Imaging
MS	Mass Spectrometry
Mut	Methanol Utilization
MVA	Mevalonate
MVE	Methyl Vinyl Ether
MT	Molecular Weight
NCBI	National Center for Biotechnology Information
NGS	Next Generation Sequencing
NMR	Nuclear Magnetic Resonance
NPS	Nitrite Pickling Salt
NRE	Negative Regulatory Element
NVCI	N-vinylcaprolactam
O B F	Open Bioinformatics Foundation
OAA	Oxaloacetate
OASIS	Open architecture for Accessible Services Integration and Standardization
OLA	Oligonucleotide Ligation Assay
OMIM	Online Mendelian Inheritance in Man
OP	Organophosphorus
Opd	Organophosphate Degrading
OPH	Organophosphorus Hydrolase
oriT	Origin of Transfer
OPP	Oxidative Pentose Phosphate Pathway
PAHs	Polycyclic Aromatic Hydrocarbons
PAMAM	Polyamidoamine
PBMCs	Peripheral Blood Mononuclear Cells
PBRs	Photobioreactors

PCA	Principal Component Analysis
PCB	Polychlorinated Biphenyls
PCR	Polymerase Chain Reaction
PDAs	Personal Digital Assistants
PDB	Protein Data Bank
PDTD	Potential Drug Target Database
PEF	Peak Expiratory Flow
PEG	Polyethylene Glycol
PEO	Poly-Ethylene Oxide
PEP	Phosphoenolpyruvate
PET	Positron Emission Tomography
PETIM	Poly-propyl ether imine
PFGE	Pulse Field Gel Electrophoresis
PgRNA	Pregenomic RNA
PHA	Poly Hydroxyalkanoate
PHB	Poly Hydroxybutirate
PHM	Personalized Health Monitoring
PHP	Hypertext Preprocessor
PIR	Protein Information Resource
PLA	Poly-Lactic Acid
PLGA	Polylactic Co-Glycolic Acid
PNIPAM	Poly-N-isopropyl acrylamide
PNPs	Polymeric Nanoparticles
PPG	Photoplethysmogram
PRE	Posttranscriptional Regulatory Element
PRIMA	<i>p53</i> -dependent Reactivation and Induction of Massive Apoptosis
PS	Photosystem
PUFAs	Polyunsaturated Fatty Acids
QF	Quantitative-Fluorescent
qPCR	Quantitative Real-Time Polymerase Chain Reaction
QSAR	Quantitative Structure-Activity Relationship
RC	Rolling Circle
RCR	Rolling-Circle Replication
RFLP	Restriction Fragment Length Polymorphism
RIA	Radioimmunoassay
RITA	Reactivation of <i>p53</i> and Induction of Tumour Cell Apoptosis
R-PC	R-phycoyanin

RPPA	Reverse Phase Protein Array
RT-PCR	Reverse Transcription Polymerase Chain Reaction
RuBP	Ribulose- Biphosphate
SCL	Short-Chain-Length
SE	Surface Exclusion
SGF	Short Glass Fibers
SMART	Simple Modular Architecture Research Tool
SNP	Single Nucleotide Polymorphism
SOG	Sudan Orange G
SRP	Signal Recognition Particle
TBM	Template Based Modeling
TDD	Therapeutic Drug Database
TEM	Transmission Electron Microscope
TF	Transcription Factors
TfR	Transferrin Receptors
THF	Tetrahydrofuran
Tn	Transposons
TNF	Tumour Necrosis Factor
TSHV	Tree Squirrel Hepatitis Virus
UCST	Upper Critical Solution Temperature
UNC	United Nation Convention
UNIVERSAAL	Universal open platform and Reference Specification for Ambient Assisted Living
UTI	Urinary Tract Infections
UTR	Untranslated Regions
VRE	Vancomycin-Resistant Enterococci
Vir	Virulence
WHO	World Health Organization
WHV	Woodchuck Hepatitis Virus

PREFACE

Biology is the study of living things, which helps to acquaint us about ourselves and the subsistence atmosphere around us with some scientific proofs. To do this, we need the unification of the various branches of biology. To discover, to identify problems, and to make complex things simple in biology, we are using various technologies that have developed through research. Among all the branches of biology, biotechnology plays a major role in research, which is aligned with all the branches of biology to develop new technologies. To make any modifications in existing biological systems, we use various methods of biotechnology, which helps in making impossible things possible, such as cloning, plant tissue culture, transplantation experiments, stem cell therapy, bioremediation, r-DNA technology in development of vaccines, drug discovery, etc.

Another branch of biology that plays a key and equal role along with biotechnology is bioinformatics. Bioinformatics is the field of science in which biology, computer science, and information technology merge to form a single discipline. Bioinformatics provides biological information of the organisms to make existing data available and to check the expected probability of results in advance, to show evolutionary relationships between organisms, to lead the identification, structure and sequence of particular proteins, to provide algorithm development and data mining, etc. These are all known techniques in use to improve technology and establish current trends as well as, at the same time, to see future perspectives.

In this context, we are introducing this book, *Biotechnology and Bioinformatics: Advances and Applications for Bioenergy, Bioremediation, and Biopharmaceutical Research* with sixteen interesting chapters written by eminent scientists and researchers in the current movement of science and technology. In the first chapter, Gul-e-Saba and Mohd Azmuddin Abdullah explain about the targeted-delivery of polymorphic nano-drugs to cancer cells. Rownock Afruza, Fumiaki Suzuki and A. H. M. Nurun Nabi elucidate pharmacogenomics in personalized medicine and the role of gene polymorphisms in the Chapter 2. In the third chapter a detailed discussion about natural history and molecular biology of hepatitis B virus has been given by Essam Mohammed Janahi. In the fourth chapter Olufemi Adeluyi and Jeong A. Lee interpret the