

Cancer Epigenetics
From basic biology to molecular targeted
therapy

Essay

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا سبحانك لا علم لنا إلا ما علمتنا إنك أنت

العليم الحكيم

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Acknowledgment

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List of Abbreviations

A	Adenine
ACTR	Activator of retinoid receptor
AdC	adenocarcinoma
ALL	Acute lymphoblastic leukemia
Alu	Retrotransposons
AML	Acute myeloid leukaemia
AP-2	Activator protein-2
APC gene	Adenomatous polyposis coli gene
APLs	Acute promyelocytic leukaemias
AR	Androgen receptor
Ash1	Drosophila Trithorax- like protein
Aurora-B/Ipl1	Aurora Kinase B
BAL	Bronchoalveolar lavage
BCL-2	B-cell leukemia 2 Oncogene = B-Cell CLL/Lymphoma 2
B-CLL	B-cell chronic lymphocytic leukemia
BMI1	Leukemia viral BMI-1 oncogene
BRCA1 gene	Breast-cancer 1 gene
Brg1	Brahma homolog
C	cytosine
CARM1	Co-activator-associated arginine methyltransferase 1
CBP	Cyclic AMP response-element-binding protein (CREB)-binding protein
CDK1	Cyclin dependent kinase 1
CDK6	Cyclin D-kinase 6 oncogene
CenH3	Centromere-specific histone H3 variant
CENP-A	Centromeric protein A
CGH	Comparative genomic hybridization
CGI	CpG island
CH3	Methyl group
CHAP	Cyclic hydroxamic acid-containing peptides
CHD1	Chromodomain helicase DNA-binding protein 1
CHD1 gene	E-cadherin gene
CHD13 gene	H-cadherin gene
ChIP	Chromatin immunoprecipitation
CHP1	Chromodomain protein
C-Jun = Oncogene Jun	Jun avian Osteosarcoma virus 17oncogene homolog

CLL	Chronic lymphocytic leukemia
CML	Chronic myelogenous leukemia
COBRA	Combined bisulfite restriction analyses
CpG	Cytosine/Guanine
CREB	Cyclic AMP response-element-binding protein
CTF or NFIC	Nuclear factor I/C.
Cy3	Cyanine3
Cy5	Cyanine5
DAPK1 gene	Death-associated protein kinase 1 gene
dC	Deoxycytidine
DcR1	Decoy receptors 1
DcR2	Decoy receptors 2
ddCTP	dideoxycytidines
ddTTP	dideoxythymidine
DDM1	Decreased DNA methylation 1
Decitabine	5-aza-2'-deoxycytidine
dmC	Deoxy-methylcytidine
DMH	Differential methylation hybridization
DNA	Deoxy ribonucleic acid
DNMTs	DNA methyltransferases
Dot1p	Disruptor of telomeric silencing 1
E1p3	Elongator protein 3
EDR	Embryonal Carcinoma Differentiation-Regulated gene
EED	Embryonic Ectoderm Development protein
EGCG	Epigallocatechin-3-gallate
EMP3	Epithelial membrane protein 3
EP300	E1A binding protein p300
ER	Oestrogen receptor
ERα	Estrogen receptor alpha
ERB-A1	Erythroblastic leukemia viral oncogene
ERCC6	Excision-Repair Cross Complementing, group 6
ES	Embryonic stem
ETO	t(8:21)
EXT1	Exostosin 1
EZH2	Enhancer of Zeste Homolog 2
FDA	Food and Drug Administration
FOS = Oncogene FOS	FBJ murine Osteosarcoma viral oncogene homolog
G	Guanine

Gcn5	General control non-derepressible 5
GNAT	General control non-derepressible 5 related acetyltransferases
GSTP1gene	Glutathione S-transferase pi1 gene
Hap2	Huntingtin-Associated protein 2
HAT	histone acetylases
HAT-CBP	Histone acetyl transferases--cyclic AMP response-element-binding protein (CREB)-binding protein
HDACs	Histone deacetylases
HDIs	HDAC inhibitors
Histone	H
hMLH1gene	homologue of MutL gene
HMT	Histone methyltransferases
Hoxa^V	Homeobox A7
Hoxa9	Homeobox A9
HP1	Heterochromatin protein 1
H-RAS	Harvey rat sarcoma viral oncogene homolog
I$\kappa$$\beta$	NF$\kappa$$\beta$ inhibitor
ID4	Inhibitor of DNA binding 4
IGF2 gene	Insulin-like growth factor 2 gene
INI1	Integrase Interactor 1
JMJD2C/GASC1	Jumonji domain-containing protein 2C
K	Lysine
KMTs	Histone lysine methyltransferases
K-RAS	Kirsten rat sarcoma viral oncogene homolog
LCoR	Ligand-dependent corepressor
LINE	Long interspersed nuclear elements
LSD1	Lysine-specific demethylase 1
Mad	Max Dimerization protein
MAGE gene	Melanoma antigen gene
MASPIN	A member of the serum protease inhibitor family
MBD	Methyl-CpG binding domain
Mdm2	Mouse double minute 2
MDS	Myelodysplastic syndrome
MECP2	Methyl-CpG-binding protein 2
MGMT gene	O⁶-methylguanine DNA methyltransferase gene
MiRNAs	Micro RNAs
MLL1	mixed lineage leukaemia gene

MLL2	Mixed-lineage leukemia 2
MLL3	Mixed-lineage leukemia 3
MM	Multiple myeloma
MORF	MOZ related factor
MOZ	Monocytic leukemia zinc finger protein
mRNA	Messenger ribonucleic acid
Msk1	Mitogen- and Stress- activated protein Kinase 1
MS-PCR	Methylation-specific polymerase chain reaction
MSPs	Methylation-sensitive primers
MSRF	Methylation sensitive restriction fingerprinting
MS-SNUPE	Methylation-sensitive single nucleotide primer extension
MS-SSCP	Methylation-sensitive single-strand conformational polymorphism
MYB = Oncogene MYB	Myeloblastosis viral oncogene homolog
MYC = Oncogene MYC	Myelocytomatosis viral oncogene homolog
MYST family	'MOZ, Ybf2/Sas3, Sas2 and Tip60
nChIP	native ChIP
NCoR	nuclear receptor corepressor
NFκB	Nuclear factor κβ
NHL	Non-Hodgkin lymphoma
NP95	Nuclear phosphoprotein 95-kD
NSCLC	Non-small cell lung cancer
NSD1	Nuclear receptor binding SET domain protein 1
NSD3	Nuclear receptor binding SET domain protein 3
NuA4 HAT	Nucleosome histone acetyltransferase of histone 4
NuRD	Nucleosome remodelling and deacetylating
p15^{INK4B} “CDKN2B	Cyclin dependent kinase inhibitor 2B gene
p16^{INK4A}/CDKN2A	Cyclin-dependent kinase inhibitor 2A gene
p21^{WAF1}/CDKN1A gene	Cyclin-dependent kinase inhibitor 1A gene
p53 gene	Tumor protein p53 gene
PADI4	peptidyl arginine deiminase 4
PBMC	peripheral blood mononuclear cells
PC	Polycomb
PCAF	p300-CBP associated factor
PcG	Polycomb-group
PCNA	Proliferating cell nuclear antigen

PEV	Position-effect variegation
PKA	Protein Kinase
PML	Promyelocytic leukemia gene
PML-RAR	Promyelocytic leukemia gene- Retinoic acid receptor
PMP24	peroxisome membrane protein 24
PR	progesterone receptor
pRb	retinoblastoma protein
PRC1	Polycomb repression complex 1
PRC2	Polycomb repression complex 2
PRDM2	PR Domain-containing protein
PRMTs	protein arginine methyltransferases
R	Arginine
RA	Retinoic acid
RARα	Retinoic acid receptor α
RARE	Retinoic acid responsive elements
RARβ	Retinoic acid receptor β
RASSF1A gene	Ras association domain family member 1 gene
RB gene	Retinoblastoma gene
RbAP48& 46	Rb associated protein 48& 46
RIZ1	Retinoblastoma protein-binding zinc finger protein1
RLGS	Restriction landmark genomic scanning
RNA	Ribonucleic acid
RNA pol II	RNA polymerase II
RNAi	RNA interference
RNF2	Ring Finger protein 2
Rpd3	Reduced potassium dependency 3
Rsk-2	Ribosomal S6 Kinase 2
RTS	Rubenstein–Taybi syndrome
S	Serine
SAH	S-adenosyl homocysteine
SAHA	Suberoylanilide hydroxamic acid
SAM	S-adenosyl methionine
SAP	Sin3 associated protein
SAP18& 30	Sin3 associated protein of 18kD& 30KD
Sas2	Something about silence2
SBHA	Suberic bishydroxamic acid
SCC	Squamous cell carcinoma
SCLC	Small cell lung cancer

SFRP1	Secreted frizzled-related protein 1
Sin3	Switch insensitive 3
SiR2	Silent information regulator 2
siRNA	Small interfering RNA
SMYD3	SET and MYND domain-containing protein 3
SNF5	Sucrose non-fermenting-5
SOCS1	Suppressor of cytokine signaling 1
SOCS3	Suppressor of cytokine signaling 3
SPI	Sphingosine phosphate 1
SRC1	Steroid receptor coactivator 1
Su(var)	Suppressors of PEV
SuVar39 or SUV39H1	Suppressor of Variegation 3-9 Homolog 1
SUZ12	Suppressor of Zeste 12
SWI/SNF	Mating type switching/sucrose non-fermenting
T	Thymine
TAF250	TBP “TATA box binding protein”-associated factor of 250 kDa
TBP	TATA box binding protein
THBS1	Thrombospondin 1
TIMP3	Tissue inhibitors of metalloproteinases3
Tip60	Tat interacting protein
TMS1	Target of methylation-induced silencing 1
TPEF/HPP1	Hyperplastic polyposis gene 1
TRD	Target recognition domain
Trx	Trithorax
TRXG	Trithorax group
TSA	Trichostatin A
TSGs	Tumor suppressor genes
VHL gene	Von Hippel Lindau gene
WRN	Werner's syndrome
xChIP	conventional ChIP
Ybf2/Sas3	something about silence3
3'UTR	3'untranslated regions
5-azaC	5-azacytidine
5-azaCdR	5-aza-2'-deoxycytidine
5-MCDG	5-methylcytosine DNA glycosylase
5-meC	5'methyl cytosine

Abbreviations for amino acids

Amino acid	Three-letter abbreviation	One-letter symbol
Alanine	Ala	A
Arginine	Arg	R
Asparagine	Asn	N
Aspartic acid	Asp	D
Asparagine or Aspartic acid	Asx	B
Cysteine	Cys	C
Glutamine	Gln	Q
Glutamic acid	Glu	E
Glutamine or Glutamic acid	Glx	Z
Glycine	Gly	G
Histidine	His	H
Isoleucine	Ile	I
Leucine	Leu	L
Lysine	Lys	K
Methionine	Met	M
Phenylalanine	Phe	F
Proline	Pro	P
Serine	Ser	S
Threonine	Thr	T
Tryptophan	Trp	W
Tyrosine	Tyr	Y
Valine	Val	V

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Introduction & Aim of the work