



HISTONE MODIFICATIONS

REGULATORS OF GENOME FUNCTION

ACTIVE  MOTIF®

The Histone Code

Domain	Modification	Proteins
14-3-3	H3 Ser10 Phos, Ser28 Phos	14-3-3 Family
Ank	H3 Lys9 Methyl	GLP
BIR	H3 Thr3 Phos	Survivin
BRCT	H2AX Ser139 Phos	53BP1, BRCA1, MDC1, NBS1
Bromo	H3 Lys9 Acetyl	BRD4, BAZ1B
	H3 Lys14 Acetyl	BRD4, BAZ1B, BRG1
	H4 Lys5 Acetyl	BRD4
	H4 Lys12 Acetyl	BRD2, BRD4
Chromo	H3 Lys4 Methyl	CHD1
	H3 Lys9 Methyl	CDY, HPI, MPP8,
	H3 Lys27 Methyl	CDY, Pc
	H3 Lys36 Methyl	MRG15
MBT	H3 Lys9 Methyl	L3MBTL1, L3MBTL2
	H4 Lys20 Methyl	L3MBTL1, MBTD1
PID	H2AX Tyr142 Phos	APBB1
PHD	H3 Lys4 Methyl	BPTF, ING, RAG2, BHC80, DNMT3L, PYGO1, JMJD2A
	H3 Lys9 Methyl	UHRF
	H4 Lys20 Methyl	JMJD2A, PHF20
TDR	H3 Lys9 Methyl	TDRD7
	H3 Arg17 Methyl	TDRD3
	H4 Lys20 Methyl	53BP1
WD	H3 Lys4 Methyl	WDR5
	H3 Lys9 Methyl	EED

The “histone code” hypothesis put forward in 2000* suggests that specific histone modifications or combinations of modifications confer unique biological functions to the regions of the genome associated with them, and that specialized binding proteins (readers) facilitate the specialized function conferred by the histone modification. Evidence is accumulating that these histone modification / binding protein interactions give rise to downstream protein recruitment, potentially facilitating enzyme and substrate interactions or the formation of unique chromatin domains. Specific histone modification-binding domains have been identified, including the Tudor, Chromo, Bromo, MBT, BRCT and PHD motifs.

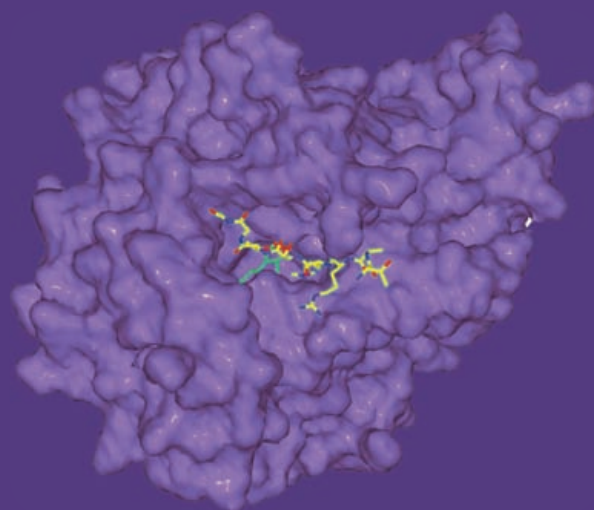
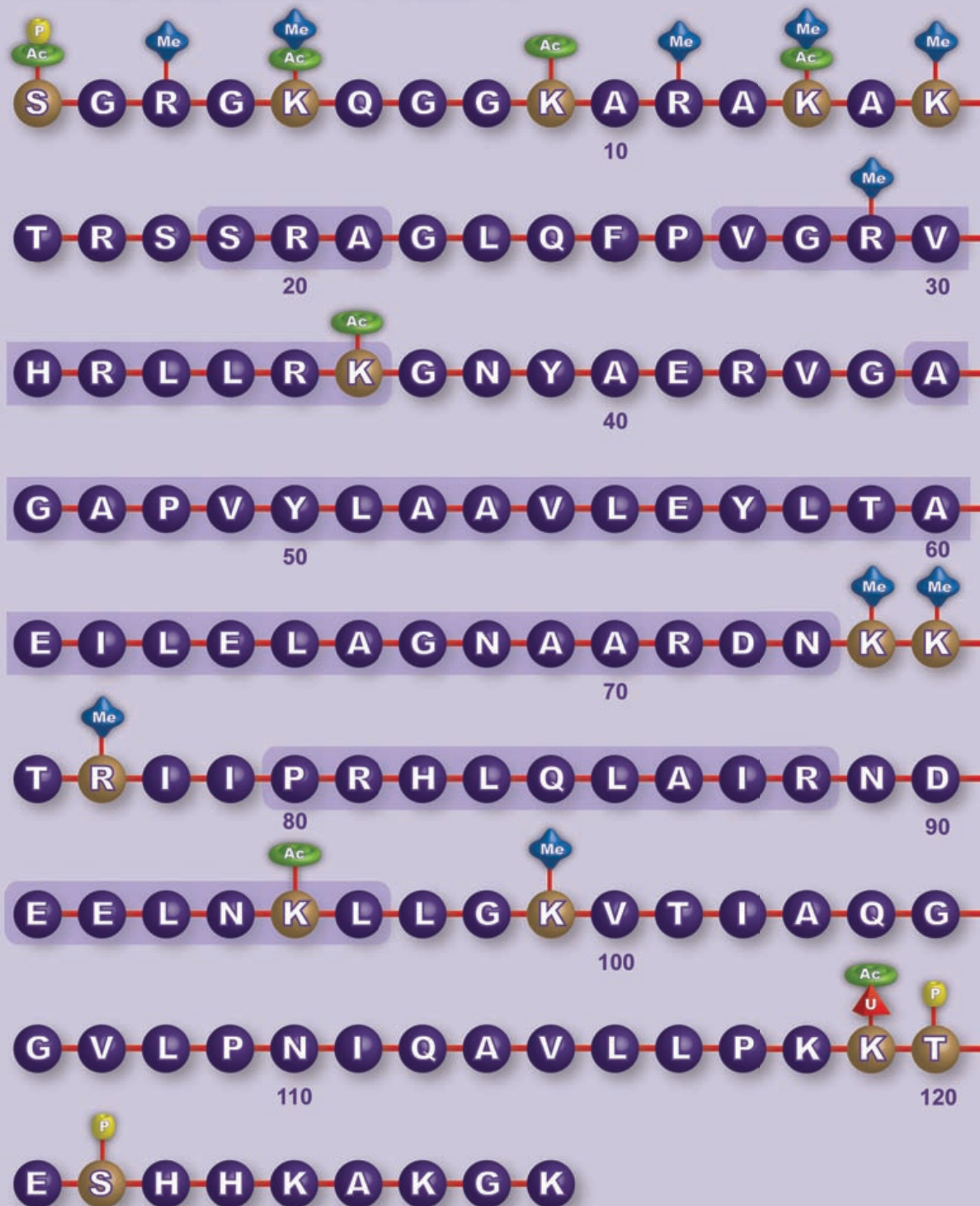


FIGURE
Resetting Histone Methylation. Crystal structure** of the catalytic domain of the histone demethylase JMJD2A bound to a peptide derived from the amino terminus of histone H3, trimethylated at lysine 9 (yellow carbon atoms). Also shown is the substrate alpha-ketoglutarate (green) and a Ni(II) cation (red) that is substituted for the Fe(II) normally present.

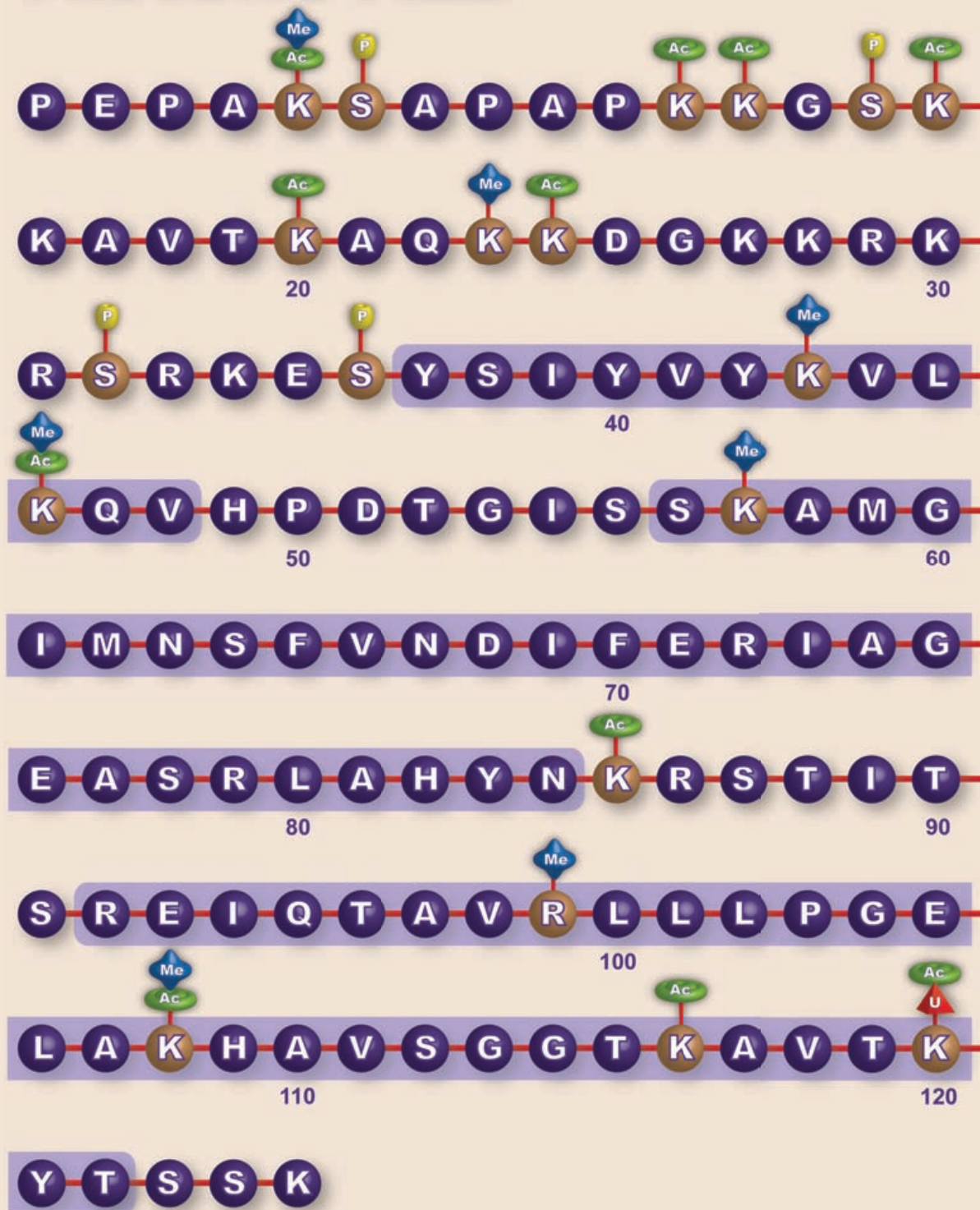
* Strahl BD, Allis CD (2000). The language of covalent histone modifications. *Nature* 403: 41-45.

** Image courtesy of Dr. Ray Trievel, Department of Biological Chemistry, University of Michigan.

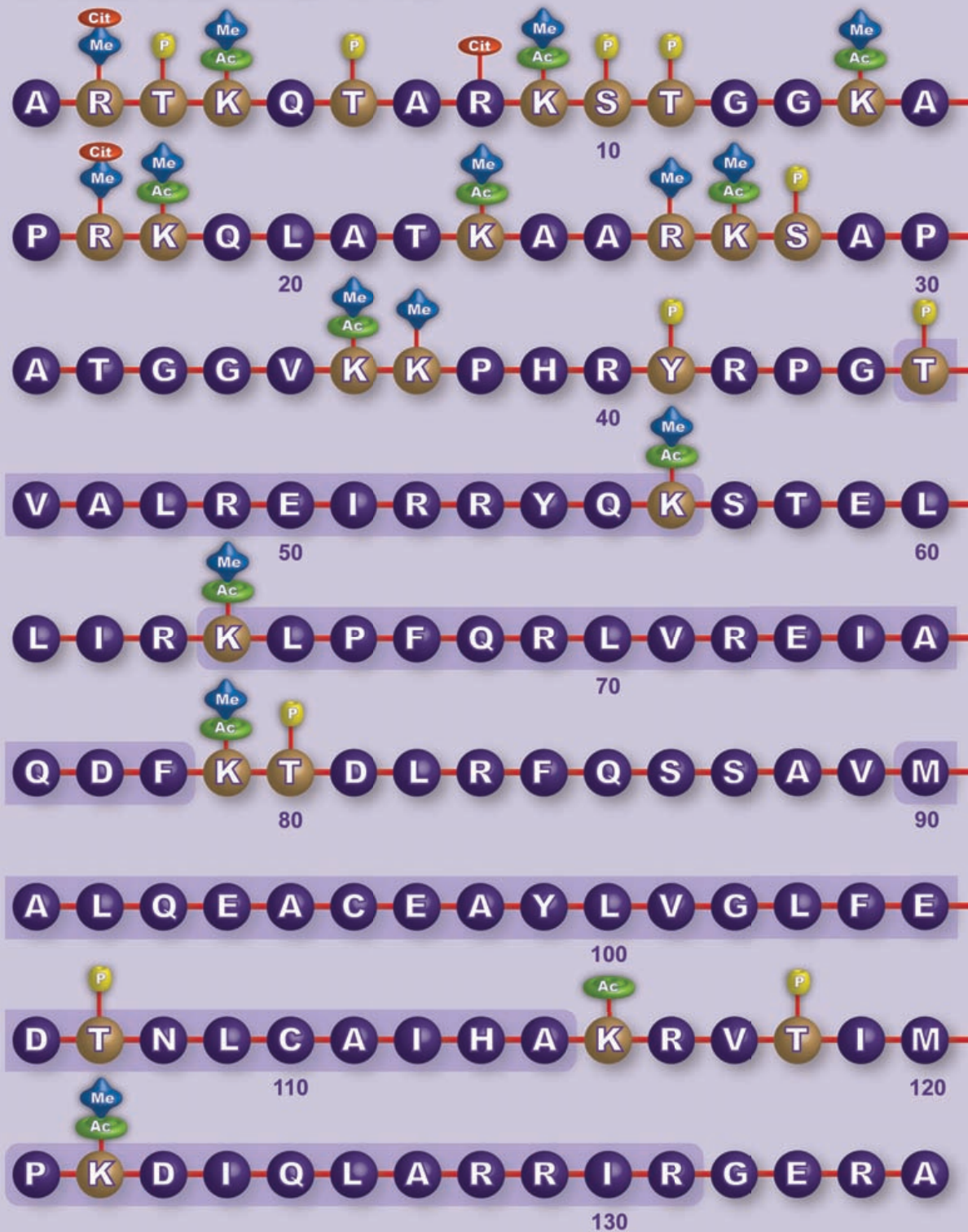
Histone H2A



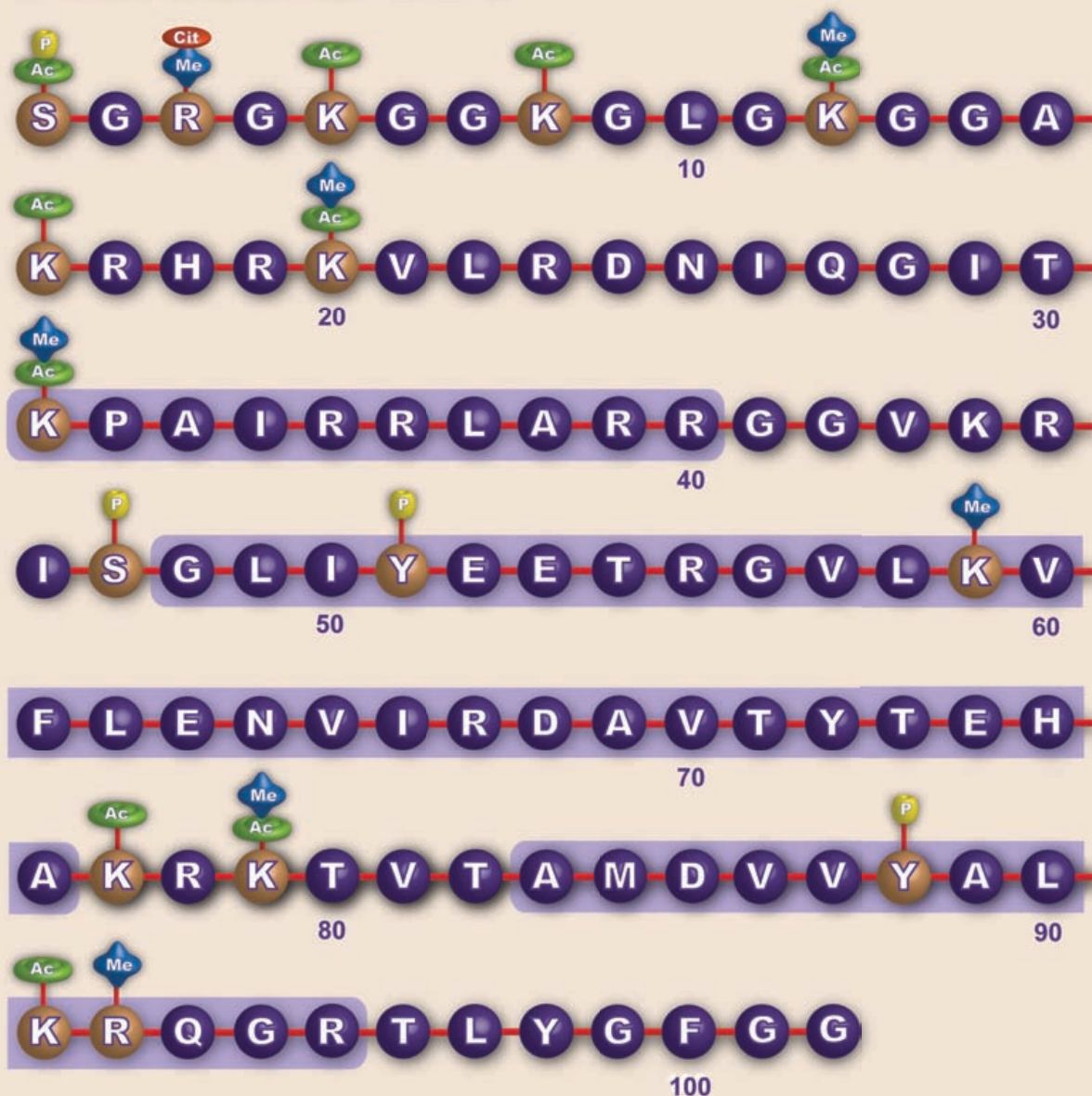
Histone H2B



Histone H3



Histone H4



Acetylation



Methylation



Phosphorylation



Ubiquitylation



Citrullination



Structured
Domain

Histone Variants

Histone Variant	Identity vs. Core Histone	Functions
H2AX	96%	DNA damage repair; Ser in the SQEY motif in mammalian H2AX is phosphorylated by ATM and ATR in response to double strand DNA breaks
H2A.Z	60-65%	Transcriptional regulation, DNA damage, chromosome stability
macro H2A	64%	Enriched on inactive mammalian X chromosome; unique N-terminal addition
CENP-A	Highly diverged	Centromere-specific; specialized H3 variant for attachment of kinetochore
H3.3	97%	Replaces H3.1 at transcriptionally active regions; varies at 5 amino acids

In addition to the core histones (H2A, H2B, H3 and H4), there are specialized versions (histone variants) of the histone proteins that exhibit unique distribution patterns and have roles not served by their more common paralogs. For example, the histone H2A variant, H2AX, is phosphorylated at a unique site in its C-terminus by the ATM protein in response to double-strand DNA breaks. Phospho-H2AX takes part in the mechanism of double strand break repair.

See the table to the left for a summary of these variants and their functions.

CENP-A



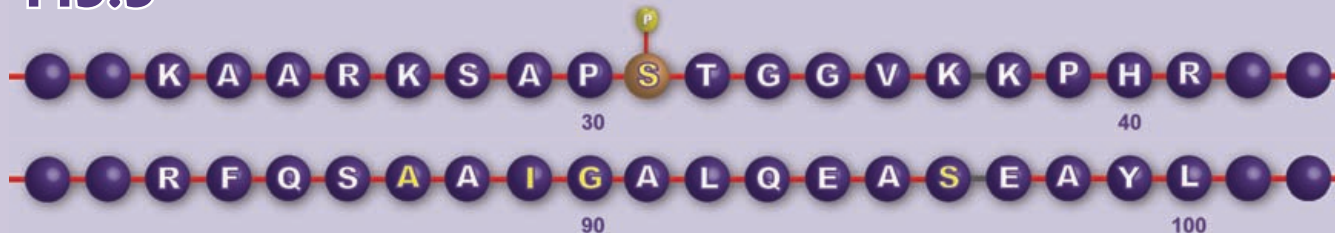
Unique N-terminus of the histone H3 variant, CENP-A.

H2A.X



Unique C-terminus of the histone H2A variant, H2AX.

H3.3



Regions of sequence divergence (residues in **YELLOW**) of the histone H3 variant, H3.3.

Histone Modifications and Animal Models

		Tet	Yeast	Fly	Mouse	Human
H3 Lysine 4	Acetyl	+/-	-	n/d	+/-	+
	Monomethyl	+++	+++	+++	++	++
	Dimethyl	++	++	++	+	+
	Trimethyl	++	++	+	+/-	+/-
H3 Lysine 9	Acetyl	+++	+	n/d	+/-	+/-
	Monomethyl	+/- (?)	-	++	++	++
	Dimethyl	-	-	+	++	++
	Trimethyl	++	-	++	+++	+++
H3 Lysine 27	Acetyl	+++	+++	n/d	+	+/-
	Monomethyl	+++	-	+	++	+++
	Dimethyl	++	-	+++	+++	+++
	Trimethyl	+	-	+++	++	++
H3 Lysine 36	Acetyl	+/-	+/-	n/d	-	+/-
	Monomethyl	++	++	++	++	++
	Dimethyl	-	++	++	++	++
	Trimethyl	++	++	+/-	+/-	+/-
H3 Lysine 56	Acetyl	+++	+++	n/d	-	+/-
	Monomethyl	+	-	n/d	-	+
	Dimethyl	-	-	n/d	-	-
	Trimethyl	-	-	n/d	-	+++
H3 Lysine 79	Acetyl	-	-	n/d	-	+/-
	Monomethyl	+	++	n/d	+	+
	Dimethyl	-	++	++	+	+
	Trimethyl	-	++	-	-	-

While the histone proteins are very highly conserved from lower eukaryotes (such as budding yeast) up to humans, many of the histone modifications are not found in all species. Budding yeast, for example, do not compact their genome to the same degree as metazoans, and therefore do not require the enzymes that deposit many of the methylation marks associated with heterochromatin.

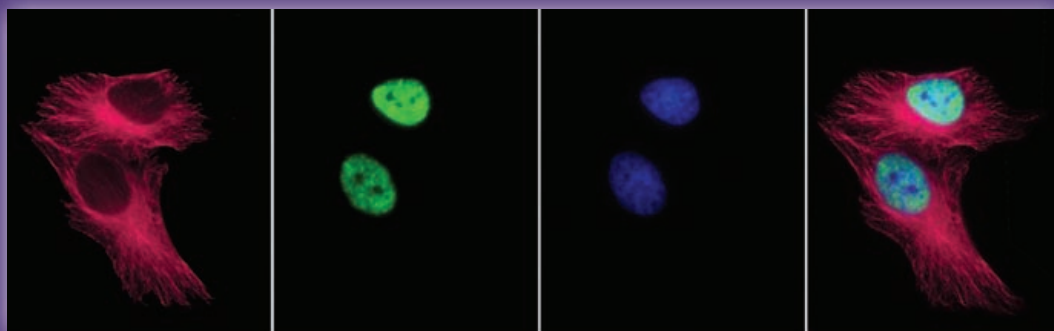
TABLE

Comparison of acetylation and methylation on specific lysine residues on histone H3 between *Tetrahymena* (Tet), *Saccharomyces* (Yeast), *Drosophila* (Fly), Mouse and Human.

Mouse and Human Modifications associated with transcriptional activation are colored in **PURPLE**.

Modifications associated with transcriptional repression are colored in **TAN**.

n/d = Not determined.



Immunodetection of Histone Acetylation in HeLa Cells.

Red: alpha Tubulin mAb (Cat. No. 39527)

Green: Histone H3 acetyl Lys23 pAb (Cat. No. 39131)

Blue: DAPI

Right: Merge of all 3 images.

Histone Modifications & Associated Functions

Residue	Modification	Functions	Writer	Eraser	Reader
Histone H2A					
Ser1	Phosphorylation	Mitosis	PKC		
Lys5	Acetylation	Transcriptional activation	CBP, p300, HAT1		
Lys119	Ubiquitylation	Spermatogenesis	RNF1		
Thr120	Phosphorylation	Mitosis	NHK1		
Histone H2AX					
Ser139	Phosphorylation	DNA Damage repair, apoptosis	ATM, ATR	PP4	MDC1 ^{BRCT} , NBS1 ^{BRCT} , 53BP1 ^{BRCT, TDR} , BRCA1 ^{BRCT}
Tyr142	Phosphorylation	Regulation of DNA damage foci formation	BAZ1B	EYA	APBB1 ^{PHD}
Histone H2B					
Lys5	Acetylation	Transcriptional activation	p300		
Lys12	Acetylation	Transcriptional activation	CBP, p300		
Ser14	Phosphorylation	Apoptosis	MST1		
Lys15	Acetylation	Transcriptional activation	CBP, p300		
Lys20	Acetylation	Transcriptional activation	CBP, p300		
Lys120	Ubiquitylation	Transcription (elongation?)	RNF20		
Histone H3					
Arg2	Methylation	Transcriptional activation	CARM1, PRMT6	JMJD6	
Thr3	Phosphorylation	Mitosis	Haspin, Vrk1		Survivin ^{BIR}
Lys4	Acetylation	Transcriptional activation			
Lys4	Methylation	Euchromatin, transcriptional activation	MLL, SET1, ASH1, SET7, SMYD2	LSD1/BHCT10, JHDM1A/ KDM2A, JHDM1B/ KDM2B, JARID1A/ KDM5A, JARID1B/ KDM5B, JARID1C/ KDM5C, JARID1D/ KDM5D	CHD1 ^{CHR} , ING Family ^{PHD} , RAG2 ^{PHD} , TAF3 ^{PHD} , BPTF ^{PHD, BRD} , BHC80 ^{PHD} , DNMT3L ^{PHD} , PYGO1 ^{PHD} , JMJD2A ^{PHD, TDR} , WDR5 ^{WD}
Thr6	Phosphorylation	Transcriptional activation	PKC β		
Arg8	Methylation	Transcriptional activation	PRMT5		
Lys9	Acetylation	Histone deposition, Transcriptional activation	GCN5, PCAF, SRC1	SIRT6	BRD4 ^{BRD} , BAZ1B ^{PHD, BRD}
Lys9	Methylation	Transcriptional silencing, heterochromatin	SUV39H1/2, G9a, CLL8, SETDB1, EuHMT1, Riz1	JMJD1A/ KDM3A, JMJD1B/ KDM3B, JMJD1C/ TRIP8, JMJD2A/ KDM4A, JMJD2B/ KDM4B, JMJD2C/ KDM4C, JMJD2D/ KDM4D	L3MBTL1/ L2 ^{MBT} , HP1 ^{CHR} , MPP8 ^{CHR, ANK} , CDY Family ^{CHR} , TDRD7 ^{TDR} , UHRF ^{PHD} , EED ^{WD} , GLP ^{ANK}
Ser10	Phosphorylation	Mitosis, immediate early gene activation	Aurora B, MSK1, IKK α	PP1	14-3-3 ¹⁴

Histone Modifications & Associated Functions (cont.)

Residue	Modification	Functions	Writer	Eraser	Reader
Histone H3, cont.					
Thr11	Phosphorylation	Mitosis; DNA damage induced transcription	DLK		
Lys14	Acetylation	Transcriptional activation	GCN5, PCAF, CBP, p300, MOZ, MORF, TIP60, SRC1		BRD4 ^{BRD} , BAZ1B ^{PHD, BRD} , BRG1 ^{BRD}
Arg17	Methylation	Transcriptional activation	CARM1		TDRD3 ^{TDR}
Lys18	Acetylation	Transcriptional activation	GCN5, PCAF, CBP, p300		
Lys23	Acetylation	Transcriptional activation	GCN5, PCAF, p300		
Arg26	Methylation	Transcriptional activation	CARM1		
Lys27	Methylation	Transcriptional silencing	EZH2, EZH1	JMJD1A/ KDM3A, JMJD1B/KDM3B, KDM6A/UTX, JMJD3/ KDM6B	Pc ^{CHR} , CDY Family ^{CHR}
Ser28	Phosphorylation	Mitosis	Aurora B		14-3-3 ¹⁴
Lys36	Acetylation	Transcription activation	GCN5, PCAF		
Lys36	Methylation	Transcription elongation	NSD1, SET2, SMYD2, NSD2	JHDM1A/KDM2A, JHDM1B/KDM2B, JHDM3A/KDM4A, JHDM3B/KDM4B, JHDM3C/KDM4C, JHDM3D/KDM4D	MGR15 ^{CHR}
Thr45	Phosphorylation	DNA replication, apoptosis	PKCδ		
Lys56	Acetylation	DNA damage repair, chromatin assembly	CBP, p300		
Lys79	Methylation	Transcriptional activation	DOT1L		

Histone H4					
Ser1	Phosphorylation	Transcriptional activation	CKII		
Arg3	Methylation	Transcriptional activation	PRMT1, PRMT5	JMJD6	TDRD3 ^{TDR}
Lys5	Acetylation	Histone deposition, transcriptional activation	ATF2, HAT1, CBP, p300, TIP60, HBO1		BRD4 ^{BRD}
Lys8	Acetylation	Transcriptional activation	CBP, p300, TIP60, HBO1		
Lys12	Acetylation	Histone deposition, transcriptional activation	HAT1, CBP, p300, TIP60, HBO1		BRD2 ^{BRD} , BRD4 ^{BRD}
Lys16	Acetylation	Transcriptional activation	MOF, TIP60	SIRT1	
Lys20	Methylation	Transcriptional silencing, heterochromatin	PR-SET7 (mono), SUV420H1 (di), MMSET, SUV420H2 (tri)		L3MBTL1 ^{MBT} , MBTD1 ^{MBT} , JMJD2A ^{PHD} , PHF20 ^{PHD} , 53BP1 ^{BRCT, TDR}
Lys91	Acetylation	Histone deposition, DNA damage repair	HAT1		

Domain Key

14 14-3-3 domain

ANK Ankyrin repeat domain

BIR Baculovirus IAP repeat

BRCT BRCA1 C-term domain

BRD Bromodomain

CHR Chromodomain

MBT MBT domain

PID Phosphotyrosine interaction domain

PHD PHD zinc finger domain

TDR Tudor domain

WD WD40 repeat domain

Histone Modification Antibodies

Description Reactivity Applications Format Cat. No.

HISTONE H1

Histone H1 pAb	H, WR	IF, WB	100 µl	39707
Histone H1 pAb	D	ChIP, IF, IP, WB	100 µl	39575
Histone H1.5 phospho Ser17 pAb	H	WB	100 µl	61107

HISTONE H2A, H2B

Histone H2A pAb	Sc, Sp	ChIP, WB	200 µl	39235
Histone H2A pAb	Sc, Sp	WB	100 µg	39945
Histone H2A pAb	H	WB	100 µg	39209
Histone H2A, acidic patch pAb	H, WR	ChIP, WB	200 µl	39111
Histone H2A, C-terminal pAb	H, WR	WB	200 µl	39591
Histone H2A acetyl Lys5 pAb	H, WR	WB	200 µl	39107
Histone H2A acetyl Lys9 pAb	H, WR	WB	200 µl	39109
Histone H2A phospho Thr120 pAb	H, WR	WB	200 µl	39391
Histone H2A phospho Ser129 pAb	Sc	ChIP, IF, IP, WB	200 µl	39271
Histone macroH2A1 pAb	H, M	IF, WB	200 µl	39593
Histone macroH2A1.1 pAb	H	IF, IHC, WB	100 µg	39871
Histone macroH2A2 pAb	H	IF, IHC, WB	100 µg	39873
Histone H2A/H4 phospho Ser1 pAb	H, WR	WB	200 µl	39115
Histone H2Av pAb	D	WB	100 µl	39715
Histone H2AX pAb	H	IF, WB	100 µl	39689
Histone H2AX phospho Ser139 pAb	H, WR	IF, WB	200 µg	39117
Htz1 pAb	Sc	ChIP, WB	100 µl	39647
Histone H2A.Z pAb	H, WR	ChIP, WB	200 µl	39113
Pht1 / H2AZ pAb	Sp	WB	100 µl	39640
Histone H2A.Z pAb	H, WR	ChIP, WB	100 µg	39943
Pht1 / H2AZ acetyl pAb	Sp	WB	100 µl	39642
Histone H2B pAb	H, WR	WB	200 µl	39125
Histone H2B pAb	Sc, Sp	ChIP, WB	200 µl	39237
Histone H2B pAb	Sc, Sp	WB	100 µg	39947
Histone H2B pAb	H	WB	100 µg	39210
Histone H2B mAb	H	WB	100 µg	61037
Histone H2B acetyl Lys5 pAb	H, WR	ChIP, WB	200 µl	39123
Histone H2B acetyl Lys12 pAb	H, WR	ChIP, WB	100 µl	39669
Histone H2B phospho Ser14 mAb	H, WR	IF, IP, WB	100 µg	61011
Histone H2B acetyl Lys16 pAb	H, WR	ChIP, WB	200 µl	39121
Histone H2B acetyl Lys46 pAb	H, WR	ChIP, WB	200 µl	39571
Histone H2B dimethyl Lys46 pAb	H, WR	IF, WB	200 µl	39567
Histone H2B acetyl Lys120 pAb	H, WR	ChIP, WB	200 µl	39119
Histone H2B ubiquityl Lys120 mAb	H, WR	ChIP, WB	100 µg	39623

Description Reactivity Applications Format Cat. No.

HISTONE H3

Histone H3 mAb	H, WR	ChIP, IF, WB	100 µg	39763
Histone H3, C-terminal pAb	Sc, H, WR	ChIP, WB	200 µl	39163
Histone H3.cs1 pAb	H	WB	200 µl	39573
Histone H3 acetyl pAb	H, WR	ChIP, WB	200 µl	39139
Histone H3 dimethyl Arg2 sym. pAb	H, WR	WB	100 µl	39703
Histone H3 phospho Thr3 pAb	H, WR	WB	200 µl	39153
Histone H3 acetyl Lys4 pAb	H, WR	ChIP, IF, WB	200 µl	39381
Histone H3 monomethyl Lys4 mAb	H, WR	ChIP, WB	100 µg	39635
Histone H3 monomethyl Lys4 pAb	H, WR	IF, WB	200 µl	39297
Histone H3 dimethyl Lys4 mAb	H, WR	ChIP, IF, WB	100 µg	39679
Histone H3 dimethyl Lys4 pAb	H, WR	ChIP, WB	200 µl	39141
Histone H3 dimethyl Lys4 pAb	H, WR	ChIP, IF, WB	100 µg	39913
Histone H3 trimethyl Lys4 pAb	Sc, H, WR	ChIP, IF, WB	200 µl	39159
Histone H3 trimethyl Lys4 pAb	Sc, H, WR	ChIP, IF, WB	100 µg	39915
Histone H3 monomethyl Arg8 pAb	H, WR	WB	100 µl	39673
Histone H3 dimethyl Arg8 asym. pAb	H	WB	100 µl	39651
Histone H3 acetyl Lys9 pAb	H, WR	ChIP, WB	200 µl	39137
Histone H3 acetyl Lys9 pAb	H, WR	IF, WB	200 µl	39585
Histone H3 acetyl Lys9 pAb	H, WR	ChIP, IF, WB	100 µg	39917
Histone H3 pan-methyl Lys9 pAb	H, WR	IF, WB	200 µl	39241
Histone H3 monomethyl Lys9 mAb	H, WR	ChIP, WB	100 µg	39681
Histone H3 monomethyl Lys9 pAb	H, WR	IF, WB	200 µl	39249
Histone H3 monomethyl Lys9 pAb	H, WR	WB	100 µg	39887
Histone H3 dimethyl Lys9 mAb	H, WR	ChIP, IF, WB	100 µg	39683
Histone H3 dimethyl Lys9 pAb	H, M, WR	ChIP, IF, WB	200 µl	39239
Histone H3 dimethyl Lys9 pAb	H, WR	ChIP, IF, WB	200 µl	39375
Histone H3 dimethyl Lys9 pAb	H, WR	ChIP, IF, WB	100 µg	39753
Histone H3 trimethyl Lys9 mAb	H, WR	ChIP, IF, IP, WB	100 µg	61013
Histone H3 trimethyl Lys9 pAb	Sp, H, WR	ChIP, IF, WB	200 µl	39161
Histone H3 trimethyl Lys9 mAb	H, WR	IF, IP, WB	200 µl	39285
Histone H3 trimethyl Lys9 pAb	H, WR	ChIP, IF, WB	100 µg	39765
Histone H3 phospho Ser10 mAb	H, WR	IF	100 µg	39636
Histone H3 phospho Ser10 pAb	H, WR	ChIP, IF, WB	200 µl	39253
Histone H3 phospho Ser10,28 pAb	H, WR	ChIP, IF, WB	200 µl	39147
Histone H3 phospho Thr11 mAb	H	ICC, WB	100 µg	39821
Histone H3 phospho Thr11 pAb	H, WR	WB	200 µl	39151
Histone H3 acetyl Lys14 pAb	H, WR	ChIP, WB	200 µl	39599
Histone H3 acetyl Lys14 pAb	H, WR	ChIP, WB	100 µg	39697
Histone H3 dimethyl Lys14 pAb	H, WR	WB	200 µl	39349

Histone Modification Antibodies (cont.)

Description Reactivity Applications Format Cat. No.

HISTONE H3, cont

Histone H3 dimethyl Arg17 asym. pAb	H, WR	WB	100 µl	39709
Histone H3 acetyl Lys18 pAb	H, WR	ChIP, IF, WB	100 µl	39693
Histone H3 acetyl Lys18 pAb	H, WR	ChIP, IF, WB	200 µl	39587
Histone H3 acetyl Lys18 pAb	H, WR	IF, WB	200 µl	39129
Histone H3 acetyl Lys18 pAb	H, WR	ChIP, IF, WB	100 µg	39755
Histone H3 monomethyl Lys18 pAb	H	WB	100 µl	39667
Histone H3 acetyl Lys23 pAb	H, WR	ChIP, IF, WB	200 µl	39131
Histone H3 monomethyl Lys23 pAb	H, WR	WB	200 µl	39387
Histone H3 dimethyl Lys23 pAb	H	WB	100 µl	39653
Histone H3 acetyl Lys27 mAb	H, WR	ChIP, IF, WB	100 µg	39685
Histone H3 acetyl Lys27 pAb	Sc, H, WR	ChIP, IF, WB	200 µg	39133
Histone H3 acetyl Lys27 pAb	Sc, H, WR	ChIP, WB	200 µl	39135
Histone H3 monomethyl Lys27 mAb	H, WR	ChIP, IF, IP, WB	100 µg	61015
Histone H3 monomethyl Lys27 pAb	H, WR	IF, WB	200 µl	39377
Histone H3 monomethyl Lys27 pAb	H, WR	WB	100 µg	39889
Histone H3 dimethyl Lys27 pAb	H, WR	ChIP, IF, WB	200 µl	39245
Histone H3 dimethyl Lys27 pAb	H, WR	IF, WB	100 µg	39919
Histone H3 di/trimethyl Lys27 mAb	H, WR	ChIP, WB	200 µl	39535
Histone H3 di/trimethyl Lys27 mAb	H, WR	IF, WB	200 µl	39536
Histone H3 trimethyl Lys27 mAb	H, WR	ChIP, IF, IP, WB	100 µg	61017
Histone H3 trimethyl Lys27 pAb	H, WR	ChIP, IF, WB	200 µg	39155
Histone H3 trimethyl Lys27 pAb	H, WR	ChIP, WB	200 µl	39156
Histone H3 phospho Ser28 mAb	H, M, R	IF, WB	100 µl	39098
Histone H3 phospho Ser28 pAb	H, WR	WB	200 µl	39149
Histone H3.3 phospho Ser31 pAb	H	WB	200 µl	39637
Histone H3 acetyl Lys36 pAb	H, WR	ChIP, IF, WB	200 µl	39379
Histone H3 dimethyl Lys36 mAb	H, WR	ChIP, IF, IP, WB	100 µg	61019
Histone H3 dimethyl Lys36 pAb	Sc, H, WR	ChIP, IF, WB	200 µl	39255
Histone H3 dimethyl Lys36 pAb	Sc, H, WR	WB	100 µg	39891
Histone H3 trimethyl Lys36 mAb	H, WR	ChIP, IF, IP, WB	100 µg	61021
Histone H3 trimethyl Lys36 pAb	H	ChIP, WB, DB	100 µl	61101
Histone H3 phospho Thr45 pAb	Sc, H, WR	WB	100 µl	39737
Histone H3 acetyl Lys56 mAb	Sc, Sp, H	ChIP, DB	100 µg	61061
Histone H3 acetyl Lys56 pAb	Sc, H	ChIP, WB	200 µl	39281

Reactivity Key

D	Drosophila	Sc	Budding yeast
H	Human	Sp	Fission Yeast
M	Mouse	WR	Wide range
R	Rat		

Description Reactivity Applications Format Cat. No.

Histone H3 monomethyl Lys56 pAb	H	WB	200 µl	39273
Histone H3 dimethyl Lys56 pAb	H	WB	200 µl	39277
Histone H3 acetyl Lys64 pAb	Sc, H, WR	ChIP, IF, WB	200 µl	39545
Histone H3 acetyl Lys79 pAb	H, WR	ChIP, WB	200 µl	39565
Histone H3 monomethyl Lys79 pAb	H, WR	ChIP, WB	200 µl	39145
Histone H3 monomethyl Lys79 pAb	H, WR	ChIP, WB	100 µg	39921
Histone H3 dimethyl Lys79 pAb	H, WR	ChIP, WB	200 µl	39143
Histone H3 dimethyl Lys79 pAb	H, WR	ChIP, WB	100 µg	39923
Histone H3 monomethyl Lys122 pAb	H, WR	WB	200 µl	39367

HISTONE H4

Histone H4 pAb	H, WR	WB	200 µl	39269
Histone H4 pan-acetyl pAb	H, WR	ChIP, IF, WB	200 µl	39243
Histone H4 pan-acetyl pAb	H, WR	ChIP, IF, WB	100 µg	39925
Histone H4 tetra-acetyl pAb	Sc, H, WR	IF, WB	50 µg	39177
Histone H4 tetra-acetyl pAb	Sc, H, WR	ChIP, WB	50 µl	39179
Histone H4 acetyl mAb	H, WR	ELISA, ICC, IP, WB	100 µg	39967
Histone H4 dimethyl Arg3, asym. pAb	H, WR	IF, WB	200 µl	39705
Histone H4 acetyl Lys5 pAb	H, WR	ChIP, IF, WB	200 µl	39169
Histone H4 acetyl Lys5 pAb	H, WR	ChIP, IF, WB	200 µl	39583
Histone H4 acetyl Lys5 pAb	H, WR	ChIP, WB	100 µg	39699
Histone H4 acetyl Lys8 pAb	H, WR	WB	200 µl	39171
Histone H4 acetyl Lys8 pAb	H	ChIP, DB, WB	100 µl	61103
Histone H4 acetyl Lys12 pAb	Sc, H, WR	ChIP, IF, WB	200 µl	39165
Histone H4 acetyl Lys12 pAb	Sc, H, WR	ChIP, IF, WB	100 µg	39927
Histone H4 acetyl Lys16 pAb	Sc, D, H, WR	ChIP, WB	200 µl	39167
Histone H4 acetyl Lys16 pAb	Sc, D, H, WR	ChIP, WB	100 µg	39929
Histone H4 monomethyl Lys20 mAb	H, WR	IF, WB	100 µg	39727
Histone H4 monomethyl Lys20 pAb	H, WR	ChIP, IF, WB	200 µl	39175
Histone H4 dimethyl Lys20 mAb	H, WR	WB	200 µl	39539
Histone H4 dimethyl Lys20 pAb	H, WR	ChIP, IF, WB	200 µl	39173
Histone H4 trimethyl Lys20 mAb	H, M, WR	ChIP, WB	100 µg	39671
Histone H4 trimethyl Lys20 pAb	H, WR	ChIP, IF, WB	200 µl	39180
Histone H4 monomethyl Lys31 pAb	H, WR	WB	200 µl	39385

Applications Key

ChIP	Chromatin immunoprecipitation	IF	Immunofluorescence
DB	Dot blot	IHC	Immunohistochemistry
ELISA	ELISA	IP	Immunoprecipitation
ICC	Immunocytochemistry	WB	Western blot

For an up-to-date list of available histone modification antibodies, please visit www.activemotif.com/hismodabs.