**Supplementary Table S1**

The encoders or the writers of the RNAPII CTD modifications.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Organisms | Proteins | Specificity | CTD modification | Functions in transcription | References |
| Yeast | Kin28 | S5, S7 | P | Transcription initiation  Pre-mRNA 3’-end processing  Bur1 activation  snRNA gene expression | (Akhtar et al, 2009; Komarnitsky et al, 2000; Rodriguez et al, 2000) |
| Srb10 | S2, S5 | P | Transcription initiation  Scaffold complex formation (Mediators and some GTFs) | (Liu et al, 2004) |
| Bur1 | S2, S5, S7 | P | Transcription elongation  Ctk1 stimulation | (Qiu et al, 2012; Qiu et al, 2009) |
| Ctk1 | S2 | P | Dissociation of the GTFs  Pre-mRNA 3’-end processing | (Ahn et al, 2004; Patturajan et al, 1999) |
| Ess1 | P3, P6 | I | CTD scaffold formation | (Hanes, 2014; Morris et al, 1999) |
| Rrd1 | P3, P6 | I | Transcription elongation during transcriptional stress | (Jouvet et al, 2010; Poschmann et al, 2011) |
| Asr1 | K1720  K1725 | Ub | Transcription initiation | (Daulny et al, 2008) |
| Mammal | CDK7 | S5, S7 | P | Transcription initiation  Pre-mRNA 3’-end processing | (Glover-Cutter et al, 2009) |
| CDK8 | S2, S5 | P | Transcription initiation  Scaffold complex formation (Mediators and some GTFs) | (Galbraith et al, 2010) |
| BRD4 | S2 | P | Transcription elongation  P-TEFb stimulation | (Devaiah et al, 2012; Itzen et al, 2014) |
| CDK9 | S2, S5, S7, T4 | P | Transcription elongation  Transition from initiation to elongation | (Bres et al, 2008; Hsin et al, 2014; Marshall et al, 1996) |
| CDK12 | S2, S5 | P | Transcription elongation  Pre-mRNA 3’-end processing | (Bartkowiak et al, 2010; Bosken et al, 2014; Davidson et al, 2014) |
| CDK13 | S2 | P | Transcription elongation  snRNA and snoRNA gene regulation | (Bartkowiak et al, 2010; Bosken et al, 2014; Liang et al, 2015) |
| DNA-PK | S2, S5, S7 | P | Transcription elongation | (Tyagi et al, 2011) |
| ERK1/2 | S5 | P | RNAPII poising at developmental genes | (Tee et al, 2014; Trigon et al, 1998) |
| c-ABL | Y1 | P | Transcription activation of specific genes | (Baskaran et al, 1993; Baskaran et al, 1999) |
| PLK3 | T4 | P | Transcription elongation | (Hintermair et al, 2012) |
| OGT | S5, S7, T4 | G | Transcription initiation | (Ranuncolo et al, 2012) |
| PIN1 | P3, P6 | I | CTD scaffold formation | (Xu et al, 2003; Xu and Manley, 2007) |
| p300/KAT3B | K | Ac | Transcription initiation | (Schroder et al, 2013) |
| CARM1 | R1810 | Me | snRNA and snoRNA gene expression | (Sims et al, 2011) |
| WWP2 | K | Ub | Maintenance of steady-state Rpb1 levels | (Li et al, 2007) |

Kin28, TFIIH complex serine/threonine-protein kinase subunit; Srb10, Suppressor of RNA polymerase B10; Bur1, Bypass UAS requirement 1; Ctk1, Carboxy-terminal domain kinase 1; Ess1, Essential 1; Rrd1, Resistant to rapamycin deletion 1; Asr1, Alcohol sensitive ring/phd finger protein 1; CDK7, Cyclin-dependent kinase 7; CDK8, Cyclin-dependent kinase 8; BRD4, Bromodomain-containing 4; CDK9, Cyclin-dependent kinase 9; CDK12, Cyclin-dependent kinase 12; CDK13, Cyclin-dependent kinase 13; DNA-PK, DNA-dependent protein kinase; ERK1/2, Extracellular signal-regulated kinases 1/2; c-ABL, Abelson murine leukemia viral oncogene homolog 1; PLK3, Polo-like kinase 3; OGT, O-linked β-N-acetylglucosamine transferase; PIN1, Peptidyl-prolyl cis-trans isomerase NIMA-interacting 1; p300, E1A-binding protein 300kD; KAT3B, Lysine acetyltransferases 3B; CARM1, Coactivator-associated arginine methyltransferase 1; WWP2, WW domain-containing protein 2. The RNAPII CTD modifications are shown as described in Fig. 1C.

**Supplementary Table S2**

The decoders or the erasers of the RNAPII CTD modifications.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Organisms | Proteins | Specificity | Functions in transcription | References |
| Yeast | Fcp1 | S2-P, S5-P, S7-P | Transcription elongation  RNAPII recycling | (Archambault et al, 1997; Cho et al, 2001; Kong et al, 2005; Zhang et al, 2012) |
|  | Ssu72 | S5-P, S7-P | Transcription initiation  Pre-mRNA 3’-end processing  Fcp1 stimulation | (Krishnamurthy et al, 2004; Zhang et al, 2012) |
|  | Rtr1 | S5-P, Y1-P | S5-P to S2-P transition | (Hsu et al, 2014; Mosley et al, 2009) |
|  | Glc7 | Y1-P | Transcription termination | (Schreieck et al, 2014) |
| Mammals | FCP1/CTDP1 | S2-P, S5-P, S7-P, T4-P | Transcription elongation  RNAPII recycling | (Archambault et al, 1998; Cho et al, 1999; Hsin et al, 2014; Xiang et al, 2012) |
|  | SSU72 | S5-P, S7-P | Transcription initiation  Pre-mRNA 3’-end processing | (St-Pierre et al, 2005; Xiang et al, 2012) |
|  | OGA | S5-G, S7-G, T4-G | Transcription initiation | (Ranuncolo et al, 2012) |
|  | RPAP2 | S5-P | S5-P to S2-P transition  snRNA gene expression | (Egloff et al, 2012) |
|  | CDC14A | S2-P, S5-P | Repression of cell cycle transcription | (Guillamot et al, 2011) |
|  | CDC14B | S5-P | Repression of cell cycle transcription | (Guillamot et al, 2011) |
|  | SCP1 | S5-P | Transcription elongation | (Yeo et al, 2003; Zhang et al, 2006) |

Fcp1, TFIIF-associating component of CTD phosphatase 1; Ssu72, Suppressor of sua7, gene 2; Rtr1, Regulator of transcription 1; Glc7, Glycogen 7; CTDP1, CTD (carboxy-terminal domain, RNA polymerase II, polypeptide A) phosphatase subunit 1; OGA; O-GlcNAcase (Beta-N-acetylglucosaminidase); RPAP2, RNA polymerase II associated protein 2; CDC14A, Cell division cycle 14 homolog A; CDC14B, Cell division cycle 14 homolog B; SCP1, small C-terminal domain phosphatase 1. The RNAPII CTD modifications are shown as described in Fig. 1C.

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