Supplemental Table S2 for

Model-Based Systems Biology:

Mapping Knowledge and Discovering Gaps in the mRNA Transcription Cycle

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Table S2. Transcription facts and relevant references.

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| --- | --- | --- | --- |
| **Ref.** | **Fact/Mechanism** | **Related Molecule** | **No** |
| [‎1] | Fcp1 phosphatase activity is stimulated by Rpb4/7 | Fcp1 |  |
| [‎2] | Fcp1 dephosphorylates CTD | Fcp1 |  |
| [‎3] | Rpb4/7 binds Pol II | Rpb4/7, Pol II |  |
| [‎‎4] | TFIIA, TFIID, TFIIH, TFIIE stays on the promoter after transcription initiation | TFIIA, TFIID, TFIIH, TFIIE |  |
| [‎‎4] | TFIIF, TFIIB, Polymerase II disassociated from the promoter after transcription initiation | TFIIF, TFIIB, Polymerase II |  |
| [‎5] | The phosphatase activity of Fcp1 is stimulated by the general transcription factor TFIIF | Fcp1, TFIIF |  |
| [‎‎5] | TFIIB inhibits Fcp1 phosphatase activity | Fcp1, TFIIB |  |
| [‎‎6] | hyperphosphorylated form of the CTD is involved in the interaction with CPSF | CTD, CPSF |  |
| [‎‎7] | TFIIB serine 65 phosphorylation is required after the phosphorylation of serine 5 of RNA pol II C-terminal domain (CTD) has occurred | TFIIB, CTD |  |
| [‎‎7] | TFIIB serine 65 phosphorylation is required before productive transcription initiation begins | TFIIB |  |
| [‎‎8] | Rpb4-Rpb7 complex is not required for stable recruitment of polymerase to active preinitiation complexes | Rpb4/7 |  |
| [‎‎9] | TFIIF and rpb7 has a role in early and late stages of transcription | Rpb7, TFIIF |  |
| [‎3] | RNA polymerase II (Pol II) is composed of ten subunit core and a two subunit dissociable subcomplex, rpb4/rpb7 (comprising the fourth and seventh largest subunits) that form a Heterodimer | Rpb4/7, Pol II |  |
| [‎‎‎3, ‎10, ‎11,  ‎‎12] | Rpb4/7 participate in promoter-directed transcription initiation, elongation and termination | Rpb4/7 |  |
| [‎‎‎13] | FCP1 is a Carboxy-terminal domain (CTD) phosphatase | Fcp1 |  |
| [‎‎‎14] | TFIIF and TFIIB bind the same binding region of fcp1 competitively | Fcp1, TFIIF, TFIIB |  |
| [‎‎‎14] | TFIIF binds Fcp1 at the BRCT domain | Fcp1, TFIIF |  |
| [‎‎‎14] | TFIIB binds Fcp1 at the BRCT domain | Fcp1, TFIIB |  |
| [‎‎‎14] | TFIIF stimulate CTD-phosphatase activity | Fcp1, TFIIB |  |
| [‎‎‎‎2, ‎‎14] | two adjacent regions of yeast Fcp1 containing amino acid residues 457 to 666 and 667 to 732 can each bind yeast RAP74 (subunit of TFIIF) independently, in *S. cerevisiae* | Fcp1, TFIIF |  |
| [‎3] | TFIIF binds Rpb4/7 heterodimer | Rpb4/7, TFIIF |  |
| ‎[‎‎10] | Fcp1/TFIIF/pol II forms a complex | Fcp1/TFIIF/pol II |  |
| [‎‎10, ‎15‎] | Rpb4 recruits the CTD phosphatase Fcp1 | Rpb4, Fcp1 |  |
| [‎‎‎‎16] | amino acid 457 to 666 of Fcp1 binds TFIIB, in *S. cerevisiae* | Fcp1, TFIIB |  |
| [‎‎‎‎16] | amino acid 667 to 732 of Fcp1 binds TFIIB, in *S. cerevisiae* | Fcp1, TFIIB |  |
| [‎‎16] | Fcp1, Phosphatase catalytic domain, named FCPH, is between residues 170 - 363, in *S. cerevisiae* | Fcp1 |  |
| [‎‎‎14] | FCPH catalytic domain of Fcp1 is essential for the function of Fcp1 in vivo | Fcp1 |  |
| [‎‎16] | Fcp1 has a BRCT domain (amino acids 499 – 593 ), in *S. cerevisiae* | Fcp1 |  |
| [‎17, ‎‎18‎] | Serine 2 phosphorylation and dephoshprylation mechanisms:   * Subsequent to ser5 phosphorylation by the action of TFIIH kinase, Ser2 residues are phosphorylated. * phosphorylation of Ser2 by the CDK9 (CDK9 in metazoans/CTDK-I in yeast) subunit of positive-transcription elongation factor b (P-TEFb) activates elongation and RNA processing (splicing and polyadenylation) * Ser2 dephosphorylated after Ser5. * Timing of dephosphorylation is unknown and conjectured to be during termination. | CTD |  |
| [‎‎17, ‎18‎] | Serine 7 phosphorylation and dephoshprylation mechanisms.   * Serine 7 phosphorylation by an unknown kinase occurs during elongation and before splicing. * Timing of dephosphorylation is unknown and conjectured to be during termination. | CTD |  |
| [‎‎17, ‎18‎] | Serine 5 phosphorylation and dephoshprylation mechanisms.   * Ser5 phosphorylated near the 5′ ends of genes depends on the kinase activity of TFIIH. * Phosphorylation on Ser5 by TFIIH helps recruit capping enzymes (capping must be activated after Ser5 phosphorylation). * Ser5 dephosphorylated In yeast and in some mammalian genes toward the 3`end of the transcription unit (after elongation, not clear when exactly). * Ser5 phosphatase activity is implicated in termination. It is not clear when exactly in the transcription cycle the Ser5 phosphatases act. | CTD |  |
| [‎19] | TFIID, TFIIA, stay at the promoter when RNAPII engages in transcript elongation | GTFs |  |

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