

**Table S2. Information of recombinant DNA**

Recombinant DNA	corresponding protein or cell line in manuscript	Details
pET28a-CTCF-mCherry	Protein: CTCF-mCherry	Vector backbone: pET28a-mcherry (modified from addgene 61607); Inserted CDS: full-length mouse CTCF fused mCherry
pET28a-CTCF-EGFP	Protein: CTCF-EGFP	Vector backbone: pET28a-EGFP (modified from addgene 61607); Inserted CDS: full-length mouse CTCF fused EGFP
pET28a- IDR (MED1)-mCherry	Protein: IDR (MED1)-mCherry	Vector backbone: pET28a-mcherry (modified from addgene 61607); Inserted CDS: C-terminal of mouse MED1 (948-1574) fused mCherry
pET28a-RYBP-EGFP	Protein: RYBP-EGFP	Vector backbone: pET28a-EGFP (modified from addgene 61603); Inserted CDS: full-length mouse RYBP fused EGFP
pET28a-IDR (RYBP)-EGFP	Protein: IDR (RYBP)-EGFP	Vector backbone: pET28a-EGFP (modified from addgene 61603); Inserted CDS: C-terminal of mouse RYBP (51-228) fused EGFP
pET28a-mutant CTCF-mCherry	Protein: Mutant CTCF	Vector backbone: pET28a-mcherry (modified from addgene 61607); Inserted CDS: mutant mouse RYBP (deletion of 18 amino acid residues in CTCF, including 96-101aa, 86-88aa, 164-169aa, 268aa, 271aa, 296aa, 324aa, 409aa, 557aa) fused mCherry
pET28a-hIDR-CTCF-EGFP	Protein: hIDR-CTCF	Vector backbone: pET28a-EGFP (modified from addgene 61603); Inserted CDS: C-terminal of human HNRNPA1 (186-320) fused CTCF and EGFP
pET28a-ARID3A-mCherry	Protein: ARID3A-mCherry	Vector backbone: pET28a-mcherry (modified from addgene 61607); Inserted CDS: full-length mouse ARID3A fused mCherry
pET28a-EGFP	Protein: EGFP	Vector backbone: pET28a-EGFP (modified from addgene 61603); empty vector
pET28a-mCherry	Protein: mCherry	Vector backbone: pET28a-mcherry (modified from addgene 61607); empty vector
pET28a-RYBP- $\Delta$ 172-EGFP	Protein: RYBP- $\Delta$ 172-EGFP	Vector backbone: pET28a-EGFP (modified from addgene 61603); Inserted CDS: mutant mouse RYBP (deletion of 172-191 amino acid residues) fused EGFP
pET28a-RYBP- $\Delta$ 192-EGFP	Protein: RYBP- $\Delta$ 192-EGFP	Vector backbone: pET28a-EGFP (modified from addgene 61603); Inserted CDS: mutant mouse RYBP (deletion of 192-211 amino acid residues) fused EGFP
pET28a-RYBP- $\Delta$ 26-EGFP	Protein: RYBP- $\Delta$ 26-EGFP	Vector backbone: pET28a-EGFP (modified from addgene 61603); Inserted CDS: mutant mouse RYBP (deletion of 26-45 amino acid residues) fused EGFP
pET28a-RYBP- $\Delta$ IDR21-EGFP	Protein: RYBP- $\Delta$ IDR21-EGFP	Vector backbone: pET28a-EGFP (modified from addgene 61603); Inserted CDS: mutant mouse RYBP (deletion of 21 amino acid residues in RYBP IDR, including 75-77aa, 86-88aa, 107-109aa, 153-155aa, 165-167aa, 183-185aa, 215-217aa) fused EGFP
pTripz-RYBP	Cell line: RYBP OE	Vector backbone: pLentiCRISPR-EGFP (modified from addgene 71307); Inserted CDS: full-length mouse RYBP
piggyBac-FLAG-EV	Cell line: <i>Rybp</i> <sup>+/+</sup> _EV, <i>Rybp</i> <sup>-/-</sup> _EV	Vector backbone: pPB-CAG-3xFLAG-empty-pgk-hph (addgene 48754); empty vector
piggyBac- FLAG-CTCF	Cell line: CTCF OE	Vector backbone: pPB-CAG-3xFLAG-empty-pgk-hph (modified from addgene 48754); Inserted CDS: full-length mouse CTCF
piggyBac-FLAG-RYBP	Cell line: <sup>FLAG</sup> RYBP	Vector backbone: pPB-CAG-3xFLAG-empty-pgk-hph (modified from addgene 48754); Inserted CDS: full-length mouse RYBP
piggyBac-FLAG-(RYBP- $\Delta$ 172)	Cell line: <i>Rybp</i> <sup>+/+</sup> _ $\Delta$ 172	Vector backbone: pPB-CAG-3xFLAG-empty-pgk-hph (modified from addgene 48754); Inserted CDS: mutant mouse RYBP (deletion of 172-191 amino acid residues) fused EGFP
piggyBac-hIDR-CTCF	Cell line: <i>Rybp</i> <sup>-/-</sup> _hIDR-CTCF	Vector backbone: pPB-CAG-3xFLAG-empty-pgk-hph (modified from addgene 48754); Inserted CDS: C-terminal of human HNRNPA1 (186-320) fused CTCF
piggyBac-IDR (RYBP)-CTCF	Cell line: <i>Rybp</i> <sup>-/-</sup> _IDR2-CTCF	Vector backbone: pPB-CAG-3xFLAG-empty-pgk-hph (modified from addgene 48754); Inserted CDS: C-terminal of RYBP (51-228) fused CTCF
piggyBac-IDR (FUS)-CTCF	Cell line: <i>Rybp</i> <sup>-/-</sup> _IDR3-CTCF	Vector backbone: pPB-CAG-3xFLAG-empty-pgk-hph (modified from addgene 48754); Inserted CDS: N-terminal of human FUS IDR (1-214) fused CTCF
piggyBac-RYBP-RFP	Cell line: RYBP-RFP	Vector backbone: pPB-CAG-3xFLAG-empty-pgk-hph (modified from addgene 48754); Inserted CDS: full-length mouse RYBP-fused RFP
piggyBac-CTCF-EGFP	Cell line: CTCF-EGFP	Vector backbone: pPB-CAG-3xFLAG-empty-pgk-hph (modified from addgene 48754); Inserted CDS: full-length mouse CTCF-fused EGFP
piggyBac-RYBP_ $\Delta$ IDR21-RFP	Cell line: RYBP- $\Delta$ IDR21-RFP	Vector backbone: pPB-CAG-3xFLAG-empty-pgk-hph (modified from addgene 48754); Inserted CDS: mutant mouse RYBP (deletion of 21 amino acid residues in RYBP IDR, including 75-77aa, 86-88aa, 107-109aa, 153-155aa, 165-167aa, 183-185aa, 215-217aa) fused RFP
piggyBac-RYBP_ $\Delta$ IDR21-HNRNPA1C	Cell line: RYBP_ $\Delta$ IDR21-HNRNPA1C	Vector backbone: pPB-CAG-3xFLAG-empty-pgk-hph (modified from addgene 48754); Inserted CDS: RYBP- $\Delta$ IDR21-RFP fused C-terminal of human HNRNPA1 (186-320) fused CTCF
plko.shEV	Cell line:shEV	Vector backbone: pLKO.1 puro (modified from addgene 8453)
plko.sh <i>Rybp</i>	Cell line:sh <i>Rybp</i>	targeting sequence: CCAGGAAACCTCGCATCAATT