Supporting Information

Cofactor-assisted three-way junction-driven strand displacement

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S1: DNA sequences

Table S1. Sequences of the Oligonucleotides (5’ to 3’)

Name	Sequence (5′→3′)	Length (n.t.)
HM	FAM-CATATTCCCTCATTCAATACCCTACG	26
HA	GGGCCTGATTGAGGTATTGAATGAGGGAATATG-BHQ	33
HI1	GCTTGTCGTAGTCAATCAGGCCC	23
HI3	CATATTCCCTCATTCAATACCCTACGTCTAGC	32
AM	FAM-AACTAATCCTCAGATCCAGCTAGTGTC-BHQ	27
AA	ATTAGGCCGAATCTAGCTGGATCTGAGGATTAGT	34
AI1	CGCTATATACCTGGGGGAGTATGACACATTCGG CCTAAT	39
AI3	ACTAATCCTCAGATCCAGCTAGTGTCTGCGGAG GAAGGTATAT	43
AI3-N	ACTAATCCTCAGATCCAGCTAGTGTCAGCGGAG GAAGGTATAT	43
PM	AACTAATCCTCAGATCCAGCTAGTGTC	27
PA	AGTCAGATTACGATATCGGCACGCGC	36
PI1	TCTCCAATTCTACCCCTAACCCCTGACACATTCG GCCTAAT	41
PI3	ACTAATCCTCAGATCCAGCTAGTGTCTCCCCTAA CCCCTAGAATTGGA	48

S2: ATP-assisted three-way junction-driven strand displacement

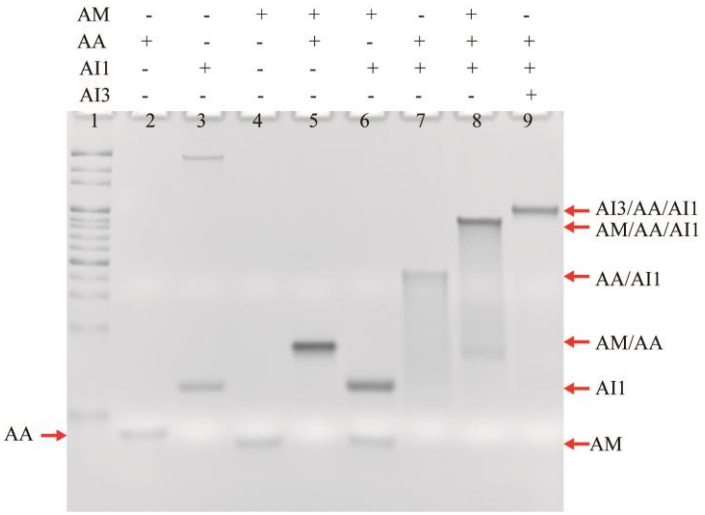

Figure S1. Native 15% polyacrylamide gel analysis of the formation of the three-way junction structure. DNA strands added in every lane are indicated above the image. The concentration of each DNA strand in PAGE was 2μM.

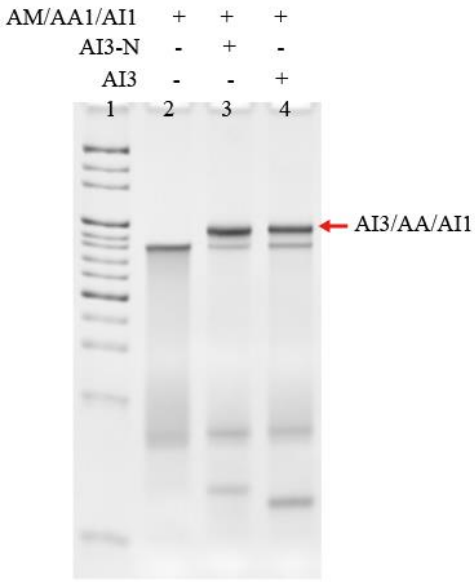

Figure S2. Native 15% polyacrylamide gel analysis of the strand displacement reaction with different inputs. DNA strands added in every lane are indicated in the table. Concentrations for each DNA strand in PAGE are all 2μM.

S3: Hg^{2+}-assisted three-way junction-driven strand displacement

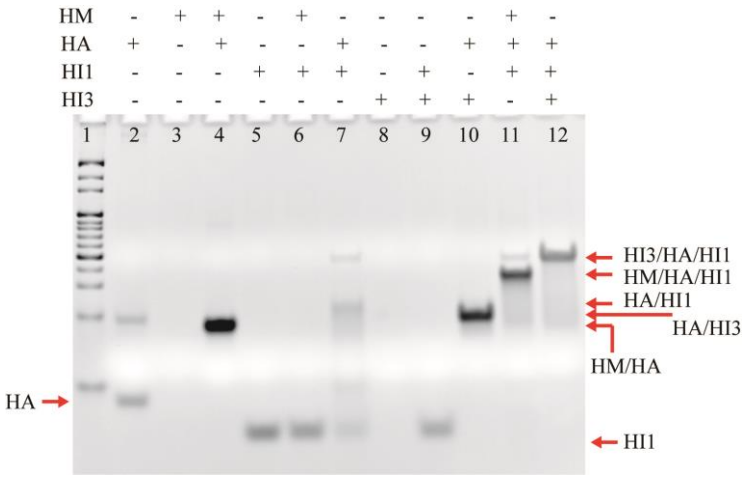

Figure S3. Native 15% polyacrylamide gel analysis of the formation of the three-way junction structure. DNA strands added in every lane are indicated above the image. The concentration of each DNA strand in PAGE was 2μM.

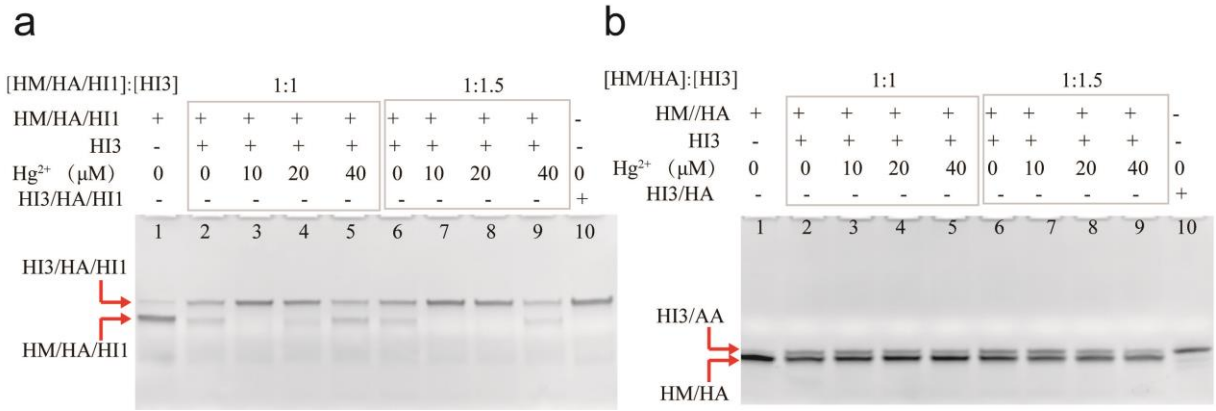

Figure S4. (a). Native 15% polyacrylamide gel analysis of **Hg^{2+}-assisted three-way junction-driven strand displacement at 25℃ for 20 hours**. DNA strands added in every lane are indicated above the image. The concentration of three-way complex HM/HA/HI1 in each lane was 2μM. The concentration of HI3 in lane 2-5 was 2μM and in lane 6-9 was 3μM. **(b).** Native 15% polyacrylamide analysis of **strand displacement without HI1 at 25℃ for 20 hours.** DNA strands added in every lane are indicated above the image. The concentration of DNA complex HM/HA in each lane was 2μM. The concentration of HI3 in lane 2-5 was 2μM and in lane 6-9 was 3μM.

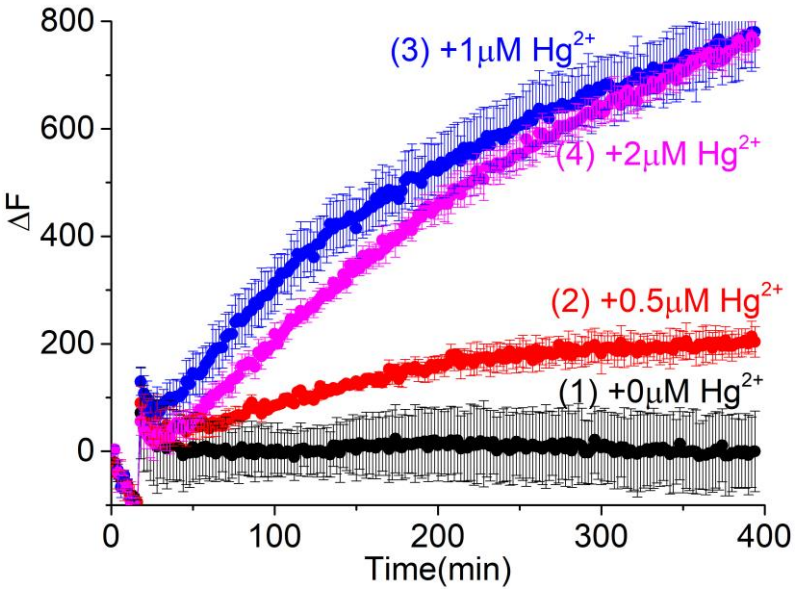

Figure S5. Fluorescence intensity analysis of the complex **HM/HA/HI1** upon addition of H13 and different concentrations of Hg^{2+}. **Curve 1: 0μM; Curve 2: 0.5μM; Curve 3: 1μM; Curve 4: 2μM.** [HM/HA/HI1] =100nM, [HI3] =150nM.

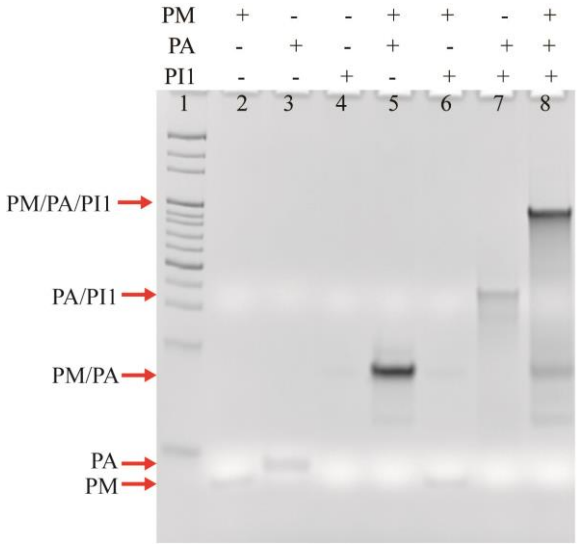

Figure S6. Native 15% polyacrylamide gel analysis of the formation of the three-way junction structure in **pH=7.5**. DNA strands added in every lane are indicated above the image. The concentration of each DNA strand in PAGE was 2μM.

S4: pH-assisted three-way junction-driven strand displacement

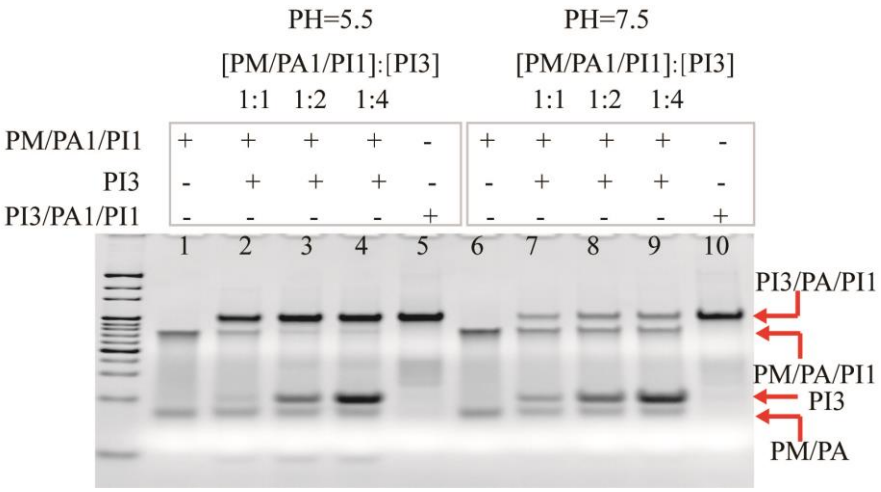

Figure S7. Native 15% polyacrylamide comparison of strand displacement reaction at 25℃ for **half an hour**, **pH=5.5 and pH=7.5 respectively.** DNA strands added in every lane are indicated above the image. The concentration of DNA complex in each lane was 2μM. The concentration of PI3 was 2μM, 4μM and 8μM respectively.