

TransNGS® Tn5 DNA Library Prep Kit for Illumina® (for 50 ng DNA)

Please read the manual carefully before use

Catalog No. KP101

Storage: at -20°C for one year

Description

TransNGS® Tn5 DNA Library Prep Kit for Illumina® is a reagent kit designed for Illumina high-throughput sequencing platform, suitable for preparing DNA library from 1ng initial sample (such as acquiring small genome, plasmid and PCR amplification product larger than 300 bp). The resulting library can be used for single-end or paired-end sequencing. This kit employs an in vitro transposition technique, which can simultaneously complete DNA fragmentation and adapter ligation within 5 minutes. In comparison to conventional library preparation method that requires DNA fragmentation, end repair, and adapter ligation, the in vitro transposition technique significantly shortens library construction time and simplifies the operation.

Feature

- Time saving and simple operation
- Require small amount of DNA

Application

Prepare short fragment DNA library for Illumina high-throughput sequencing platform from purified dsDNA.

Kit content

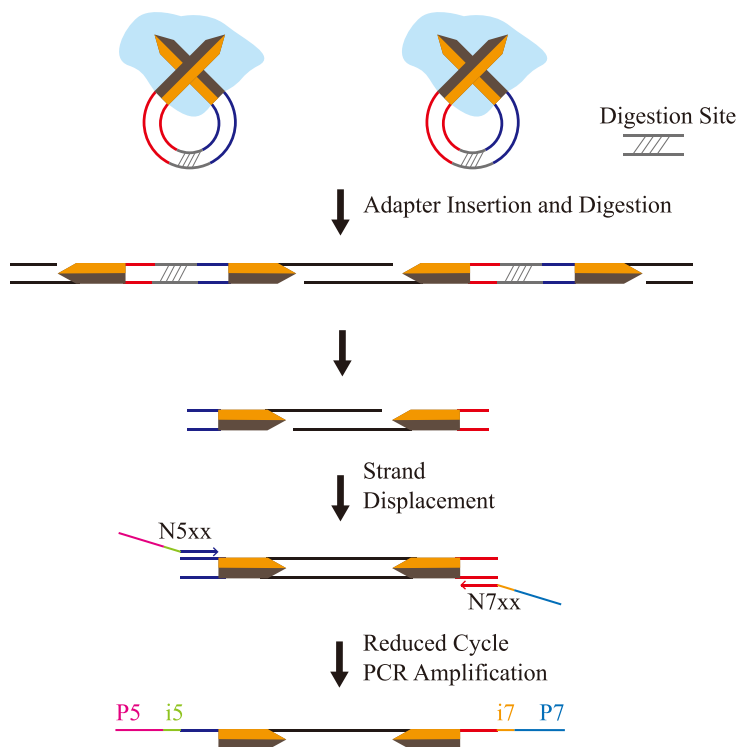
Component	KP101-11 (12 rxns)	KP101-03 (96 rxns)
Tn5-50 Enzyme Mix	24 µl	192 µl
5×Insertion Buffer	75 µl	600 µl
2×Tn5 Digestion Mix	375 µl	4×750 µl
TransNGS® Tn5 Library Amplification SuperMix (2×)	300 µl	4×600 µl
Library Elution Buffer	1.2 ml	2×5 ml
Nuclease-free Water	1 ml	5 ml

Initial Sample Requirement

The initial sample should be purified DNA dissolved in Nuclease-free Water or 10 mM Tris-HCl (pH8.0), with an OD260/OD280 value between 1.8-2.0. Fluorescent dye method (Qubit or PicoGreen) is chosen for specific dsDNA detection and DNA concentration measurement. The ratio of the concentration measured by absorbance method (such as Nanodrop) to the concentration measured by fluorescent dye method for the same DNA sample is ≤ 2 .



Principle Schematic of Library Construction



Library Construction

5' -AATGATACGGCGACCACCGAGATCTACAC[i5]TCGTCGGCAGCGTCAGATGTGTATAAGAGACAG
-XXXXXXXX-CTGTCTCTTATACACATCTCCGAGCCACGAGAC[i7]ATCTCGTATGCCGTCTTCTGCTTG-3'

i5: Index 2, 8 bases

i7: Index 1, 8 bases

-XXXXXXXX-: inserted DNA.

Protocol

Prepare the following reagents: freshly prepared 80% ethanol; *MagicPure*[®] Size Selection DNA Beads (Cat. No. EC401); *TransNGS*[®] Tn5 Index Kit for Illumina[®] (Cat. No. KI101).

1. Adapter Insertion and DNA Fragmentation

The transposase Tn5 can react slowly at room temperature; therefore, the reaction mixture should be prepared on ice, mixed by pipetting, and immediately move to thermocycler for reaction.

Thaw the 2×Tn5 Digestion Mix completely at room temperature.

(1) Assemble the following reaction set in a sterile PCR tube on ice:

Component	Volume
Tn5-50	2 µl
50 ng gDNA	Variable
5×Insertion Buffer	6 µl
Nuclease-free Water	Variable
Total volume	30 µl



(2) Mix by pipetting up and down, if there is liquid on the walls of the tube, spin briefly and immediately proceed to the next step of the reaction.

(3) Place the reaction tube in a thermocycler and incubate at 55°C for 5 minutes (lid temperature at 70°C).

(4) Immediately place the reaction tube on ice, and immediately add 30 µl of 2× Tn5 Digestion Mix to the tube. Mix by pipetting up and down, and incubate in a PCR machine at 55°C for 5mins (lid temperature 70°C) Then immediately place the tube on ice.

2. DNA Purification

MagicPure® Size Selection DNA Beads (Cat. No. EC401) is recommended for DNA purification. The specific steps are as follows:

(1) Pre-warm the DNA beads for 30mins from 2-8°C to room temperature.

(2) Transfer 60ul output from previous step into a 1.5ml centrifuge sterile tube.

(3) Pipette magnetic beads up and down to ensure thorough mixing. Add 60 µl of beads (1.0×) to the sterile tube in step (2).

(4) Mix the sample thoroughly by pipetting up and down, then let it stand at room temperature for 5 minutes.

Note: Insufficient mixing will significantly affect experimental results.

(5) Place the 1.5 ml centrifuge tube on the magnetic rack and let it stand at room temperature for approximately 5 minutes until the solution becomes clear, allowing the magnetic beads to fully adhere to the tube wall close to the magnetic rack. Discard the supernatant.

Note: If there is liquid on the tube wall, briefly centrifuge and then place it on the magnetic rack, ensuring all magnetic beads are fully attached to the tube wall. Do not pipette the magnetic beads, as this may affect the final yield.

(6) Keep the 1.5ml tube on the Magnetic Stand, add 200 µl of freshly prepared 80% ethanol into the tube and keep it at room temperature for 30 seconds without mixing. Then discard the supernatant.

Note: 80% ethanol must be freshly prepared, as it may affect the experimental results.

(7) Repeat Step (6) once.

(8) Keep the 1.5ml tube on the Magnetic Stand with the lid open, dry the beads at room temperature.

Note: Do not heat-dry the tube, as it may affect the final yield.

(9) Remove the 1.5ml tube from the Magnetic Stand, add 22 µl Library Elution Buffer. Mix by pipetting up and down or by vortex. Incubate at room temperature for 2 minutes.

(10) Place the 1.5ml tube on the Magnetic Stand and wait for about 2 minutes until the solution is clear, ensuring that all magnetic beads are fully attached to the tube walls.

Note: If there is liquid on the tube wall, briefly centrifuge and then place it on the magnetic rack. The room temperature stand time can be extended to 5 minutes, ensuring all magnetic beads are fully attached to the tube wall.

(11) Carefully transfer 20 µl of the supernatant into a fresh PCR tube for library amplification or to be stored at -20°C.

3. Library Amplification

(1) Add the following reaction components to the PCR tube on ice:

Component	Volume
Output of previous step (DNA purification)	20 µl
Tn5 Library Amplification SuperMix	25 µl
N5xx*	2.5 µl
N7xx*	2.5 µl
Total volume	50 µl

* *TransNGS*® Tn5 Index Kit for Illumina® (Cat. No. KI101) provides 8 different N5xx barcode oligos and 12 different N7xx barcode oligos. Please choose as needed.



(2) Mix by pipetting up and down. Spin briefly.

(3) Recommended PCR amplification program:

72°C	3 min*	
98°C	3 min	
98°C	30 sec	} 4-7 cycles**
62°C	30 sec	
72°C	30 sec	
72°C	3 min	
≤10°C	Hold	

* This step is indispensable. The transposition reaction product is not complete double-stranded DNA. Incubate at 72°C for 3 minutes to generate complete PCR templates.

** More PCR cycles means more library output, but more duplication in sequencing result. Please choose as needed. Check to table 1 for library output from different PCR cycles.

4. Size selection of library amplification product

If there is no special requirement for fragment length, the enriched library can directly be purified with 1.0× DNA beads, rather than going through size selection steps.

MagicPure[®] Size Selection DNA Beads (Cat. No. EC401) is recommended for size selection of library amplification product. To avoid residual adapter or residual long fragments, it is recommended to perform fragment size selection twice, or to conduct DNA purification with 1.0× magnetic beads before size selection. The specific steps for fragment size selection are as follows:

(1) Pre-warm the DNA beads for 30mins from 2-8°C to room temperature.

(2) Transfer 50ul output from library amplification step into a 1.5ml sterile tube. If the output is less than 50 µl, it should be supplemented with Nuclease-free Water.

(3) Vortex the magnetic beads to ensure thorough mixing. Add the appropriate volume of DNA beads to the PCR products (refer to table2).

Volume of DNA beads to add = volume of DNA solution × 1st volume ratio.

For example: 30 µl beads = 50 µl DNA solution × 0.6

(4) Mix the sample thoroughly by pipetting up and down, then let it stand at room temperature for 5 minutes.

Note: Insufficient mixing will lead to inconsistent size selection results.

(5) Place the 1.5ml tube on a Magnetic Stand. Let it stand at room temperature for approximately 5 minutes until the solution becomes clear, allowing the magnetic beads to fully adhere to the tube wall close to the magnetic rack.

Note: If there is liquid on the tube wall, briefly centrifuge and then place it on the magnetic rack. Please make sure that all magnetic beads are fully attached to the tube wall.

(6) Keep the 1.5ml tube on the Magnetic Stand, transfer the supernatant into another clean 1.5 ml tube. Discard the beads.

(7) Add the appropriate volume of beads into the supernatant (refer to Table 2).

Volume of the beads to add = initial volume of DNA solution × 2nd volume ratio

For example: 7.5 µl beads = 50 µl DNA solution × 0.15

(8) Mix by pipetting up and down. Incubate at room temperature for 5 minutes.

Note: Insufficient mixing will lead to inconsistent size selection results.

(9) Place the 1.5 ml centrifuge tube on the magnetic rack and let it stand at room temperature until the solution becomes clear for approximately 5 minutes, allowing the magnetic beads to fully adhere to the tube wall close to the magnetic rack. Discard the supernatant.



Note: If there is liquid on the tube wall, briefly centrifuge and then place it on the magnetic rack, ensuring all magnetic beads are fully attached to the tube wall. Do not aspirate the magnetic beads, as this may affect the final yield.

(10) Keep the 1.5ml tube on the Magnetic Stand, add 200 μ l of freshly prepared 80% ethanol into the tube and keep it at room temperature for 30 seconds without mixing. Then discard the supernatant.

Note: 80% ethanol must be freshly prepared, as it may affect the experimental results.

(11) Repeat Step (10) once.

(12) Keep the 1.5ml tube on the Magnetic Stand with the lid open, dry the beads at room temperature.

Note: Do not heat-dry the tube, as it may affect the final yield.

(13) Remove the 1.5ml tube from the Magnetic Stand, add 23 μ l Library Elution Buffer. Mix by pipetting up and down or by vortex. Incubate at room temperature for 2 minutes.

(14) Place the 1.5ml tube on the Magnetic Stand and wait for 2 minutes until the solution is clear, ensuring that all magnetic beads are fully attached to the tube walls.

Note: If there is liquid on the tube wall, briefly centrifuge and then place it on the magnetic rack. The room temperature stand time can be extended to 5 minutes, ensuring all magnetic beads are fully attached to the tube wall.

(15) Carefully transfer 20 μ l of the supernatant into a fresh EP tube, and store at -20°C .

Appendix

Table 1 Reference of library output

Amplification cycles	4	5	6	7
Library output (not size selected) (ng)	230	420	800	1200

Table 2 Reference conditions for size selection by *MagicPure*[®] Size Selection DNA Beads

Average Size of Selected Library (bp)	~330	~480	~680
Insert Size of Selected Library (bp)	~200	~350	~550
1 st volume ratio (DNA Beads : DNA)	0.75 \times	0.63 \times	0.54 \times
2 nd volume ratio (DNA Beads : DNA)	0.20 \times	0.15 \times	0.12 \times

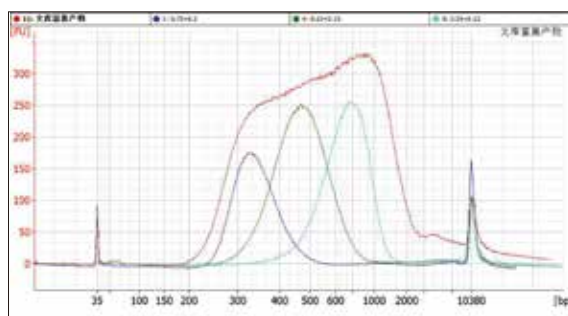


Figure 1 Reference of size selected library by *MagicPure*[®] Size Selection DNA Beads.

Library amplification output - Bacteria library prepared by this kit, after 7 PCR cycles and 1.0 \times beads purification (red curve); or after 7 PCR cycles and size selection by 0.75 \times +0.2 \times (blue curve); 0.63 \times +0.15 \times (green curve); or 0.54 \times +0.12 \times beads (light blue curve).



Note

If slight precipitate or turbid liquid is visible after thawing 2×Tn5 Digestion Mix, dissolve at 37°C water bath and mix thoroughly before use.

The transposase recognition sites exhibit a certain preference, resulting in each inserted fragment having 9 nucleotides at both ends that are not entirely randomly distributed, which means the first 9 nucleotides of each sequencing read show a certain preference (Table 3).

Table 3 Transposase recognition site preference statistics table

Probability Statistics (%)									
Base position	1	2	3	4	5	6	7	8	9
A	20.0375	21.08	24.8825	16.1325	36.29	38.2125	30.3475	34.4075	15.02
T	10.3075	36.355	29.0425	39.1625	35.6925	17.7975	23.9275	21.42	21.6425
C	25.125	24.66	25.1125	31.4525	13.8025	13.2325	19.8475	19.0425	39.17
G	44.345	17.3975	20.96	13.21	14.2175	30.7575	25.8775	25.13	24.165

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