

CLAIMS

What is claimed is:

1. A method for detecting and sequencing accessible chromatin in fixed cells, comprising:
 - (a) obtaining a transposase complex comprising a transposase bound to at least one DNA adapter, wherein said at least one DNA adapter or said transposase comprises a detectable label, and wherein said transposase complex retains the activity and selectivity of a transposase complex without said detectable label;
 - (b) contacting chromatin in said fixed cells with said transposase complex under conditions suitable for transposition, thereby joining said at least one DNA adapter to said chromatin at said accessible regions in said chromatin;
 - (c) detecting said detectable label;
 - (d) adding a reverse crosslink solution; and
 - (e) sequencing DNA at the sites where the DNA adapter inserts into the accessible chromatin.
2. The method of claim 1, wherein said at least one DNA adapter comprises a first DNA adapter and a second DNA adapter.
3. The method of claim 2, wherein said first DNA adapter comprises (i) a first oligonucleotide comprising the nucleotide sequence of SEQ ID NO: 1 or a nucleotide sequence having at least 95% identity to the sequence of SEQ ID NO: 1, and (ii) a second oligonucleotide comprising the nucleotide sequence of SEQ ID NO: 2 or SEQ ID NO: 3, or a nucleotide sequence having at least 95% identity to the sequence of SEQ ID NO: 2 or SEQ ID NO: 3.
4. The method of claim 3, wherein said first DNA adapter comprises a first oligonucleotide comprising the nucleotide sequence of SEQ ID NO: 1 and a second oligonucleotide comprising the nucleotide sequence of SEQ ID NO: 2 and wherein said second DNA adapter comprises a first oligonucleotide comprising the nucleotide

sequence of SEQ ID NO: 1 and a second oligonucleotide comprising the nucleotide sequence of SEQ ID NO: 3.

5. The method of any one of claims 1-4, wherein said detectable label is a fluorophore, a metal particle, a magnetic particle, an isotopic label, a chemiluminescent label, a ligand, a mass tag, a quantum dot, or a hapten.

6. The method of any one of claims 1-5, wherein said detectable label is a metal particle or a quantum dot and wherein said detecting comprises performing electron microscopy.

7. The method of any one of claims 1-6, wherein said detectable label is a metal particle, an isotopic label, or a mass tag and wherein said detecting comprises performing mass cytometry.

8. The method of any one of claims 1-7, further comprising identifying regulatory elements, a transcription factor binding site, or a nucleosome binding site in said accessible chromatin.

9. The method of any one of claims 1-8, further comprising mapping positions of sites that said DNA adapters insert into said accessible chromatin.

10. The method of any one of claims 1-9, further comprising sorting cells based on labeling of their accessible chromatin by said detectable label.

11. The method of any one of claims 1-10, wherein said transposase is a MuA transposase.

12. The method of any one of claims 1-10, wherein said transposase is a Tn transposase.

13. The method of claim 12, wherein said Tn transposase is a Tn5 transposase.
14. The method of claim 13, wherein said Tn5 transposase is a hyperactive Tn5 transposase.
15. The method of any one of claims 1-14, wherein said detectable label is a fluorophore.
16. The method of claim 15, wherein said fluorophore is an ATTO fluorescent dye.
17. The method of claim 15 or 16, wherein said detecting comprises performing fluorescence imaging.
18. The method of any one of claims 1-17, wherein said detecting comprises flow cytometry.
19. The method of any one of claims 2-18, wherein said first DNA adapter comprises a first directable label and said second DNA adapter comprises a second detectable label.