Claims

1. A method for identifying a compound that binds to a target molecule, the method comprising:

(i) providing a set of candidate compounds, wherein each candidate compound comprises a DNA tag encoding the identity of the candidate compound;

(ii) contacting the set of candidate compounds with a molecule that is the mirror-image of the target molecule; and

(iii) selecting a binding compound from the set of candidate compounds that binds to the mirror-image of the target molecule, thereby identifying a compound that binds to the target molecule.

2. The method of claim 1, wherein the method further comprises generating the mirror-image of the binding compound, thereby identifying a compound that binds to the target molecule.

3. The method of any one of claims 1 or 2, wherein the method further comprises validating the compound that binds to the target molecule.

4. The method of claim 3, wherein validating the compound that binds to the target molecule comprises binding a molecule that is a mirror-image of the binding compound to a non-mirrored target molecule.

5. The method of any one of claims 1 to 4, wherein the target molecule binds to the DNA tag in its naturally-occurring stereochemical form.

6. The method of claim 5, wherein the mirror-image of the target molecule does not bind to the DNA tag.

7. The method of any one of claims 1 to 6, wherein:

(a) the target molecule is a complex comprising a protein and/or a nucleic acid;

(b) the target molecule is a complex comprising more than one protein and/or more than one nucleic acid;

(c) the target molecule is a protein; or

(d) the target molecule is a nucleic acid.

8. The method of claim 7, wherein:

(i) the mirror-image of the target molecule is produced by chemical synthesis; or

(ii) the target molecule is a nucleic acid and the mirror-image of the nucleic acid is produced by an enzymatic reaction.

9. The method of claim 7 or 8, wherein:

(i) the target molecule is a complex in which (a) the protein in the complex comprises L-amino acid residues and (b) the nucleic acid in the complex comprises D-nucleotides;

(ii) the target molecule is a protein comprising L-amino acid residues;

(iii) the target molecule is a nucleic acid-binding protein;

(iv) the target molecule is a DNA;

(v) the target molecule is a D-DNA;

(vi) the target molecule is an RNA; or

(vii) the target molecule is a D-RNA.

10. The method of claim 9, wherein:

(i) the nucleic acid-binding protein is a DNA-binding protein or an RNA-binding protein;

(ii) the DNA is a protein-coding DNA, RNA-coding DNA, exonic DNA, intronic DNA, regulatory DNA (e.g., promoter DNA, enhancer DNA, activator DNA, repressor DNA), pseudogenes, transposons, chromosomal DNA, mitochondrial DNA, centromeric DNA, telomeric DNA, satellite DNA, scaffold DNA, repetitive DNA, DNA encoding expanded repeats, modified DNA, methylated DNA, A-DNA, B-DNA, Z-DNA, single-stranded DNA, or a double-stranded DNA; or

(iii) the RNA is an antisense RNA, circular RNA, long non-coding RNA, microRNA, messenger RNA, PIWI-interacting RNA, ribosomal RNA, small conditional RNA, small nucleolar RNA, small nuclear RNA, transfer RNA, Y RNA, MALAT1-associated small cytoplasmic RNA, mitochondrial RNA, small interfering RNA, guide RNA, CRISPR RNA, trans-activating CRISPR RNA, single guide RNA, short hairpin RNA, enhancer RNA, vault RNA, or an RNA encoding expanded repeats.

11. The method of claim 9, wherein:

(i) the target molecule is a D-DNA and the mirror-image of the target molecule is an L-DNA; or

(ii) the target molecule is a D-RNA and the mirror-image of the target molecule is an L-RNA.

12. The method of any one of claims 1 to 11, wherein the candidate compounds are small molecules.

13. The method of claim 12, wherein the small molecules are optically active compounds.

14. The method of any one of claims 1 to 13, wherein:

(a) the candidate compounds are in stereochemically pure form;

(b) the candidate compounds are in the form of a mixture of stereoisomers; or

(c) the candidate compounds are in the form of a racemic mixture.

15. The method of any one of claims 1 to 14, wherein:

(i) the selecting step comprises affinity-mediated selection; and/or

(ii) the selecting step comprises sequencing the DNA tag to identify the binding compound.

16. The method of claim 15, wherein the selecting step comprising affinity-mediated selection comprises enriching the set of candidate compounds for the binding compound.

17. The method of any one of claims 1 to 16, wherein the set of candidate compounds comprises:

(i) at least 250,000 different compounds;

(ii) at least two million different compounds;

(iii) at least ten million different compounds; or

(iv) at least twenty- five million different compounds.

18. The method of claim 1, wherein the compound that binds to the target molecule is a chiral molecule.

19. The method of claim 1, wherein the compound that binds to the target molecule is not a chiral molecule.