

CLAIMS

What is claimed is:

1. A method of identifying a compound that preferentially affects a level of association of a first macromolecule with one or more target condensates as compared to another macromolecule associated with the one or more target condensates, the method comprising:
 - (a) contacting a cellular composition with a compound, wherein
 - (i) the cellular composition comprises the one or more target condensates; and/or
 - (ii) the one or more target condensates form simultaneously with and/or after contacting the cellular composition with the compound;
 - (b) measuring, after contacting the cellular composition with the compound, co-localization of the first macromolecule and the other macromolecule via the level of association of the first macromolecule with the one or more target condensates and a level of association of the other macromolecule with the one or more target condensates, wherein the one or more target condensates are the same class of condensate; and
 - (c) determining whether the compound preferentially affects the level of association of the first macromolecule with the one or more target condensates, wherein the determining is by comparing the level of association of the first macromolecule as compared to a reference level for the first macromolecule and the level of association of the other macromolecule as compared to a reference level for the other macromolecule, wherein the compound preferentially affects the level of association of the first macromolecule with the one or more target condensates when the compound alters the level of the first macromolecule as compared to the reference level for the first macromolecule more than the compound alters the level of the other macromolecule as compared to the reference level for the other macromolecule, and wherein the reference level for the first macromolecule is the level of association of the first macromolecule with the one or more target condensates in the absence of the compound, and the reference level for the other macromolecule is the level of association of the

other macromolecule with the one or more target condensates in the absence of the compound.

2. The method of claim 1, wherein the one or more target condensates are in the same cell type.
3. The method of claim 1, further comprising measuring the reference level for the first macromolecule.
4. The method of claim 1, further comprising measuring the reference level for the other macromolecule.
5. The method of claim 1, wherein the compound preferentially increases the level of association of the first macromolecule with the one or more target condensates if the compound increases the level of association of the first macromolecule as compared to the reference level for the first macromolecule more than the compound increases the level of association of the other macromolecule as compared to the reference level for the other macromolecule.
6. The method of claim 5, wherein the compound results in the first macromolecule associating with the one or more target condensates.
7. The method of claim 1, wherein the compound preferentially decreases the level of association of the first macromolecule with the one or more target condensates if the compound decreases the level of association of the first macromolecule as compared to the reference level for the first macromolecule more than the compound decreases the level of association of the other macromolecule as compared to the reference level for the other macromolecule.
8. The method of claim 7, wherein the compound results in the first macromolecule not associating with the one or more target condensates.

9. The method of claim 1, wherein the compound alters the level of association of the first macromolecule with the one or more target condensates as compared to the reference level for the first macromolecule at least 0.25 fold.
10. The method of claim 1, further comprising assessing at least one characteristic of the one or more target condensates.
11. The method of claim 10, wherein the characteristic of the one or more target condensates is selected from the group consisting of: size, number, shape, composition, surface area, location, functional activity, stability, liquidity, and solidification.
12. The method of claim 10, wherein the assessing the at least one characteristic of the one or more target condensates is performed using a microscopy technique.
13. The method of claim 1, further comprising causing the formation of the one or more target condensates.
14. The method of claim 1, wherein the first macromolecule and the other macromolecule are each independently selected from the group consisting of: a polypeptide, a DNA, and an RNA.
15. The method of claim 14, wherein the first macromolecule or the other macromolecule is aberrantly present in a disease state.
16. The method of claim 14, wherein the first macromolecule or the other macromolecule comprises a mutation that alters the level of association of the first macromolecule or the other macromolecule with one or more target condensates compared to a related protein that does not comprise the mutation.
17. The method of claim 1, wherein the first macromolecule comprises a first label.
18. The method of claim 17, wherein the other macromolecule comprises a second label.
19. The method of claim 18, wherein the first label and the second label are distinguishable.

20. The method of claim 19, wherein the first macromolecule and the first label are a fusion protein, and the other macromolecule and the second label are a fusion protein.
21. The method of claim 19, further comprising labeling the first macromolecule and the other macromolecule.
22. The method of claim 21, wherein the labeling comprises contacting the first macromolecule with an antibody or antigen-binding fragment thereof comprising the first label, and contacting the other macromolecule with another antibody or antigen-binding fragment thereof comprising the second label.
23. The method of claim 19, wherein the first label and the second label are each independently selected from the group consisting of: a radioactive label, a colorimetric label, and a fluorescent label.
24. The method of claim 1, wherein measuring the co-localization of the first macromolecule and the other macromolecule comprises use of an imaging technique.
25. The method of claim 1, wherein the cellular composition comprises an animal cell.
26. The method of claim 25, wherein the animal cell has one or more features of a neurodegenerative, proliferative, immunological, cardiac, or metabolic disease.