Quantifying Live Cell Liquid-Liquid Phase Separation Condensates

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Liquid-liquid phase separation (LLPS) is the formation of biomolecular condensates that house various chemical reactions. The dysregulation of LLPS has been linked to tumorigenesis and neurodegenerative diseases. LLPS is quantified by the frequency of condensates, size, shape, and a condensate's specific role. The methods used to count the number of condensates vary so a standard approach to quantify condensates that will enhance reproducibility and enrich acquired data is needed. This program was created by testing procedures to segment the cells, bring out the condensates, and then actually count up the condensates in each cell for every slice slice in an image. Every step was combined into one program that runs in about 1.5 minutes for 60 images. The program was tested by using images where LLPS can be observed. Results of the counts obtained from the program showed an overall constant trend as expected from cells with no outside interference, other than the addition of salt at one point, where changes did occur. There was not a clear way to analyze for accuracy of the program because of the nature of this program, which was to create a standard. Because the results mostly follow expected trends, this solution can be validated as a preliminary step. The next step would be to get ground truth datasets using high resolution microscopy to quantitatively define if condensates are in or out of plane. After refinement of procedures, this program could be utilized in medical research.

Awards Won:
YM American Academy: Third Award of $500.00