A Sensor to Monitor ER Turnover in C. elegans

Shastri, Dhriti (School: St. Joseph's Academy)

The ER is an essential organelle that carries out various cellular tasks, including protein synthesis and processing, detoxification of compounds, and lipid synthesis. How ER quality is controlled in an organism in different physiological states and different times of life is an important question in biology. In many organisms, from yeasts to mammals, starvation triggers autophagy (lysosome-based degradation of cellular material, including organelles). Using C. elegans, I tested whether starvation would also trigger ERophagy, or autophagy of the endoplasmic reticulum. To test this hypothesis, I used an ER-targeted, red/green fluorescent sensor that changes fluorescence depending on if it is in an acidic environment; specifically, the red signal (mCherry) would always be visible, but the green signal (GFP) is quenched within the lysosomes during autophagy. As expected, I found that fed worms showed an equal ratio of signal strength between GFP and mCherry with the exception of one outlier. I saw some variation in signal strength in the starved animals, but due to small sample size it was difficult to statistically assess differences in the sensor caused by starvation. Further analysis of this fluorescent sensor should provide information on how ERophagy is regulated in live animals. This research along with more research in the field of the cell biology, especially in relation to the autophagy process, may provide insight into fighting degenerative and age-related disease.

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