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Autophagy and Lipid Metabolism in C.elegans

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Autophagy and Lipid Metabolism in *C.elegans*

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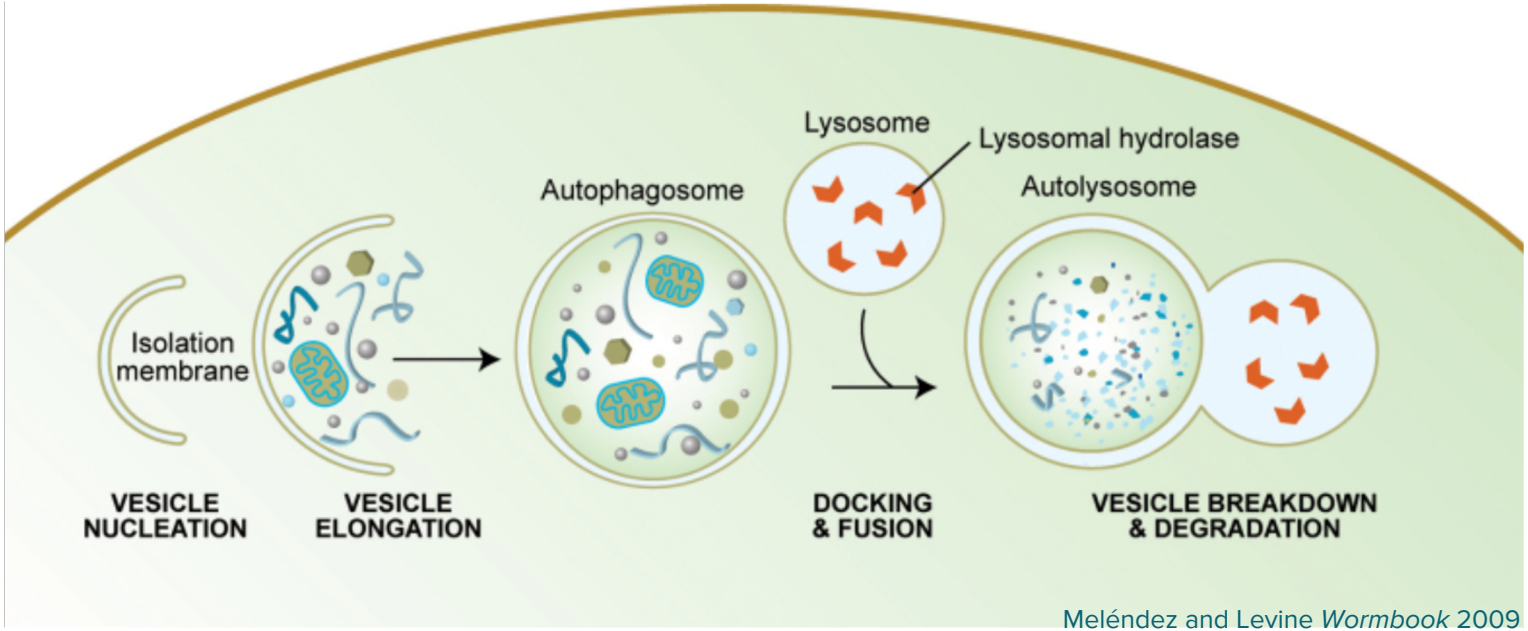
Advanced Imaging Concepts Inc., 2018

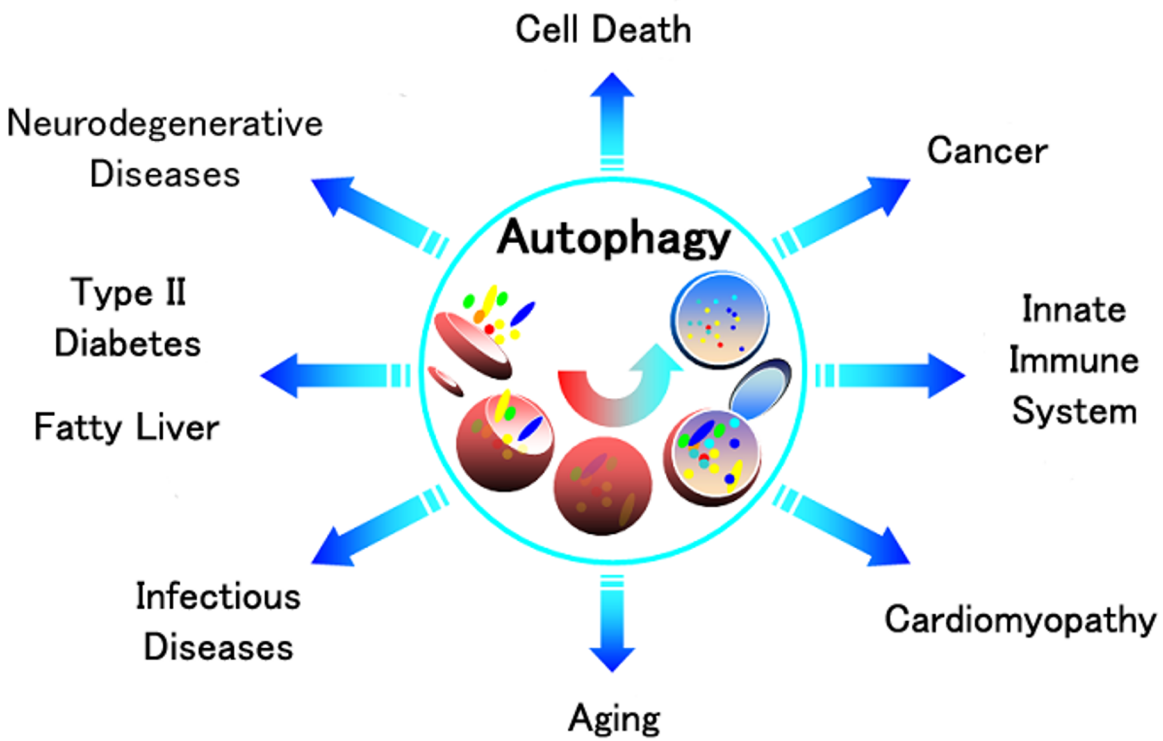
Autophagy is a cellular recycling system



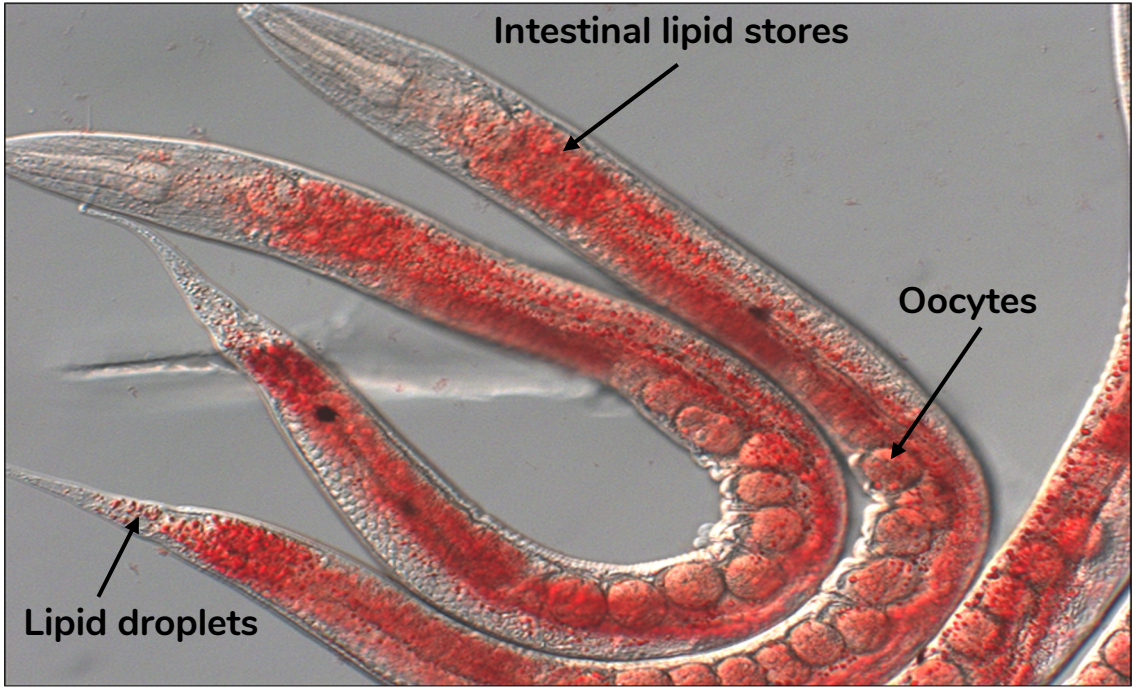
Meléndez and Levine *Wormbook* 2009

Macroautophagy is characterized by the formation of a double membrane vesicle, an autophagosome that sequesters intracellular material to be delivered to the lysosome for degradation. There are over 30 autophagy proteins that contribute to the dynamic process of autophagy that can be broken down into 4 distinct steps: vesicle nucleation, vesicle elongation, docking & fusion, and vesicle breakdown and degradation.

Pathological and Physiological Functions of Autophagy



Why *C.elegans* as a model system?



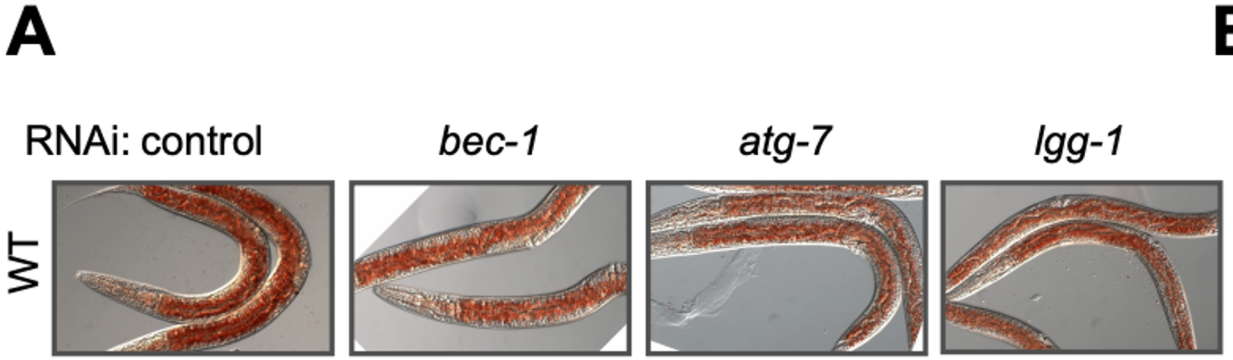
Day 1 adults fixed and stained with a neutral lipid stain (Oil-Red-O)

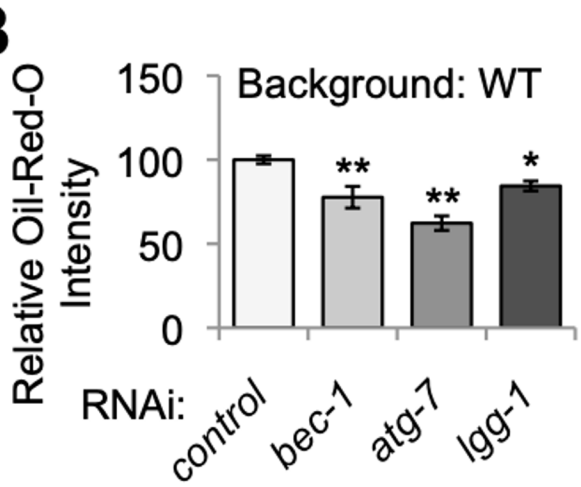
-Transparent (great for microscopy)

-1 mm in length (easy to maintain in the lab)

-Sequenced genome

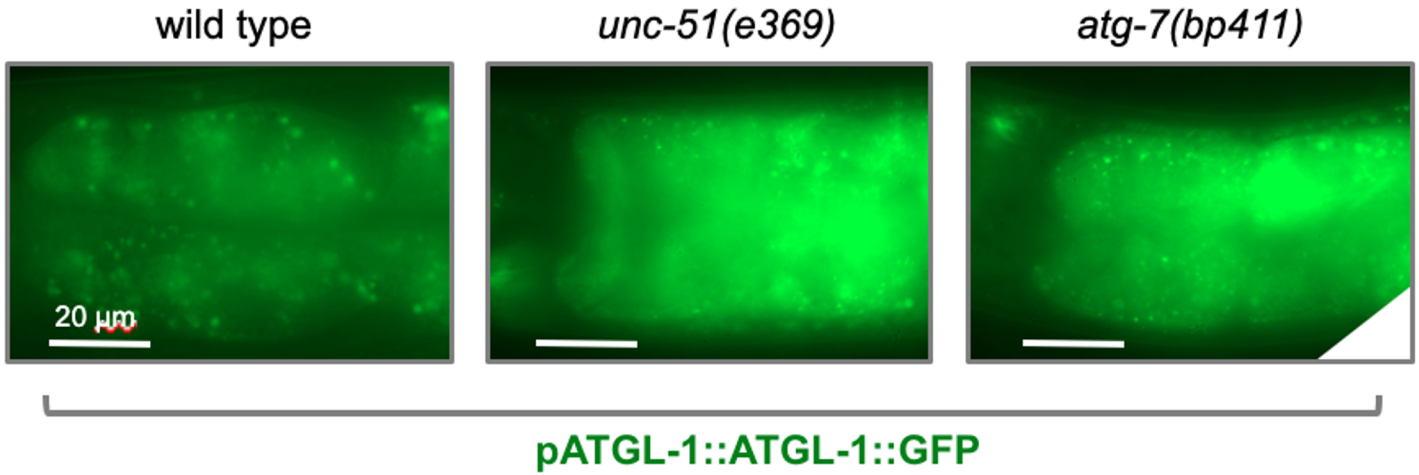
Inhibition of autophagy gene function by RNA interference (RNAi) reduces neutral lipid storage in *C. elegans*

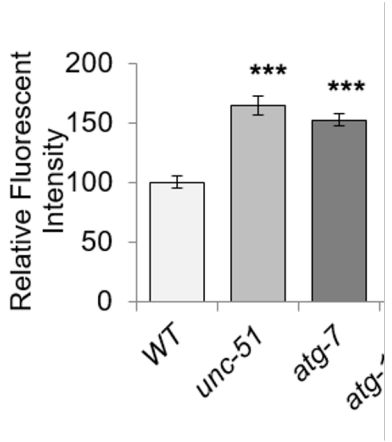




Worms were fed *E. coli* bacteria expressing dsRNA against autophagy genes (*bec-1*, *atg-7*, *lgg-1*) or the empty vector control throughout development. (**A**)Images of young adult animals fixed and stained with Oil-Red-O. (**B**) Neutral neutral lipids were quantified using Image J software (160 X magnification), *p < 0.05, **p < 0.01 ANOVA (n>30).

Increased ATGL-1 expression may drive lipid-loss in autophagy mutants in *C. elegans*





Methodology: *in vivo* quantification of cAMP

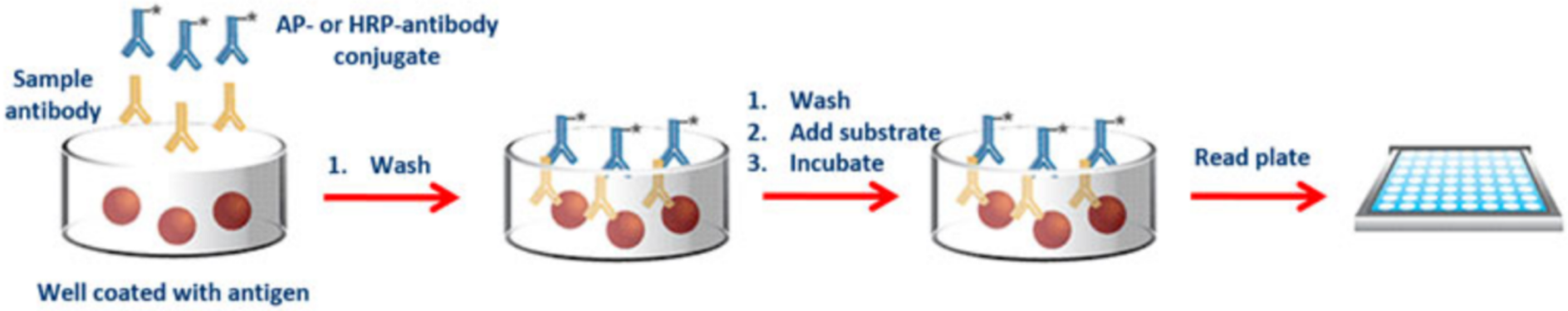
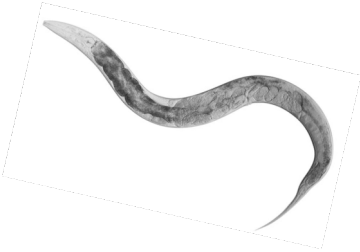
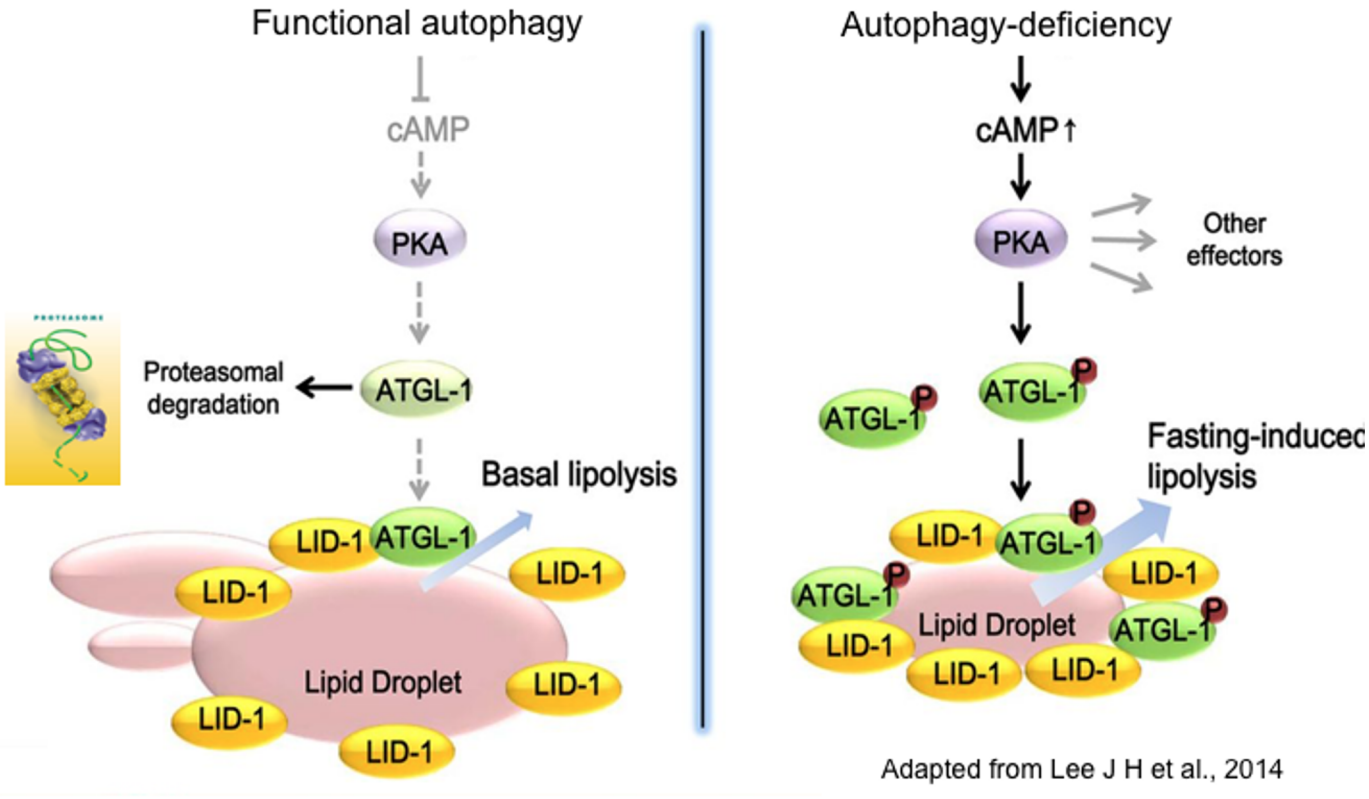


Image adapted from 'Enzo Life Sciences'

- **What is an immunoassay or ELISA?**
  - It's a method to detect proteins or other molecules (cAMP) using antigens or antibodies

Working Model:





Adapted from Lee J H et al., 2014

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