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AUTOPHAGY

Doubling up

Autophagy is a pathway that degrades cytoplasmic components. It can be cargo-selective, for example the cytoplasm-to-vacuole targeting (Cvt) pathway in *Saccharomyces cerevisiae*. A double-membrane autophagosome, or Cvt vesicle in the Cvt pathway, is thought to form *de novo*, sequester cytoplasm, expand through membrane addition from vesicular fusion and fuse with the lysosome or vacuole to release autophagic bodies for degradation. Not much is known about the molecular components involved, and recent studies have tried to identify the origin, or origins, of the double membrane. Yen *et al*. now show that the conserved oligomeric Golgi (COG) complex is required for double-membrane vesicle formation.

The COG complex is a tethering factor involved in trafficking in the Golgi and retrograde trafficking from the endosome to the Golgi. It consists of lobe A (comprising Cog2–Cog4) and lobe B (comprising Cog5–Cog8), which are connected by Cog1. By screening the yeast deletion library and using temperature-sensitive mutants for COG subunits, the authors found that lobe A is essential for autophagy and lobe A and lobe B are required for an efficient Cvt pathway.

Autophagy-related (Atg) proteins are crucial components of autophagy. The localization of Atg8 (a marker of autophagosomes and Cvt vesicles) and Atg9 (which is essential for double-membrane vesicle formation) to the site of autophagosome formation — the phagophore assembly site (PAS) — was disrupted in Cog mutants during autophagy-inducing conditions.

Precursor aminopeptidase I (prApe1) is transported by the Cvt pathway; however, in Cog mutants, prApe1 was not completely enwrapped in Cvt vesicles. Furthermore, Cog-mutant cells contained fewer and smaller autophagic bodies compared with wild-type cells. In addition to the Golgi, Cog proteins were seen to localize at the PAS, and co-immunoprecipitation showed interactions between COG subunits and various Atg proteins. Together, these data suggest a direct participation of the COG complex in double-membrane vesicle formation.

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The authors suggest that the COG complex is a tethering factor at the PAS, interacting with membrane-associated Atg proteins and enabling vesicles to fuse and form autophagosomes and Cvt vesicles. This provides important insights into the molecular basis of autophagic vesicle formation and the origin of the double membrane.

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ORIGINAL RESEARCH PAPER Yen, W. *et al.* The conserved oligomeric Golgi complex is involved in double-membrane vesicle formation during autophagy. *J. Cell Biol.* **188**, 101–114 (2010)