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[BioChemistry] Biochemists at Academia Sinica Identify Link between a Motor Protein and Forming of Autophagosomes

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Academia Sinica Newsletter (2011/02/22) Dr. Guang-Chao CHEN and Hong-Wen TANG, an Assistant Research Fellow and a PhD student, respectively, at the Institute of Biological Chemistry at Academia Sinica, recently identified the role of a motor protein (myosin-II) in forming autophagosomes. Autophagy is a process by which components of the cytoplasm (the jelly-like substance that fills a cell) are engulfed and degraded; it has recently been found to play a key role in certain human diseases such as cancer, infection and immunity, cardiovascular disease, myopathy, and neurodegeneration. The results of the study may aid the development of therapeutic intervention for autophagy-related diseases. The research was published in the EMBO Journal on February 16, 2011, and was selected by Nature Reviews Molecular Cell Biology as a Research Highlight.

Autophagy is a process by which macromolecules and organelles inside the cell are engulfed and degraded through the lysosomal system. The formation of double-membrane degradation vesicles (autophagosomes) is the central part of autophagy, however, until recently, the mechanism underlying this process remained largely elusive. In this study, Dr. CHEN and colleagues investigated the relationship between a gene called autophagy-specific gene 1 (Atg1, an autophagy regulator) in Drosophila (a small fruit fly), and the cell's actin cytoskeleton, and their possible involvement in autophagy. The scientists discovered a new substrate of Atg1 called Sqa, a myosin light chain kinase (MLCK)-like kinase. Depletion of Sqa, as well as its equivalent in mammals ZIPK, and the inactivation of myosin-II compromised autophagy induced by starvation in both Drosophila and mammalian cells. They also found that Atg1-mediated myosin activation plays a critical role in the regulation of actin-dependent autophagy-specific gene 9 (Atg9) cycling during autophagosome formation.

The integral membrane protein Atg9 is thought to be involved in promoting lipid transport to forming autophagosomes. The results of this study hence provide evidence of a link between Atg1 and the formation of autophagosome through the myosin-II motor protein, a finding that may serve as a target for therapeutic intervention on diseases related with autophagy dysfunction.

Related websites:
http://www.nature.com/nrm/journal/v12/n2/full/nrm3053.html
http://www.nature.com/emboj/journal/vaop/ncurrent/full/emboj2010338a.html

Media Contacts:
Dr. Guang-Chao CHEN, Assistant Research Fellow, Institute of Biological Chemistry, Academia Sinica,
(Tel) +886-2- 2789-9800 # 7010 E-mail: gcchen@gate.sinica.edu.tw
Mei-Hui LIN, Office of Public Affairs, Central Office of Administration, Academia Sinica (Tel) +886-2-2789-8821,
(Fax) +886-2-2782-1551, (M) 0921-845-234
E-mail: mhlin313@gate.sinica.edu.tw

Further Information:
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