Potential Helpful Sources

Menant A, Barbey R, Thomas D. Substrate-mediated remodeling of methionine transport by multiple ubiquitin-dependent mechanisms in yeast cells. EMBO J. 2006 Oct 4;25(19):4436-47. doi: 10.1038/sj.emboj.7601330. Epub 2006 Sep 14. PMID: 16977312; PMCID: PMC1589980.

https://pmc.ncbi.nlm.nih.gov/articles/PMC1589980/

"Therefore, high methionine exposure results into a rapid elimination of the high-affinity methionine permease Mup1 through two additive ubiquitin-based mechanisms: repression of transcription and protein destabilization."

Jaroslav Horák, The role of ubiquitin in down-regulation and intracellular sorting of membrane proteins: insights from yeast, Biochimica et Biophysica Acta (BBA) - Biomembranes, Volume 1614, Issue 2, 2003, Pages 139-155, ISSN 0005-2736, https://doi.org/10.1016/S0005-2736(03)00195-0. (https://www.sciencedirect.com/science/article/pii/S0005273603001950)

Abstract: Ubiquitination is a versatile tool used by all eukaryotic organisms for controlling the stability, function, and intracellular localization of a wide variety of proteins. Two of the best characterized functions of protein ubiquitination are to mark proteins for degradation by cytosolic proteasome and to promote the internalization of certain plasma membrane proteins via the endocytotic pathway, followed by their degradation in the vacuole. Recent studies of membrane proteins both in yeast and mammalian cells suggest that the role of ubiquitin may extend beyond its function as an internalization signal in that it also may be required for modification of some component(s) of the endocytotic machinery, and for cargo protein sorting at the late endosome and the Golgi apparatus level. In this review, I will attempt to bring together what is currently known about the role of ubiquitination in controlling protein trafficking between the yeast plasma membrane, the trans-Golgi network, and the vacuole/lysosome.

Keywords: Ubiquitin; Proteolysis; Vacuole; Membrane protein; Sorting; Yeast

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Lee S, Ho HC, Tumolo JM, Hsu PC, MacGurn JA. Methionine triggers Ppz-mediated dephosphorylation of Art1 to promote cargo-specific endocytosis. J Cell Biol. 2019 Mar 4;218(3):977-992. doi: 10.1083/jcb.201712144. Epub 2019 Jan 4. PMID: 30610170; PMCID: PMC6400557.

https://pmc.ncbi.nlm.nih.gov/articles/PMC6400557/

Abstract: Regulation of plasma membrane (PM) protein abundance by selective endocytosis is critical for cellular adaptation to stress or changing nutrient availability. One example involves rapid endocytic turnover of Mup1, a yeast methionine transporter, in response to increased

methionine availability. Here, we report that methionine triggers rapid translocation of the ubiquitin ligase adaptor Art1 to the PM and dephosphorylation of Art1 at specific threonine residues. This methionine-induced dephosphorylation of Art1 is mediated by Ppz phosphatases, and analysis of phosphomimetic and phosphorylation-defective variants of Art1 indicates that these events toggle Art1 recognition of Mup1 at the PM. Importantly, we find that Ppz phosphatases are dispensable for Art1 PM translocation, but are required for Art1 interaction with Mup1. Based on our findings, we propose that methionine influx triggers Art1 translocation to the PM, followed by Ppz-mediated dephosphorylation which promotes cargo recognition at the PM.

Lin, C. H., MacGurn, J. A., Chu, T., Stefan, C. J., & Emr, S. D. (2008). Arrestin-related ubiquitin-ligase adaptors regulate endocytosis and protein turnover at the cell surface. *Journal of Cell Biology*, *135*(4), 714-725. https://doi.org/10.1083/jcb.200805151

https://www.cell.com/cell/fulltext/S0092-8674(08)01182-3?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0092867408011823%3Fshowall%3Dtrue

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Isnard AD, Thomas D, Surdin-Kerjan Y. The study of methionine uptake in Saccharomyces cerevisiae reveals a new family of amino acid permeases. J Mol Biol. 1996 Oct 4;262(4):473-84. doi: 10.1006/jmbi.1996.0529. PMID: 8893857.

https://pubmed.ncbi.nlm.nih.gov/8893857/

Abstract: The screening of mutants resistant to the oxidized analogues of methionine (methionine sulphoxide and ethionine sulphoxide) allowed the characterisation of a yeast mutant strain lacking the high affinity methionine permease and defining a new locus that was called MUP1. The study of MUP1 mutants showed that methionine is transported into yeast cells by three different permeases, a high affinity and two low affinity permeases. The MUP1 gene was cloned and was shown to encode an integral membrane protein with 13 putative membrane-spanning regions. Database comparisons revealed that the yeast genome contains an ORF whose product is highly similar to the MUP1 protein. This protein is shown here to encode very low affinity methionine permease and the corresponding gene was thus called MUP3. It has previously been suggested that the amino acid permeases from yeast all belong to a single family of highly

similar proteins. The two methionine permeases encoded by genes MUP1 and MUP3 are only distantly related to this family and thus define a new family of amino acid transporters.

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https://pdf.sciencedirectassets.com/272582/1-s2.0-S0022283600X0040X/1-s2.0-S002228369690529X/main.pdf?X-Amz-Security-Token=IQoJb3JpZ2luX2VjEBwaCXVzLWVhc3QtMSJIMEYCIQC9D5TOwkT%2Fl3HTv8bfJmSTpyym6Zyn20qFq6Sf9pmP2wIhAKr0Boa4qyWK28DmZyJP57PFMH%2BbXvHpMXJVZPT9WCtSKrwFCJX%2F%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEQBRoMMDU5MDAzNTQ2ODY1IgytAjNy8E2OxW9Q4OYqkAVJCwKZEhBjJONTIXGieVuTxkw7Ubm5WTo9KhrfeXAK8tKqWGwegGO4Vm5pWjZiJ5TvF3NBXCvWSWSxnobT4VBnzez9lwMS8Uxfc5uUm%2FNDUGpHMWWlJTVKINTWRq%2F5%2BR%2FJdEru4L5iT%2FpFteNG00Cxd8lVSsIkWZppxvh3XvN5ka7a8SFCjWXEanAEUjM8Ski%2B5UGugN0C2w4apmBVCY%2FG4BAJjK05viCqdKoowWAHecuzQmPnCTX975D30IiiHnKQTfTLhn87rYHkdGJkMuKPSJpIUQAghAbfAcgbtiuhac0kX6%2FEMYCQ35xdUZvLL%2BmxeR7KY26l7Aky2MxnuzBU76lwTDptMdis3%2Fboap%2B7hlxgIFJiqZ7ZIFi%2FiG0i97Q3a1c2FW5xvNJv2bFugLSMfG3HBxy8DiAeM%2ByBX8yPPNy%2B5gBOBqLQKAwW4aSwcjfGS4jrjV0onpawbmYFKyKj6Koh0gfPVWkO8Ud7L8U6U07IDTFRSdZJcUOrxAQtmBMOmVM8z1KdyShXWBGLjTW1gWTD%2B5qlFKKhDJiMP2PdFdVtvqV0PVNCuc0%2BP3zvJXEgoGS9cwR2lHCay8e7IS1vmE93iMa1AMqZleAmVHw%2F81wHNDJT%2BY%2FOVMsHUe3dJWJcAFBHXQP%2FDohxUd8AUVutI79ckw9QfAGmauB3N2aR3RQTYRPWk%2B62U2nwtNzg0f9CLe7Mn6mWCW%2BKLBsA4IUjsEDWZv5fhZtO1Vxd2sZK5ywytNqV%2BfOCXHdHn8hHvlPqm8bK9oDzLW49wxnqJUY%2BgbJ4MigYtxHVAB16npRhFiWnnT9Q05orT9yj%2BUuvhmbCqQmkNXdi5Ddpoc3ODCNfkXWiPcuRm0XCfMbTEeNpPDConNu%2FBjqwATN87x0qaqPs5SUTPrSsKXEVxBIe1cvK21cOFN9sLjE8MwDhEeKXa7panMeN5X5UL4pU9EPZQSiJsHUKYofxOlFfi7E4UN4U%2FI%2Bavn9MACjfLYoXlxtlgFJ1H0dLL1u2hg2EWIglVO%2F0blMjWGPydxGzFCPqtIn0GYEgoJFELhjSdeua9uWSYqZXbIrq0Z%2BdHAAr5aQBcCjyWMwYQlXyi%2FRowV2EbIyMkRH3gredxqA4&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Date=20250409T211908Z&X-Amz-SignedHeaders=host&X-Amz-Expires=300&X-Amz-Credential=ASIAQ3PHCVTY7BWTTXU2%2F20250409%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Signature=299e2998341f6be536921868b80f2ab5cee766962dafa62eda1c956faf93dc93&hash=cd2fc2ab27351f04b9ab53543b6363ef9b2ba5faa17499e428341dd077586f08&host=68042c943591013ac2b2430a89b270f6af2c76d8dfd086a07176afe7c76c2c61&pii=S002228369690529X&tid=spdf-4d9bfc7a-db2f-4353-93ef-f14ae2a4d645&sid=fc6841ac70ece34314784f1206b50b106bf6gxrqa&type=client&tsoh=d3d3LnNjaWVuY2VkaXJlY3QuY29t&rh=d3d3LnNjaWVuY2VkaXJlY3QuY29t&ua=0f105d5d050b52035305&rr=92dd0a7b9b43db7a&cc=us