Proteotoxicity caused by perturbed protein complexes leads to hybrid incompatibility

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Title: Proteotoxicity caused by perturbed protein complexes leads to hybrid incompatibility

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Abstract (150 words, Font 12):
Dobzhansky-Muller incompatibilities represent a major driver of reproductive isolation between species. They are caused when two or more interacting components encoded by alleles from different species cannot function properly when mixed. At incipient stages of speciation, complex incompatibilities involving multiple genetic loci with weak effects are frequently observed, but the underlying mechanisms remain elusive. We observed perturbed proteostasis leading to compromised mitosis and meiosis in *Saccharomyces cerevisiae* hybrid lines carrying one or two chromosomes from *Saccharomyces bayanus*. Levels of proteotoxicity are correlated with the number of protein complexes on replaced chromosomes and can be alleviated or aggravated, respectively, by up- or down-regulating the ubiquitin-proteasomal degradation machinery. Using proteomic approaches, we detect destabilized multi-protein complexes in a hybrid line. However, hybrid fitness can be significantly improved by rescuing small ribosomal subunits, a primary destabilized complex. Our findings reveal the general role of impaired protein complex assembly in complex incompatibilities.

Purpose: Peer-review publication

Design/Methodology/ Approach: Molecular and Cell biology, Transcriptomics and Proteomics

Findings: Unbalanced proteostasis leads to hybrid incompatibility, a novel molecular mechanism for speciation at the incipient stage.

Research Limitations/ implications:

Originality/ Value: It can provide insight into how new lineages are formed from hybrids. This is the first study discovering how new lineages begin to develop from introgressed hybrids.

Keywords: speciation, genetic incompatibility, proteostasis, protein complex, proteotoxicity, epistasis.

Description: