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EVOLUTION

Proteins partner up in a vigorous relationship

The hybridization between two species can result in the offspring being fitter than the parents and can therefore have a role in the development of novel adaptive traits. Until recently, such hybrid vigour has been attributed to the resultant allelic variation and altered transcriptional networks. However, it is known that hybrid species are able to form interspecies chimeric protein complexes, and in a recent study, Piatkowska *et al.* shows that these contribute to fitness effects.

The *Saccharomyces sensu stricto* yeasts are excellent models in which to study the effect of hybridization — they are a diverse monophyletic group that cross to form stable hybrids which inhabit new ecological niches. From this group of species, the authors crossed either *Saccharomyces mikatae* or *Saccharomyces uvarum* with a range of *Saccharomyces cerevisiae* strains that each carried an affinity-tagged subunit in one of six protein complexes that they had chosen to study. The authors used this tag to purify protein complexes and identified constituent subunits using mass spectrometry.

Four of the six complexes that were studied could form chimeric complexes (that is, complexes containing protein subunits from both parental strains). The authors attributed the lack of formation of interspecies proteins by the other two protein complexes to incompatible changes in protein interfaces or to stoichiometric imbalances.

Such chimeric protein complexes are postulated to be suboptimal owing to the divergent evolutionary history of the proteins. However, by engineering different combinations of the complex components in different genetic backgrounds, the authors were able to show that the chimeric complexes were able to confer positive fitness effects in relevant environmental niches. For example, some chimeric Trp2–Trp3 complexes, which are involved in the first step of tryptophan biosynthesis, were able to confer more rapid growth in medium that lacks tryptophan relative to either parental complex.

It will be interesting to see how commonly hybrid vigour is caused by the fitness changes that are conferred by chimeric protein complexes, and how this mechanism interacts with the other postulated causes of hybrid vigour.

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ORIGINAL RESEARCH PAPER Piatkowska, E. M. *et al.* Chimeric protein complexes in hybrid species generate novel phenotypes. *PLoS Genet.* http://dx.doi.org/10.1371/journal.pgen.1003836 (2013)