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Systems Biology: A new approach to industrial yeast strain development

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The ability to interrogate genome-wide biological datasets as part of a Systems biology framework is poised to revolutionize the development of industrial microorganisms such as the yeast *S. cerevisiae*. Over recent years, laboratory strains of *S. cerevisiae* have been applied at the cutting edge of Systems Biology research. However, relative to laboratory strains, industrial *S. cerevisiae* strains, such as those used in baking, brewing, winemaking and biofuel production, display very distinct phenotypes, such as increased stress tolerance and the production of key secondary metabolites, that are critical for industrial applications. Consistent with this phenotypic diversity there is considerable genomic variation that separates industrial and laboratory strains of *S. cerevisiae*, including both single nucleotide polymorphisms and clusters of strain-specific ORFs. Given the intellectual and economic benefits that fundamental understanding of industrial yeasts will provide, we have undertaken a collaborative Systems Biology investigation of industrial wine yeast fermentation. Comparative genomic, transcriptomic (RNAseq), proteomic (2D-gels and iTRAQ) and metabolomic (targeted and non-targeted metabolomic profiling and flux balance analysis) data have been collected for wine yeast under model winemaking conditions. These data are being analyzed with aim of modeling an industrial fermentation for the development of improved strains for industrial application.

Biography

Cristian Varela is a Research Microbiologist at the AWRI, leading the Low-Ethanol Project. He completed his undergraduate degree in Biochemistry at the Catholic University of Chile where he also completed a Master degree in Biochemistry and a Ph.D. in Chemical Engineering and Bioprocesses. Cristian joined the AWRI in 2004 and his main research interests are to understand yeast metabolic networks and the interaction between gene expression, protein levels and metabolite concentrations, i.e. Systems Biology.

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