

## GEPHE SUMMARY

<p>GAL1 (<a +gal1+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=">https://www.gephebase.org/search-criteria?/and+Gene+Gephebase="+GAL1+"#gephebase-summary-title</a>)</p> <p>Published</p>	<p>Gephebase Gene</p> <p>Entry Status</p>	<p>GP00000385</p> <p>Courtier</p>	<p>GepheID</p> <p>Main curator</p>
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## PHENOTYPIC CHANGE

<p>Physiology (<a +physiology+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait+Category=">https://www.gephebase.org/search-criteria?/and+Trait+Category="+Physiology+"#gephebase-summary-title</a>)</p> <p>Carbohydrate metabolism (galactose) (<a +carbohydrate+metabolism+(galactose)+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait=">https://www.gephebase.org/search-criteria?/and+Trait="+Carbohydrate+metabolism+(galactose)+"#gephebase-summary-title</a>)</p> <p>Kluyveromyces lactis</p> <p>Saccharomyces cerevisiae</p> <p>Data not curated</p> <p>Intergenic or Higher (<a +intergenic+or+higher+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=">https://www.gephebase.org/search-criteria?/and+Taxonomic+Status="+Intergenic+or+Higher+"#gephebase-summary-title</a>)</p>	<p>Trait Category</p> <p>Trait</p> <p>Trait State in Taxon A</p> <p>Trait State in Taxon B</p> <p>Ancestral State</p> <p>Taxonomic Status</p>	<p>Taxon A</p> <p>Latin Name</p> <p>Kluyveromyces lactis (<a +kluyveromyces+lactis+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Kluyveromyces+lactis+"#gephebase-summary-title</a>)</p> <p>-</p> <p>Synonyms</p> <p>Kluyveromyces drosophilorum; Kluyveromyces lactis var. drosophilorum; Kluyveromyces lactis var. lactis; Kluyveromyces marxianus lactis; Kluyveromyces marxianus var. drosophilorum; Kluyveromyces marxianus var. lactis; ATCC 56498; ATCC:56498; CBS 2105; CBS 683; CBS:2105; CBS:683; NRRL Y-8278; NRRL Y-8279; NRRL:Y:8278; NRRL:Y:8279</p> <p>Rank</p> <p>species</p> <p>Lineage</p> <p>cellular organisms; Eukaryota; Opisthokonta; Fungi; Dikarya; Ascomycota; saccharomyceta; Saccharomycotina; Saccharomycetes; Saccharomycetales; Saccharomycetaceae; Kluyveromyces</p> <p>Parent</p> <p>Kluyveromyces () - (Rank: genus) (<a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4910">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4910</a>)</p> <p>NCBI Taxonomy ID</p> <p>28985 (<a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=28985">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=28985</a>)</p> <p>is Taxon A an Intraspecies?</p> <p>No</p>	<p>Taxon B</p> <p>Latin Name</p> <p>Saccharomyces cerevisiae (<a +saccharomyces+cerevisiae+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Saccharomyces+cerevisiae+"#gephebase-summary-title</a>)</p> <p>Common Name</p> <p>baker's yeast</p> <p>Synonyms</p> <p>Saccharomyces capensis; Saccharomyces italicus; Saccharomyces oviformis; Saccharomyces uvarum var. melibiosus; baker's yeast; S. cerevisiae; brewer's yeast; ATCC 18824; ATCC:18824; CBS 1171; CBS:1171; NRRL Y-12632; NRRL:Y:12632; Saccharomyces cerevisiae; Saccharomyce cerevisiae; Saccharomyes cerevisiae; Sccharomyces cerevisiae</p> <p>Rank</p> <p>species</p> <p>Lineage</p> <p>cellular organisms; Eukaryota; Opisthokonta; Fungi; Dikarya; Ascomycota; saccharomyceta; Saccharomycotina; Saccharomycetes; Saccharomycetales; Saccharomycetaceae; Saccharomyces</p> <p>Parent</p> <p>Saccharomyces () - (Rank: genus) (<a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4930">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4930</a>)</p> <p>NCBI Taxonomy ID</p> <p>4932 (<a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4932">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4932</a>)</p> <p>is Taxon B an Intraspecies?</p> <p>No</p>
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## GENOTYPIC CHANGE

<p>GAL1</p> <p>KLLA0F08393g</p> <p>284590.XP_455461.1 (<a href="http://string-db.org/newstring.cgi/show_network_section.pl?identifier=284590.XP_455461.1">http://string-db.org/newstring.cgi/show_network_section.pl?identifier=284590.XP_455461.1</a>)</p>	<p>Generic Gene Name</p> <p>Synonyms</p> <p>String</p> <p>Sequence Similarities</p> <p>GO - Molecular Function</p> <p>GO - Biological Process</p>	<p>UniProtKB Kluyveromyces lactis (strain ATCC 8585 / CBS 2359 / DSM 70799 / NBRC 1267 / NRRL Y-1140 / WM37)</p> <p>P09608 (<a href="http://www.uniprot.org/uniprot/P09608">http://www.uniprot.org/uniprot/P09608</a>)</p> <p>GenebankID or UniProtKB</p> <p>CAA84962 (<a href="https://www.ncbi.nlm.nih.gov/nuccore/CAA84962">https://www.ncbi.nlm.nih.gov/nuccore/CAA84962</a>)</p> <p>Belongs to the GHMP kinase family. GalK subfamily.</p> <p>GO:0005524 : ATP binding (<a href="https://www.ebi.ac.uk/QuickGO/term/GO:0005524">https://www.ebi.ac.uk/QuickGO/term/GO:0005524</a>)</p> <p>GO:0004335 : galactokinase activity (<a href="https://www.ebi.ac.uk/QuickGO/term/GO:0004335">https://www.ebi.ac.uk/QuickGO/term/GO:0004335</a>)</p> <p>GO:0005534 : galactose binding (<a href="https://www.ebi.ac.uk/QuickGO/term/GO:0005534">https://www.ebi.ac.uk/QuickGO/term/GO:0005534</a>)</p>
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GO:0006012 : galactose metabolic process  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006012>)

GO - Cellular Component

GO:0005737 : cytoplasm (<https://www.ebi.ac.uk/QuickGO/term/GO:0005737>)

Presumptive Null

No ([#gpepbase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive+Null+No))

Molecular Type

Cis-regulatory ([#gpepbase-summary-title](https://www.gephebase.org/search-criteria?/and+Molecular+Type+ Cis-regulatory))

Aberration Type

Complex Change ([#gpepbase-summary-title](https://www.gephebase.org/search-criteria?/and+Aberration+Type+Complex+Change))

Molecular Details of the Mutation

Helical phasing of GAL4 elements in promoter region following duplication

Experimental Evidence

Candidate Gene ([#gpepbase-summary-title](https://www.gephebase.org/search-criteria?/and+Experimental+Evidence+Candidate+Gene))

Main Reference

Gene duplication and the adaptive evolution of a classic genetic switch. (2007) (<https://pubmed.ncbi.nlm.nih.gov/17928853>)

Authors

Hittinger CT; Carroll SB

Abstract

How gene duplication and divergence contribute to genetic novelty and adaptation has been of intense interest, but experimental evidence has been limited. The genetic switch controlling the yeast galactose use pathway includes two paralogous genes in *Saccharomyces cerevisiae* that encode a co-inducer (GAL3) and a galactokinase (GAL1). These paralogues arose from a single bifunctional ancestral gene as is still present in *Kluyveromyces lactis*. To determine which evolutionary processes shaped the evolution of the two paralogues, here we assess the effects of precise replacement of coding and non-coding sequences on organismal fitness. We suggest that duplication of the ancestral bifunctional gene allowed for the resolution of an adaptive conflict between the transcriptional regulation of the two gene functions. After duplication, previously disfavoured binding site configurations evolved that divided the regulation of the ancestral gene into two specialized genes, one of which ultimately became one of the most tightly regulated genes in the genome.

Additional References

## RELATED GEPHE

No matches found.

Related Genes

No matches found.

Related Haplotypes

## EXTERNAL LINKS

## COMMENTS

@Duplication