



# Strain Improvement



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Using classical and/or recombinant strain improvement techniques, we genetically manipulate microorganisms to enhance their ability to synthesize a specific product or perform a specific function. These services can stand alone or be integrated with our process development and scale-up services.

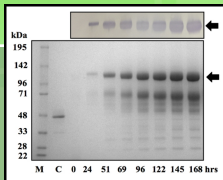
*No matter what technique you prefer, BTR provides the custom strain improvement services you're looking for.*



## Classical Strain Improvement

Natural products such as antibiotics, secondary metabolites or proteins are made in native microorganisms. Classical strain improvement programs at BTR can increase the titer or productivity of these compounds using the following proven techniques:

- Mutation by irradiation or chemical mutagen
- Enrichment or selection for improved mutants
- Rational selection using structural analogues or inhibitors
- Agar plate screens using indicator media or inhibition assays
- Generation of auxotrophic, catabolite repression resistant or constitutive mutants
- Selection for strains blocked in competing pathways



## Recombinant Strain Improvement

BTR utilizes recombinant approaches to amplify single genes for protein expression projects or manipulate entire biosynthetic pathways using gene integration and knockout techniques for metabolic engineering programs. We offer a variety of non-proprietary host strains.

Successful recombinant programs have been completed with the following host strains:

- *Escherichia coli*
- *Bacillus subtilis*
- *Saccharomyces cerevisiae*
- *Pichia pastoris*
- *Trichoderma reesei*

BTR also has experience in the previously, but no longer offered, proprietary expression systems:

- *Hansenula polymorpha* (Artes Biotechnology)
- *Bacillus licheniformis* (DSM)
- *Myceliophthora thermophila* C1 (p.k.a., *Chrysosporium lucknowense* C1) (Dyadic)