

## Bialaphos

### Introduction

Bialaphos is a tripeptide antibiotic naturally produced by a few species of the soil bacteria *Streptomyces*. It is made up of two alanine residues and the glutamic acid analog phosphinothricin, also called glufosinate. Inside the cell, peptidases release the phosphinothricin compound, enabling it to inhibit normal nitrogen metabolism and causing an accumulation of intracellular ammonia. The *pat* gene from *Streptomyces viridochromogenes*, or the *bar* gene from *Streptomyces hygroscopicus*, encode enzymes that modify phosphinothricin and detoxify the compound, conferring cellular resistance to bialaphos as well as phosphinothricin or glufosinate.

### Additional Information

Bialaphos has most commonly been used in plant molecular biology to select for genetically engineered cell lines containing one of the resistance genes. Bialaphos has increasingly become an important drug selection for yeast genetics as well. Yeast cells carrying the *pat* gene grow in the presence of bialaphos, and resistance is a dominant trait. Bialaphos resistance can be used in combination with auxotrophic yeast markers as well as other dominant selectable drugs like hygromycin B or kanamycin. Dominant drug resistant markers like bialaphos-resistance are especially useful in studies involving wild or industrial yeast strains that are often prototrophic for the most common yeast nutritional markers. Resistance to bialaphos is also an efficient way to identify diploid progeny from crosses between haploids lacking compatible auxotrophic markers. Cells resistant to bialaphos have no detectable growth disadvantage, and therefore can be used in competition experiments or for monitoring other processes dependent on metabolic state. Finally, the *pat* gene is heterologous to the yeast genome, therefore inappropriate integration or recombination is unlikely.

### References

- Goldstein, A.L. & McCusker, J.H. (1999). Three new dominant drug resistance cassettes for gene disruption in *Saccharomyces cerevisiae*. *Yeast* 15, 1541-1553
- Sadowski, I., Lourenco, P. & Parent, J. (2008). Dominant marker vectors for selecting yeast mating products. *Yeast* 25, 595-599.
- Tan, S., Evans, R. & Singh, B. (2006). Herbicidal inhibitors of amino acid biosynthesis and herbicide-tolerant crops. *Amino Acids* 30, 195-204.