Technical Data Sheet

IPTG

for biochemistry

Order number: **1122**

Isopropyl-β-D-thiogalactopyranoside, or IPTG, is an artificial, non-metabolizable inducer of the *lac* operon[1] of *E. coli*. IPTG causes the *lac* repressor to detach from the operator, allowing transcription of genes in the *lac* operon. These genes include the *lacZ* gene, which encodes ß-galactosidase[2] and is probably the most widely used reporter gene in molecular biology research.

Uptake of IPTG into *E. coli* cells occurs via various transport pathways and does not depend (solely) on the ß-galactoside permease (*lacY*).

IPTG is soluble in water as well as in organic solvents such as ethanol (20 mg/ml), methanol, DMSO and DMF. For molecular biology applications, the stock solution should be prepared in water to avoid possible physiological effects of the solvents on the cells.

Application

Since IPTG abolishes the inhibitory effect of the *lac* repressor, it is used for the controlled induction (i.e. selective "switching on") of the transcription of genes that are under the control of the *lac* promoter. Often, these are gene products composed of the actual target gene and ß-galactosidase (as a reporter). *E. coli* clones that carry the *lacZ* reporter gene construct (genome- or plasmid-encoded) can be easily selected by blue/white screening (using X-Gal as substrate). The activity of ß-galactosidase can be quantified in an enzyme assay using ONPG as a substrate.

Stock solution: 0.1 M (23.8 mg/ml) in water; sterile filtered

Working concentration: 0.1 - 1 mM

Storage

IPTG is very stable as a solid, even at room temperature. For long-term storage, we nevertheless recommend a temperature of -20°C. IPTG stock solutions should be stored in aliquots at -20°C to avoid repeated freeze-thaw cycles.

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[1] The *lac* operon encodes the genes required by *E. coli* for the uptake and degradation of lactose. Naturally, transcription of the *lac* genes is induced by allolactose, a lactose isomer. IPTG, like allolactose, binds to the *lac* repressor, releasing the tetrameric repressor from the *lac* operator. However, unlike allolactose, IPTG cannot be metabolized by the cells, which causes the IPTG concentration in the cell to be kept constant.

[2] ß-galactosidase is a hydrolase. It cleaves lactose into galactose and glucose and also converts lactose into allolactose. Since ß-galactosidase can also hydrolyse artificial substances, such as ONPG and X-Gal, releasing colored end products, the *lacZ* gene is very often used as a reporter gene in molecular biology.

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