

# JM

## Product guide: Cofactor regeneration

**JM** Johnson  
Matthey



## Glucose dehydrogenase

Glucose dehydrogenase (GDH) catalyses the oxidation of D-glucose to D-glucoactone, while reducing in turn  $\text{NAD}^+$  or  $\text{NADP}^+$  to  $\text{NADH}$  and  $\text{NADPH}$ . The product of this reaction, D-glucoactone, spontaneously and irreversibly hydrolyses in water to gluconic acid, favouring the formation of reduced  $\text{NADH}$  and  $\text{NADPH}$ .

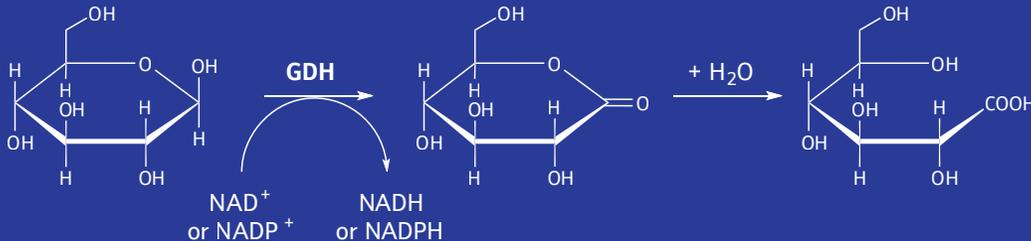
Several examples are available in the literature where GDH is used as an efficient system for cofactor regeneration at large-scale. The main factors include its cheap substrate, the favourable reaction equilibrium towards the reduced cofactor, and the high activity and stability of GDH in a wide range of reaction conditions.

Three GDHs are provided in the JM kit.

**GDH-101** is a "general purpose" GDH. It accepts both  $\text{NAD}^+$  and  $\text{NADP}^+$  cofactors, is stable between pH 6 and 9, and is active at temperatures up to  $50^\circ\text{C}$ .

**GDH-5** accepts both  $\text{NAD}^+$  and  $\text{NADP}^+$  however, it has a remarkable activity with  $\text{NADP}^+$ , making an interesting alternative to GDH-101 if the enzyme of choice prefers  $\text{NADP}^+$  as cofactor. Its pH optimum is between 6.5 and 9.0.

**GDH-8** accepts only  $\text{NADP}^+$  as a cofactor and is most active at alkaline pH, especially between pH 9 and 12.



## Formate dehydrogenase

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Formate dehydrogenase (FDH) oxidises formate to carbon dioxide while reducing in turn  $\text{NAD}^+$  to NADH. Carbon dioxide leaves the reaction media as a gaseous molecule, favouring NADH cofactor regeneration.

FDH is especially interesting for biocatalytic applications because, unlike GDH, no residual side products remain in the reaction as carbon dioxide evaporates.

One FDH is provided in the JM kit.

**FDH-102** is active at pH between 6.0 and 9.0 and accepts only  $\text{NAD}^+$  as cofactor.

