

Establishment of platform technology for monosaccharides bioconversion

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Monosaccharides have recently attracted much attention due to their many uses, such as low-calorie sweeteners, bulking agents, immunosuppressants in allogenic orthotopic liver transplantation, and potential inhibitors of various glycosidases, ischemia/reperfusion injury of the rat liver, and segmented neutrophil production without other detrimental clinical effects. Monosaccharides can be made by enzymatic reactions with ketose epimerase, aldose isomerase, aldose-phosphate isomerase, aldose reductase, and oxidoreductase. In this study, library of sugar-converting enzymes for monosaccharides conversion is constructed, their biochemical properties and substrate specificities are investigated, new sugar-converting enzymes are obtained from naturally occurring enzymes using protein engineering, and the production of monosaccharides is attempted using these enzymes. Increases in the production of monosaccharides are realized by directed evolution and rational protein design, based on homology models or the determined structure of the enzymes. These approaches can establish platform technology of monosaccharides bioconversion.