CRITICAL ROLE OF METALS IN BIOCHEMICAL PROPERTIES OF XYLOSE ISOMERASE

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Improving the activity of xylose isomerase (XI) is highly desired for achieving efficient fermentation of xylose in lignocellulosic biomass using XI-expressing *S. cerevisiae*. XI is a metalloenzyme which requires two bivalent metals for its catalytic activity. The enzyme from *Piromyces* sp. E2 (PirXI)[1],[2] is activated with various metal ions including Mg^{2+}, Mn^{2+}, Ca^{2+}, Co^{2+}, Zn^{2+} and Fe^{2+}. The biochemical properties of PirXI are dependent on the types of its metal cofactors. Moreover, the enzyme shows different affinities towards these metals. Characterization of these properties is critical for understanding the enzyme behavior *in vivo* and to further adapt the enzyme to the cytosolic metal environment. Recently, we have shown that altered intracellular metal composition can improve anaerobic growth of a xylose-fermenting strain by enhancing the activity of PirXI[3]. Furthermore, our current study on PirXI and other studies on different XIs have shown that it is also possible to change the metal preferences of the enzyme[4]. A PirXI variant with a single amino acid substitution in the proximity of the metal binding residues showed significant changes in metal preference compared to the wild-type PirXI. Further exploration on metal specificity of PirXI is necessary to optimize the *in vivo* enzyme activity.

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