Structural and functional studies for blocking viral interactions through metalloproteins

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Concanavalin A has been investigated for its ability to bind to pathogens. Due to the potential value of ConA to diagnostic microbiology, its mechanisms of action have been extensively studied; however, studies have reported different binding affinities due to the formation of different complexes. Monomeric structure of ConA can provide crucial information, as most reported structures are dimers or tetramers.

We obtained a monomeric structure of ConA and revealed that metal coordination was a major cause of the carbohydrate-binding ability. When this structure was superimposed with apo-ConA, the conformational change in N14, a calcium-coordination residue, triggered other carbohydrate-binding residues. This result elucidates the mechanisms by which Ca^{2+} is crucial for sugar-binding while the elimination of Mn^{2+} would not affect sugar-binding. This study revealed the sequential mechanisms by which metal coordination affects sugar-binding residues. This analysis provides basic information for the controlling of ConA structure and a specific condition of crystallization indicates possible condition for the designing of diagnostic kit that can recognize pathogens, selectively.