

X-ray Crystallographic Study of hen lysozyme- HyHEL-10 Fv Mutant Complexes: II. Hydrogen Bonds via Interfacial Water Molecules

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Hydrogen bonds via interfacial water molecules have been observed in several protein-ligand interactions. In order to address the role of the hydrogen bond formation in the interaction between protein antigen and the fragments of antibody variable regions termed as Fv, the interaction between hen egg-white lysozyme (HEL) and its monoclonal antibody HyHEL-10 has been focused on, and three Fv mutants (Tyr50LPhe, Ser91LAla, and Ser93LAla) have been constructed.

Thermodynamic analyses of the interactions between mutant constructed and HEL have indicated that the mutation led to dramatic decrease in enthalpy changes, in part offset by decrease in entropy changes, leading to moderate decrease in affinity.

X-ray crystal structures of Fv fragment mutants complexed with its cognate antigen, HEL, have been solved. The overall structures of the complexes are similar to that of a previous report wild-type Fv fragment-HEL complex (PDB code:1C08, [1,2]). In addition, local structures around the mutated sites, including location of interfacial water molecules are almost the same as wild-type (Fig. 1). These results indicate that the role of hydrogen bond formation via interfacial water molecules can be discussed on the basis of thermodynamic analyses.

From these results, it could be concluded that hydrogen bond formation via interfacial water molecules made enthalpic contribution to the interaction. Upon comparison with other hydrogen bonds, e.g. side chain-side chain and main chain-side chain hydrogen bonds, these hydrogen bonds make less contribution to the interaction, due to

significant entropy loss of residing water molecules in the interface.

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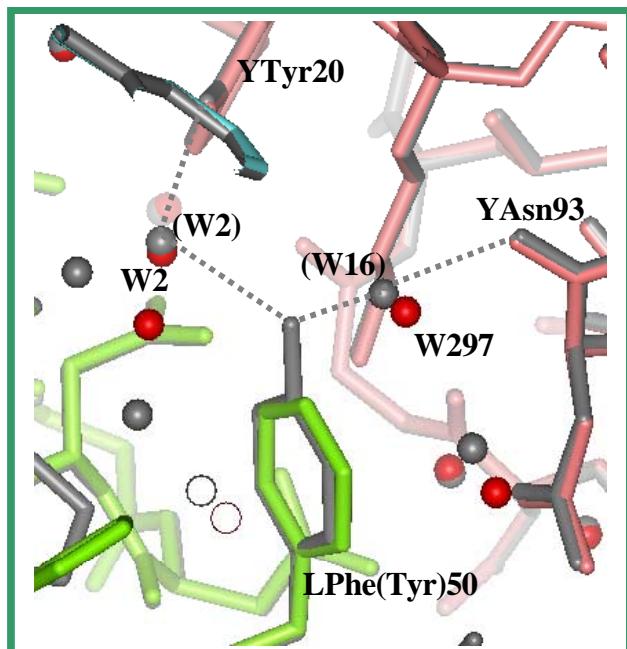


Fig. 1. The local structure of HyHEL-10 Tyr50LPhe mutant Fv-hen lysozyme complex.

References

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