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SUMMARY of
2021 RESEARCH RESULTS REPORT
For International Collaborative Research with IPR, Osaka University

Research Title		Complex structures of α-galactosidase with substrates and products
Applicant	**Name**	Chun-Jung Chen
	Affiliation	National Synchrotron Radiation Research Center
	Present Title	Scientist/Professor (Deputy Director)
Research Collaborator (Host PI)		Prof. Atsushi Nakagawa

Summary

α-galactosidases spread in microorganisms, plants, animals and human. α-galactosidases are the initial enzymes in the metabolic pathway of the raffinose and sachyose catabolism, which catalyze the hydrolysis of the terminal linked α-1,6-galactosyl residue from galacto-oligosacharides. The deficiency of α-Gal A in human was found involved in Fabry disease, a cause of the failure to catabolize α-D-galactosyl of sphingolipid in lysosome. The potential of a wide specificity of the hydrolase activity could be applied in food industries: to remove raffinose and to increase the yield of sucrose in beet sugar industry, to improve the gelling properties of galactomannans to be used as food thickeners, and to degrade the raffinose family sugars in food and feed materials and enzymotheraphy. The *apo*-structure of wild-type α-galactosidase was previously determined. In order to study and compare the differences of the catalytic binding sites among α-galactosidases, we have successfully determined two crystal structures of the α-galactosidase mutant in complex with various substrates and products using X-ray protein crystallography with the BL44XU beamline at SPring-8 under the collaboration with Prof. Atsushi Nakagawa at the Institute of Protein Research (IPR). The study provides the deep understanding of the functional subsites and catalytic mechanism of this enzyme. The paper has been submitted and currently under review.