

## Intestinal Immune Modulating Polysaccharides of *Atractylodes lancea* DC. Rhizomes

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A kind of traditional herbal prescription, Sip-Jeon-Dae-Bo-Tang (TJ-48), has been reported to improve the general condition of cancer patients receiving chemotherapy and/or radiation therapy, and to accelerate hematopoietic recovery from bone marrow injury by mitomycin C. In the present studies, we found that hot-water extract from *Atractylodes lancea* DC. rhizomes contributed mainly to intestinal immune modulating activity of TJ-48 on Peyer's patch cells mediated-hematopoietic response. After the fractionation, ALR-5 II a-1-1, 5 II b-2-2 and 5 II c-3-1 were further purified from crude polysaccharide fraction. Chemical analyses of each fraction indicated that ALR-5 II a-1-1 mainly contained arabinogalactan fraction whereas ALR-5 II b-2-2 and 5 II c-3-1 mostly comprised pectic polysaccharide fractions as the active polysaccharide ingredients. In order to analyze the essential structure of the activity, ALR-5 II a-1-1 was treated by sequential enzymatic digestion using *exo- $\alpha$ -L-arabinofuranosidase* and *exo- $\beta$ -D-(1 $\rightarrow$ 3)-galactanase*. Based upon the results of chemical and MALDI-TOF-MS analyses and activity on the digested fractions, the galactosyl side chains consisting of 6-linked Galf and Galp over tetrasaccharide in ALR-5 II a-1-1 might be responsible for the potent intestinal immune modulating activity. To characterize moiety of ALR-5 II c-3-1 for the expression of activity, *endo- $\alpha$ -D-(1 $\rightarrow$ 4)-polygalacturonase (GL-PGase)* purified from dried leaves of *Panax ginseng* digested ALR-5 II c-3-1. The results of structural analyses and activity on the digested fractions showed that PG-2, which structurally resembles to rhamnogalacturonan II (RG II), and PG-3 (galacturono-oligosaccharides) contained potent intestinal immune modulating activity. Further purification of the other acidic fraction (ALR-5 II b-2-2) indicated that ALR-5 II b-2-2Bb showed that the most potent activity. ALR-5 II b-2-2Bb also contained the unusual component sugars characteristics in RG-II as well as PG-2 derived from ALR-5 II c-3-1, but it could not be digested with GL-PGase. The present studies of relationship between structures and intestinal immune modulating activity of the active polysaccharides purified from *A. lancea* DC. rhizomes suggested that neutral galactosyl chains consisting mainly of (1 $\rightarrow$ 6)-linked Galf and Galp, and RG-II-like moiety with unique component sugars, such as 2-Me-Xyl, 2-Me-Fuc, Api, AceA, Kdo and Dha should play an important role in the potent intestinal immune modulating action of *A. lancea* DC. rhizomes.