EFFECTS OF D-ALLOSE, ONE OF RARE SUGARS, ON Fcγ RECEPTOR-MEDIATED FUNCTIONS OF MONONUCLEAR PHAGOCYTES

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Background. D-Allose, a C-3 epimer of glucose, is a rare monosaccharide, which can be mass-produced using the microorganism in Kagawa University recently. It has been shown that D-allose has anti-oxidant and anti-proliferative activities (Rare sugars in Kagawa 2006). However, its immunological effects on mononuclear phagocytes have not been well understood. We examined the effects of D-allose on antigen up-take and activation of T cells by macrophages and dendritic cells.

Materials and Methods. All cells necessary for this experiment were prepared from specific pathogen free BALB/c mice (12-20 weeks old). Peritoneal macrophages (PMs) were induced by intraperitoneal administration of 3% thioglycollate (TG) 4 days before collection, obtained by peritoneal lavage and washed in RPMI 1640 medium. The splenic dendritic cells (DCs) were prepared according to Leenen et al. (1998) and enriched by the Stainman's procedure (1983). Splenic T cells were purified by T cell recovery column (CEDARLANE). To determine Fcγ receptor (FcγR)-mediated phagocytosis, IgG-coated sheep red blood cells (SRBCs) labeled by PKH-2 fluorescent cell linker kit (Zynaxis Cell Science, Malvern, PA) were used. Non-specific phagocytosis was determined using fluorescent solid-latex beads of 1μm diameter (Polysciences, Inc. Warrington, PA). SRBCs or fluorescent latex beads were incubated with PMs for 30min at 37^{o}C in PBS with supplementation of 12.5mM sugar(s). Both FcγR-mediated and non-specific phagocytosis were measured by flow cytometer (EPICS XL, Coulter Corp., Miami, FL). Ingestion of BCG-anti-BCG (IgG) immune complexes (ICs) by DCs was assessed under the electron microscope. Activation of T cells was determined by cell proliferation (BrdU incorporation) using flow cytometry.

Results. FcγR-mediated phagocytosis by PMs was down-regulated in D-allose containing medium. However, non-specific phagocytosis was not significantly affected by D-allose. When BCG-anti BCG ICs were exposed to DCs in D-allose containing medium, internalization of ICs and proliferation of $CD4^+$ T cells were down-regulated.

Conclusions. Our studies showed that FcγR-mediated phagocytosis and endocytosis were down-regulated by D-allose. It was suspected that D-allose inhibited binding of ICs to FcγR on mononuclear phagocytes to decrease antigen presenting ability of DCs, so that apoptosis of $CD4^+$ T cells increased. It was suggested that D-allose depressed initiation of immunological process. Therefore, D-allose might be useful to reduce mononuclear phagocytes-mediated tissue damages.