Activation of Dendritic Cells by Soypeptide Lunasin: Implication in Vaccine Adjuvant

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Adjuvants enhance the immunogenicity of vaccines and improve the immune responses. Although many adjuvants are currently used in research, FDA approved aluminum salt (Alum) remains the most often used in human vaccines. Alum is known to promote the Th2 immune response and enhance antibody production, but is less efficient on eliciting Th1 and CTL cellular responses. Thus, it is prudent to improve the effectiveness of current adjuvants or to develop a novel alternative adjuvant. We have recently identified lunasin, a seed peptide from soybeans, as a novel immune modulator. The objective is to define the effectiveness of lunasin peptide as an adjuvant that can enhance the protective immunity of vaccines. Our studies have revealed stimulatory effects of lunasin on dendritic cells (DCs) by regulating expression of a number of genes that are important for immune responses. Lunasin-treated human conventional DCs (cDCs) not only expressed elevated levels of co-stimulatory molecules (CD86) but also exhibited up-regulation of chemokines (CCL2, CCL3, CCL4) and cytokine (IL-1β). To determine the function of lunasin-treated cDCs, these cells were co-cultured with allogeneic human peripheral blood CD4+ T cells for 7 days in the mixed lymphocyte reaction. Lunasin-treated cDCs induced almost 2-fold higher proliferation of allogeneic CD4+ T cells when comparing with a sham treatment. To verify the in vivo effects, lunasin was administered into mice. Increased CD86 expression was found in cDCs from spleens of mice treated with lunasin. Furthermore, mice vaccinated with lunasin-adjuvanted ovalbumin (OVA) had reduced tumor growth following challenging with OVA-expressing A20 B-lymphoma cells. Taken together, our data suggest that lunasin may act as a vaccine adjuvant by targeting DCs to enhance and modulate the immune responses to antigens.

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