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Immunomodulatory activity of *Plantago major* L. on IgM titer of mice

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Abstract

Immunomodulatory activity of four fractions from *Plantago major* L. (n-hexane, ethyl acetate, n-butanol and water) on titer of IgM has been carried out on mice, ex vivo. Each test sample was taken orally during 7 days, single dose, at 3 different level dose. Titer of IgM has been determined using agglutination method, 5 days after immunization with sheep red blood cell (SRBC). All of the fractions has capability in increasing the titer of IgM, but the highest activity resulted from n-hexane fraction.

Key words : immunomodulator, *Plantago major* L., titer of IgM

Introduction

Immune system is a combination of cells, molecules and tissues that play a role in resistance to various diseases, especially infections. Drugs which can restore the imbalance in the immune system called as immunomodulator. The immune system is divided into two categories: specific and non-specific, each consisting of cellular and humoral immune system. Complements, interferon, C-reactive protein (CRP) are some examples of non-specific humoral defense, while the antibody including specific humoral immune components. The main function of antibodies is a defense against viral infections and extra cellular bacteria, also neutralize its toxin (1).

Antibodies are formed through the theory of "Two Signal Theory", meaning that antibodies will be formed if there are 2 signals: the first one is derived from the bond between the APC/Antigen Presenting Cell (B lymphocytes, monocytes, macrophages) and T-helper (especially TH₂); the second, is derived from cytokines released by activated T-helper (2).

One of the plants whose immunomodulatory activities is *Plantago major* L. ("daun sendok"). Their activity are : chemotactic activity in neutrophils (3); increase NO & TNF- α production (4); enhance lymphocyte proliferation and secretion of IFN- γ (5); increase phagocytosis by monocytes and macrophages (6).

The activity of immune system components are interrelated, it is interesting to study the role of *P. major* L. in enhancing phagocytosis by monocytes and macrophages, and the ability to increase the production of antibodies. Based on "Two Signal Theory", it is predicted that *P. major* L. be able to increase the production of antibody, especially IgM as the primary antibody response.

This study have been conducted to investigate the immunomodulatory activity of *P. major* L. leaves on the formation of IgM, which is determined by measuring IgM titer. In order to guide the discovery of bioactive compounds, tests carried out on chemical fractions of *P. major* L. leaves, i.e.: n-hexane, ethyl acetate, n-butanol and water.

Methodology

Materials

Materials are the : leaves of *Plantago major* L. (obtained from the Village Tlekung, District Jungrejo, Batu; determination conducted by the Center for Information and Development of Traditional Medicine, UBAYA), methanol, grade (Mallinckrodt), n-hexane (Riedel-dehaen), ethyl acetate (Merck), n-butanol, Aqua bidestilata (Ikapharmindo Putramas), CMC Na, normal saline (B. Braun) and sheep red blood cells (SRBC).

Test animals are mices, BALB/c strain, male and female, aged 1-2 months (obtained from Laboratory of Pharmacology, Faculty of Pharmacy, UBAYA).