



Opinion

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Potential of *Lactobacillus Casei* Subsp. *Casei* R-68 Isolated from Dadih to Prevent Cancer



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Abstract

Cancer is one of the leading causes of deaths worldwide including Indonesia. Factors causing the disease include sexual behavior, infection, medical drugs, food additive, smoking, radiation, UV rays and diet. Lactic acid bacteria can be used to prevent cancer. The cancer prevention mechanism by LAB includes the binding of mutagen and carcinogen compounds by lactic acid bacteria cells and peptidoglycan of the LAB cell wall, enhancement of immune system, inhibition of the growth of pathogenic bacteria producing pro-carcinogen enzymes that convert pro-carcinogen compounds into carcinogens.

Keywords: *Lactobacillus casei* subsp; Casei R-68; Cancer; Antimutagenicity; Mutagen; Carcinogen

Introduction

Cancer is one of the 5th largest causes of human death in the world and the seventh in Indonesia. According to data from Fundamental Health Research of the Indonesian Health Ministry that the prevalence of death from cancer in Indonesia is 1.4 per 1000 population in 2013. Factors causing the disease include sexual behavior, infection, medical drugs, food additive, smoking, radiation, UV rays and diet. Among the factors causing this diet is a major factor causing the occurrence of cancer. This is supported by the findings of various types of mutagenic and carcinogenic compounds isolated from various types of food, especially foods containing high protein heated in high temperature. These compounds are also formed from the reaction of amino acids such as tryptophan and glutamic acid heated in high temperature. This compound is known as heterocyclic amines namely, Trp-P1 (3-amino-1,4-dimethyl-5 H-pyrido (4,3-b) indole), Trp-P2 (3-amino-1-methyl-5 H-pyrido (4,3-b) indole), Glu-P1 (2-amino-6-methyldipyrido (1,2-a: 3', 2'-d) imidazole), Glu-P2 (2-aminodipyrido (1,2-amino 9H-pyrido (2,3-b) indole), MeAαC (2-amino-3-methyl-α-carboline). These mutagen compounds generally formed from protein-rich foods such as meat and fish treated with high heating (roasting and frying process) [1].

Cancer cells are formed from normal cells in a complex process called "transformation", which consists of two stages of initiation and promotion. At the initiation stage, there is a change in the genetic material (DNA) of the cell that is triggered by mutagen and carcinogens compounds to provoke the formation

of abnormal cells. At the promotion stage, an initiated cell will turn into cancer cells. In general, the prevention of cancer can be done through the application of:

- Good lifestyle such as avoiding cigarettes, keep the weight to stay ideal, exercise regularly.
- Maintain a good diet such as limiting intake or if need not drink alcohol, consume fruit, vegetables and functional foods.
- Pay attention to environmental conditions such as avoiding continuous exposure to sunlight and avoid exposure and intake of cancer-causing mutagen and carcinogen compounds.

Probiotics such as lactic acid bacteria and Bifidobacterium sp. can prevent the mutation of cells caused by mutagens and carcinogens. *Lactobacillus casei* subsp. *casei* R-68 isolated from dadih, a kind of fermented food made from buffalo milk in Bukittinggi West Sumatra. Based on its morphology, *Lactobacillus casei* is short rod in single or chain cells with size length 1.5-5.0mm and width 0.6-0.7mm. This bacterium is a gram-positive bacterium, negative catalase, not form endospores or capsules, has no flagella and grows well under facultative anaerobic conditions. Based on its growth temperature, these bacteria belong to the mesophyll group that can grow at temperature of 15-41°C and at pH of 3.5 to 7.0. The optimum condition of the growth is at 37°C and pH 6.8 [2]. This bacterium was resistant to stomach acids and

bile acids [3]. *Lactobacillus casei* is a probiotic bacteria because it can improve health for the host. This bacterium can improve digestive function by producing lactic acid which can decrease the amount of harmful pathogenic bacteria in the digestive tract. Thus, *Lactobacillus casei* can prevent diseases and disorders associated with the digestive tract such as diarrhoea, constipation and prevent from harmful diseases such as cancer.

Mechanisms of prevention include the binding of mutagen and carcinogen compounds by lactic acid bacteria (LAB) cells, enhancement of immune system, inhibition of the growth of pathogenic bacteria producing pro-carcinogen enzymes that convert pro-carcinogen compounds into carcinogens. Extracellular polysaccharide compounds produced by LAB and Bifidobacterium sp. during their growth also have antimutagenic and antitumor activities. In addition, the antimutagenic compounds of fermented milk are caused by casein contained in fermented milk products. However, the percentage of inhibition of mutagenicity by casein is very low compared with LAB cells [4].

Based on the previous study, it was found that the antimutagenic mechanism of *Lactobacillus casei* subsp. casei R-68 is carried out by binding to mutagen and carcinogen compounds in the digestive tract especially in the small intestine and colon. Most mutagenic and carcinogen compounds are bound by peptidoglycan of the LAB cell wall [5,6], which is then excreted with feces and/or urine. Thus, mutagenic compounds and carcinogens do not attack the cells of the human body so as not to form cancer cells. *Lactobacillus casei* subsp. casei R-68 was able to inhibit the mutations of several mutagen and carcinogenic compounds such as NDMA (N-nitrosodimethylamine), NPYR (N-nitroso-pyrrolidine), NPIP (N-nitrosopiperidine), Trp-P1 and Trp-P2 [1]. Besides by binding of mutagen to cells, antimutagenic and/or antitumor mechanisms of *Lactobacillus casei* subsp. casei R-68 was also performed

by inhibiting the activity of pro-carcinogen enzymes such as β -glucuronidase and β -glucosidase, and inhibiting the growth of *E. coli* and *L. monocytogenes*, two types of pathogenic bacteria producing enzymes that convert pro-carcinogen compounds into carcinogens. The decrease in the number of procarcinogen enzymes is caused by the decrease in the number of enzyme-producing bacteria [7].

Various commercial functional food products sold in Indonesia generally still use probiotics from outside the country, although the production process has been done in Indonesia. Local isolate *Lactobacillus casei* subsp. casei R-68 potentially used as a starter to produce probiotic fermented milk and cocoghurt commercially.

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