STUDI PEMANFAATAN STRAIN PROBIOTIK DALAM PRODUK SUSU FERMENTASI SEBAGAI AGENSIA ANTIHIPERLIPIDEMIA DAN ANTIHIPERGLIKEMIA PADA TIKUS MODEL DIABETES

INTISARI

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Penelitian ini bertujuan untuk menguji kemampuan strain bakteri asam laktat (BAL) asal manusia dan susu kambing Peranakan Etawa dalam produk susu fermentasi sebagai agensia antihiperglikemia dan antihiperlipidemia pada tikus Sprague Dawley (SD). Penelitian terdiri dari tiga tahapan, yaitu pengujian kualitas susu fermentasi, pengujian produk secara *in vivo* pada tikus percobaan dan pengamatan ekspresi sel beta pankreas penghasil insulin. Tahap pertama adalah pembuatan susu fermentasi menggunakan kultur starter *Pediococcuss acidilactici* strain BE dan *Pediococcus pentocaseus* strain M103. Parameter yang diukur dari produk susu fermentasi yang dihasilkan meliputi viskositas, sineresis, total BAL, pH, kadar keasaman, *free fatty acid* (FFA), lemak, protein, laktosa, air, aktivitas antioksidan dan profil SCFA. Tahap kedua penelitian adalah pengujian produk susu fermentasi pada kelompok tikus percobaan yang meliputi: (P1) Tikus diberi pakan basal, (P2) Tikus diberi pakan tinggi lemak kemudian induksi streptozotocin (STZ), (P3) Tikus diberi pakan tinggi lemak, induksi STZ dan diberi susu fermentasi (*P. acidilactici* BE) sebanyak 2 ml (10^8 CFU/mL), (P4) Tikus diberi pakan tinggi lemak, induksi STZ dan diberi susu fermentasi (*P. pentocaseus* M103) dan (P5) Tikus diberi pakan tinggi lemak, induksi STZ dan diberi metformin (sebagai kontrol). Induksi hiperglikemia menggunakan STZ dengan dosis 40 mg/BB. Variabel yang diukur antara lain berat badan, kadar glukosa, profil lipid (kadar kolesterol total, trigliserida, LDL dan HDL) dan total koloni BAL dalam feses. Tahap ketiga penelitian yaitu pewaraan imunohistokimia pada preparat pankreas tikus. Variabel yang diamati yaitu ekspresi sel beta pankreas penghasil insulin. Data penelitian dianalisis menggunakan *One-Way* ANOVA. Hasil pengujian menunjukan bahwa perbedaan kultur starter susu fermentasi berpengaruh nyata ($P<0,05$) terhadap pH, keasaman, viskositas dan aktivitas antioksidan, namun tidak berpengaruh nyata ($P>0,05$) terhadap kadar laktosa, lemak, protein, air, sineresis dan total BAL. Perlakuan pemberian susu fermentasi dengan starter *P. acidilactici* strain BE selama 15 hari berpengaruh nyata ($P<0,05$) terhadap penurunan kadar glukosa, trigliserida, LDL dan total BAL dalam feses. Namun tidak berpengaruh nyata ($P>0,05$) terhadap penurunan kolesterol maupun peningkatan HDL. Hasil pengamatan histologi menunjukan adanya perbaikan pada struktur sel beta pankreas dibanding dengan kelompok kontrol negatif (P2) dan kontrol positif (P5).

Kata kunci: Strain BAL, susu fermentasi, antihiperglikemia, antihiperlipidemia

STUDIES ON ANTIHYPERGLYCEMIA AND ANTIHYPERCHOLESTEROLEMIA IN DIABETES RATS MODEL USING PROBIOTICS STRAINS

ABSTRACT

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The present study aims to evaluate the ability of lactic acid bacteria (LAB) isolated from human and goat milk in fermented milk as an anti-hyperglycemia and anti-hyperlipidemia agent. This study consists of three steps; evaluation of psycho-chemical quality in fermented milk, in vivo evaluation on rats model, and histologic observation of pancreatic beta cells. The first step was making fermented milk using *Pediococcuss acidilactici* strain BE and *Pediococcus pentocaseus* strain M103 as a starter culture. In this stage, we evaluate pH, acidity, viscosity, antioxidant activity, lactic acid bacteria counts, syneresis, lactose, fat, proteins, water content and SCFA profile of the fermented milk. The second step was the evaluation of the fermented milk in the rats model. Rats were randomly assigned into five different groups: (P1) was fed basal diet; (P2) was fed high fat diet followed by STZ injection; (P3) was fed high fat diet followed by STZ injection and 2 ml (10^8 CFU/mL) of fermented milk by *P. acidilactici* BE for 15 days; (P4) was fed high fat diet followed by STZ injection and 2 ml (10^8 CFU/mL) of fermented milk by *P. pentocaseus* strain M103 for 15 days; (P5) was fed high fat diet followed by STZ injection and metformin (45 mg/kg) for 15 days. Hyperglycemia induction was performed by injecting 40 mg/Kg BB STZ on the rats model. Blood and feces samples were collected to determine glucose level, lipid profile (total cholesterol, triglyceride, LDL, and HDL), and total lactic acid bacteria counts. The third step of this study was the observation of immunoreactive beta cells expression. Data were analyzed with One-Way ANOVA. Results showed that the culture starter differences significantly affect the pH, acidity, viscosity, and antioxidant activity of fermented milk, but on the other hand, it didn't affect the lactic acid bacteria counts, syneresis, lactose, fat, proteins, and water content. Treatment with *P. acidilactici* BE fermented milk for 15 days exhibited a significant decrease in glucose, triglyceride, and LDL level, as well as an increase in total lactic acid bacteria, count in rat feces. But it didn't significantly affect the decrease in total cholesterol or the increasing level of HDL. Histologic observation results showed that rats with *P. acidilactici* BE fermented milk treatment have better regeneration of beta cells compared with the negative control (P2) and positive control (P5) group.

Keyword: LAB strain, fermented milk, antihyperglicemia, antihyperlipidemia