

**EFEK PEMBERIAN KEFIR SUSU KAMBING BERBAGAI DOSIS
TERHADAP KADAR ALT DAN AST TIKUS PUTIH (*Rattus norvegicus*)
GALUR WISTAR MODEL DIABETES MELITUS TIPE 2**

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ABSTRAK

Pendahuluan: Diabetes melitus tipe 2 (DMT2) merupakan gangguan metabolik kronis yang ditandai hiperglikemia akibat resistensi insulin dan kerusakan sel beta pankreas. Kondisi ini dapat memicu berbagai komplikasi, salah satunya inflamasi hepatik yang ditandai dengan peningkatan kadar enzim *alanine transaminase* (ALT) dan *aspartate transaminase* (AST). Peningkatan kadar enzim ini berhubungan dengan stres oksidatif dan inflamasi pada hati yang dapat memperburuk kondisi DMT2. Kefir susu kambing mengandung probiotik yang memiliki potensi antiinflamasi. Penelitian ini bertujuan untuk mengetahui pengaruh pemberian kefir susu kambing berbagai dosis terhadap kadar ALT dan AST pada tikus Wistar model DMT2.

Metode: Desain penelitian ini menggunakan eksperimental dengan pendekatan *post-test only with control group design*. Hewan coba yang digunakan adalah tikus putih (*Rattus norvegicus*) galur Wistar jantan, yang dibagi menjadi lima kelompok: kelompok kontrol sehat (A), kelompok kontrol DMT2 (B), dan tiga kelompok perlakuan yang diberi kefir susu kambing dengan dosis 1,05 mL (C), 2,1 mL (D), dan 4,2 mL (E) selama 28 hari. Induksi DMT2 dilakukan dengan pemberian diet tinggi lemak berupa otak sapi selama 28 hari dan injeksi *Streptozotocin* (STZ) dosis 30 & 50 mg/kgBB. Pengukuran kadar ALT dan AST dilakukan menggunakan metode kinetik enzimatis sesuai standar *International Federation of Clinical Chemistry and Laboratory Medicine's* (IFCC). Data dianalisis menggunakan uji *One-Way ANOVA* untuk menguji perbedaan antarkelompok.

Hasil: Analisis univariat menunjukkan rerata kadar ALT tertinggi di kelompok C (kefir dosis 1 mL) $\pm 257,25$ U/L dan nilai terendah pada kelompok A (kontrol sehat) $\pm 73,67$ U/L. Analisis bivariat menggunakan *One-Way Anova* dan menunjukkan perbedaan signifikan ($p = 0,004$), dilanjutkan dengan uji *post hoc* Tukey menunjukkan perbedaan antara kelompok A dan C ($p = 0,020$). Rerata kadar AST tertinggi di kelompok C (kefir dosis 1 mL) ± 228 U/L dan terendah di kelompok A (kontrol sehat) $\pm 119,17$ U/L. Analisis bivariat menggunakan *One-Way ANOVA* tidak menunjukkan perbedaan signifikan ($p = 0,106$).

Kesimpulan: Pada penelitian ini, pemberian kefir susu kambing dosis 1,05 mL memiliki efek signifikan dalam meningkatkan kadar ALT tikus putih (*Rattus norvegicus*) Wistar model DMT2 terhadap kelompok kontrol sehat. Namun, hasil tersebut kemungkinan besar terjadi karena variabel pengganggu berupa DMT2 yang tidak terkontrol pada kelompok C.

Kata Kunci: DMT2, Kefir Susu Kambing, ALT, AST, Probiotik, Inflamasi

EFFECT OF GIVING GOAT MILK KEFIR AT VARIOUS DOSES ON ALT AND AST LEVELS IN WHITE RATS (*Rattus norvegicus*) WITH TYPE 2 DIABETES MELLITUS MODEL

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ABSTRACT

Introduction: Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder that causes hyperglycemia due to insulin resistance and pancreatic beta cells damage. Hyperglycemic condition can trigger various complications, one of which is hepatic inflammation, marked by increased alanine transaminase (ALT) and aspartate transaminase (AST) enzyme levels. The elevation of these enzymes is related to oxidative stress and inflammation in the liver, which further exacerbates the condition of T2DM. Goat-milk kefir contains probiotics that have an anti-inflammatory potential. This study aims to determine the effect of giving various doses of goat milk kefir on ALT and AST levels in Wistar rats with a T2DM model.

Methods: The design of this study uses an experimental approach with a post-test only with control group design. The subjects used were male Wistar strain white rats (*Rattus norvegicus*), which were divided into five groups: healthy control group (A), T2DM control group (B), and three treatment groups that were given goat milk kefir at doses of 1.05 mL (C), 2.1 mL (D), and 4.2 mL (E) for 28 days. T2DM induction was performed by giving a high-fat diet (HFD) consisting of cow brain for 28 days and an injection of Streptozotocin (STZ) at doses of 30 & 50 mg/kgBW. ALT and AST levels were measured using the enzymatic kinetic method according to International Federation of Clinical Chemistry and Laboratory Medicine's (IFCC) standards. Data were analyzed using One-Way ANOVA to test differences between the groups.

Results: Univariate analysis showed the highest average ALT level in group C (1 mL kefir dose) ± 257.25 U/L, and the lowest value in group A (healthy control) ± 73.67 U/L. Bivariate analysis using One-Way ANOVA showed a significant difference ($p = 0.004$), followed by a post hoc Tukey HSD test, which revealed a difference between groups A and C ($p = 0.020$). The highest average AST level was in group C (1 mL kefir dose) ± 228 U/L, and the lowest was in group A (healthy control) ± 119.17 U/L. Bivariate analysis using One-Way ANOVA showed no significant difference ($p = 0.106$).

Conclusion: In this study, administration of 1.05 mL of goat milk kefir had a significant effect in increasing ALT levels in Wistar rats (*Rattus norvegicus*) with DMT2 compared to the healthy control group. However, these results were most likely due to the confounding variable of uncontrolled DMT2 in group C.

Keywords: T2DM, Goat Milk Kefir, ALT, AST, Probiotic, Inflammation