

INTISARI

Latar Belakang : Latihan yang berlebihan dapat menyebabkan kelelahan otot akibat ketidakseimbangan suplai energi dan peningkatan produksi laktat oleh enzim LDH. Akumulasi laktat dan ROS dapat mengganggu metabolisme, menyebabkan kerusakan oksidatif otot serta disfungsi mitokondria. Tanaman herbal seperti temulawak, kunyit dan meniran memiliki senyawa aktif yang berpotensi mempercepat proses pemulihan dan biogenesis mitokondria. Penelitian terkait formula polih herbal dari ketiga tanaman tersebut digunakan untuk mengevaluasi efek polih herbal terhadap kelelahan otot melalui ekspresi gen PGC-1 α dan kadar LDH.

Tujuan : Penelitian ini bertujuan untuk mengetahui efek proteksi polih herbal yang terdiri dari temulawak (*C.xanthorrhiza*), kunyit (*C.longa*) dan meniran (*P.niruri*) terhadap kadar laktat dehidrogenase dan biogenesis mitokondria otot melalui ekspresi gen PGC-1 α pada mencit yang diberi perlakuan *exhaustive swimming*.

Metode : Dua puluh lima mencit *Swiss Webster* jantan berusia 2 bulan dibagi menjadi lima kelompok: kontrol dan *exhaustive (aquades)*, dosis 78 mg/kg, 156 mg/kg, 312 mg/kg dan diberi perlakuan *exhaustive*. Pemberian ekstrak polih herbal secara oral selama 28 hari dan perlakuan uji berenang dilakukan pada hari ke-26 setelah 30 menit pemberian polih herbal. Hari ke-28, mencit direnangkan dengan pemberat 5% dari berat badan. Serum darah digunakan untuk pemeriksaan LDH dengan spektrofotometri serta otot gastrocnemius dan soleus untuk analisis kuantitas mRNA PGC-1 α dengan qPCR. Uji statistik menggunakan one-way ANOVA diikuti post-hoc LSD. Nilai $p < 0,05$ dianggap signifikan secara statistik.

Hasil : Kadar laktat dehidrogenase pada kelompok dosis 2 lebih rendah dibandingkan dengan kelompok *exhaustive* signifikan secara statistik ($p=0,001$). Ekspresi mRNA PGC-1 α otot gastrocnemius ($p=0,008$) dan otot soleus ($p=0,009$) pada kelompok dosis 2 lebih tinggi dibandingkan kelompok *exhaustive* signifikan secara statistik.

Kesimpulan : Kadar laktat dehidrogenase pada kelompok polih herbal lebih rendah dibandingkan dengan kelompok *exhaustive*. Ekspresi gen PGC-1 α pada kelompok polih herbal lebih tinggi dibandingkan dengan kelompok kontrol. Pemberian polih herbal dapat mengurangi efek negatif akibat latihan fisik yang berlebihan.

Kata Kunci : polih herbal, laktat, biogenesis mitokondria, PGC-1 α , kelelahan otot.

ABSTRACT

Background : Excessive exercise can cause muscle fatigue due to an imbalance in energy supply and increased lactate production by the LDH enzyme. The accumulation of lactate and ROS can disrupt metabolism, causing muscle oxidative damage and mitochondrial dysfunction. Herbal plants such as temulawak, kunyit and meniran have active compounds that have the potential to accelerate the recovery process and mitochondrial biogenesis. Research related to polyherbal formulas from the three plants was used to evaluate the effects of polyherbal on muscle fatigue through PGC-1 α gene expression and LDH levels.

Objective : This study aims to determine the protective effect of polyherbal consisting of temulawak (*C.xanthorrhiza*), turmeric (*C.longa*) and meniran (*P.niruri*) on lactate dehydrogenase levels and muscle mitochondrial biogenesis through PGC-1 α gene expression in mice treated with exhaustive swimming.

Methods : Twenty five male Swiss Webster mice aged 2 months were divided into five groups: control and exhaustive (distilled water), dose 78 mg/kg, 156 and 312 mg/kg and given exhaustive treatment. The polyherbal extract was administered orally for 28 days and the swimming test treatment was carried out on day 26 after 30 minutes of polyherbal administration. On the 28th day, the mice were subjected to swimming with a weight of 5% of body weight. Blood serum was used for LDH examination by spectrophotometry and gastrocnemius and soleus muscles for PGC-1 α mRNA quantity analysis by qPCR. Statistical tests used one-way ANOVA followed by post-hoc LSD. A value of $p < 0.05$ was considered statistically significant.

Results : The lactate dehydrogenase level in the dose 2 group was lower than the exhaustive group statistically significant ($p=0,001$). The expression of PGC-1 α mRNA in the gastrocnemius muscle ($p=0,008$) and soleus muscle ($p=0,009$) in the dose 2 group was statistically significantly higher than in the exhaustive group.

Conclusion : Lactate dehydrogenase levels in the polyherbal group were lower than those in the exhaustive group. PGC-1 α gene expression in the polyherbal group was higher than the control group. Giving polyherbal can reduce the negative effects of excessive physical exercise.

Keywords : polyherbal, lactate, mitochondrial biogenesis, PGC-1 α , muscle fatigue.