

## INTISARI

**Latar Belakang:** Penuaan berhubungan dengan gangguan homeostasis tubuh seperti penurunan fungsi ginjal. Latihan fisik dapat memperbaiki gangguan homeostasis.

**Metode:** Model penuaan menggunakan hewan coba tikus *Wistar* jantan (3 bulan, 200-300g, n=18) yang diinduksi D-galaktosa 300mg//mL/kg berat badan secara intraperitoneal selama 4 minggu. Tikus dibagi menjadi 3 kelompok: tikus yang diinduksi D-galaktosa dan tidak diberi latihan fisik (DNE), tikus yang diinduksi D-galaktosa dan diberi latihan fisik intensitas rendah (DELI) dan latihan fisik intensitas sedang (DEMI). Latihan fisik dilakukan selama 4 minggu menggunakan *treadmill* tikus. Pada akhir perlakuan diperiksa kadar kreatinin serum dan skor proteinuria. Kuantifikasi skor glomerulosklerosis dan skor cedera tubulus menggunakan pewarnaan PAS, serta ekspresi eNOS diperiksa menggunakan *Reverse Transcriptase* PCR dan pewarnaan imunohistokimia.

**Hasil:** Kelompok DNE secara bermakna memiliki skor proteinuria, skor glomerulosklerosis dan skor cedera tubulus yang lebih tinggi dibandingkan dengan kelompok DELI dan DEMI ( $p < 0,05$ ). Ekspresi eNOS pada kelompok DELI dan DEMI tidak lebih tinggi secara signifikan dibanding kelompok DNE ( $p < 0,05$ ). Distribusi eNOS lebih banyak ditemukan pada kapiler peritubulus di bagian medula ginjal dibandingkan bagian korteks ginjal.

**Kesimpulan:** Latihan fisik intensitas rendah dan intensitas sedang secara bermakna memperbaiki kerusakan ginjal yang terjadi pada tikus jantan yang diinduksi D-galaktosa dengan adanya penurunan skor proteinuria, skor glomerulosklerosis dan skor cedera tubulus.

**Kata Kunci:** D-galaktosa, penuaan, latihan fisik, *treadmill*, kerusakan ginjal.

## ABSTRACT

**Background:** Aging is associated with disturbances of homeostasis, such as decrease of kidney function. Physical exercise may ameliorate the homeostasis disturbances.

**Methods:** Aging was induced in male Wistar rat (3-4 months, 200-300g, n=18) using intraperitoneal injection of D-galactose 300mg/mL/kg body weight in 4 weeks. The rats were divided into 3 groups: the rats induced by D-galactose and not treated physical exercise (DNE), the rats induced by D-galactose and treated low intensity of physical exercise (DELI), and moderate intensity of physical exercise (DEMI). Physical exercise used rat treadmill in 4 weeks. After treatment, creatinine serum levels and proteinuria scores were measured. Glomerulosclerosis score and tubular injury score were quantification on PAS staining. eNOS expression was measured using Reverse Transcriptase PCR and immunohistochemical staining.

**Results:** The DELI and DEMI group were significantly lower score of proteinuria, glomerulosclerosis and tubular injury compare with the DNE group ( $p < 0.05$ ). eNOS expression in DELI and DEMI group were not significantly higher than the DNE group ( $p > 0.05$ ). Positive staining of eNOS more express in peritubular capillaries in renal medulla region compared the renal cortex region.

**Conclusions:** Moderate and low physical exercise significantly ameliorated the kidney damage on aging rat model induced by D-galactose, in the presence of decreased proteinuria scores, glomerulosclerosis scores and tubular injury scores.

**Key Words:** D-galactose, Aging, physical exercise, treadmill, kidney damage.