Pengaruh paparan hipoksia hipobarik intermiten terhadap kadar Malondialdehid pada otot tikus Sprague-Dawley = Intermittent hypobaric hypoxia exposure effect on malondialdehyde level in Sprague-Dawley rat muscle

Alexander Rafael Satyadharma, author

Abstrak

Latar belakang: Tekanan udara rendah pada dataran tinggi berdampak buruk bagi tubuh pendaki gunung dan pilot. Salah satu dampaknya adalah terjadi hipoksia jaringan yang dapat mencetuskan stres oksidatif. Kondisi tersebut dapat merusak struktur penting sel seperti protein, lipid, dan asam nukleat. Di otot, stres oksidatif dapat menyebabkan atrofi dan gangguan kontraktilitas. Di sisi lain, pajanan hipoksia hipobarik berulang diketahui mampu memicu proses adaptasi di berbagai organ. Penelitian ini bertujuan untuk menelusuri pengaruh paparan hipoksia hipobarik intermiten terhadap kadar malondialdehid, yang merupakan marker stres oksidatif, di otot gastrocnemius tikus Sprague-Dawley. Metode: Sebanyak 25 tikus Sprague-Dawley dibagi ke dalam kelompok kontrol dan empat kelompok uji. Kelompok uji mendapat perlakuan berupa dimasukkan ke dalam hypobaric chamber yang mensimulasikan ketinggian 25.000 kaki selama 5 menit. Kelompok uji 1 mendapat 1x perlakuan, kelompok uji 2 mendapat 2x perlakuan, kelompok uji 3 mendapat 3x perlakuan, dan kelompok uji 4 mendapat 4x perlakuan. Pada kelompok uji 2,3, dan 4, terdapat jeda 1 minggu antarperlakuan. Setelah mendapat perlakuan, jaringan otot gastrocnemius diambil dari tikus. Kadar malondialdehid pada otot gastrocnemius selanjutnya diukur menggunakan metode Wills. Hasil: Pada uji one-way ANOVA, rata-rata kadar malondialdehid meningkat secara bermakna ($p = 0.008$) pada kelompok yang mendapat paparan hipoksia hipobarik satu kali dibandingkan kelompok kontrol. Rata-rata kadar malondialdehid pada kelompok yang mendapat tiga paparan dan empat paparan mengalami penurunan yang bermakna secara statistik ($p < 0,05$) dibandingkan kelompok yang terpapar satu kali dan dua kali. Kesimpulan: Paparan hipoksia hipobarik sebanyak satu kali meningkatkan kadar malondialdehid pada otot gastrocnemius tikus yang menandakan terjadinya kondisi stres oksidatif. Paparan hipoksia hipobarik yang dilakukan berulang secara intermiten (tiga kali dan empat kali) mampu menciptakan adaptasi jaringan otot gastrocnemius terhadap stres oksidatif sehingga kadar malondialdehid lebih rendah dibandingkan kelompok yang lebih sedikit mendapat perlakuan hipoksia hipobarik

.....Introduction: Low barometric pressure in high altitude has detrimental effects on hikers and pilots. One of which is inducing tissue hypoxia that can instigate oxidative stress. Oxidative stress can damage important cellular structures such as protein, lipid, and nucleic acid. Oxidative stress can cause muscle atrophy and contractile dysfunction in skeletal muscle. On the other hand, repeated hypobaric hypoxia exposure is known for its effect to induce adaptation in various organs. This study aims to assess intermittent hypobaric hypoxia effects on malondialdehyde level, a marker of oxidative stress, in gastrocnemius muscle of Sprague-Dawley rat. Method: Twenty-five Sprague-Dawley rats were divided to a control group and four experimental group. The experimental group were then exposed to hypobaric environment by being placed on hypobaric chamber that simulated altitude of 25,000 ft for 5 minutes. Experimental group 1 got one exposure, experimental group 2 got two exposures, experimental group 3 got three exposures, and experimental group 4 got four exposures. There was a week interval between each

exposure for experimental group that got more than one exposure (experimental group 2, 3, and 4). After getting the treatment, gastrocnemius muscle was taken from each rat as sample. Malondialdehyde level in the tissue was then measured by Wills method. Result: Mean malondialdehyde level in the group of rats subject to one hypobaric hypoxia exposure was significantly higher than that of control group ($p = 0.008$). Mean malondialdehyde level in the group of rats subject to three and four hypobaric hypoxia exposures were significantly ($p < 0,05$) lower than that of groups of rats subject to one and two exposures. Conclusion: One-time hypobaric hypoxia exposure increased malondialdehyde level in rat gastrocnemius muscle, implying stress oxidative had occurred. Three and four times of intermittent hypobaric hypoxia exposures induced adaptive response against oxidative stress in gastrocnemius muscle tissue, as seen by lower level of malondialdehyde in those groups compared to the groups exposed to fewer intermittent hypobaric hypoxia.