

ABSTRACT

THE EFFECT OF HYPERTONIC SODIUM LACTATE ON THE CONCENTRATION OF REACTIVE OXYGEN SPECIES (ROS) IN WISTAR ALBINO RATS (*NORVEGICUS RATTUS*) WITH TRAUMATIC BRAIN INJURY

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BACKGROUND: Traumatic brain injury is a mechanical trauma to the head that can result in impaired neurological, physical, cognitive, and psychosocial function, which can be temporary or permanent. Hypertonic sodium lactate is one of the antioxidants that has the potential to reduce the oxidative damage caused by SOD, which can be found after traumatic brain injury.

OBJECTIVE: To analyze the differences in levels of reactive oxygen species (ROS) between Wistar albino rats (*Rattus norvegicus*) with traumatic brain injury treated with hypertonic sodium lactate and those not given hypertonic sodium lactate.

METHODS: This is an experimental laboratory with a simple randomized design. The research was conducted at the Faculty of Biology, Faculty of Veterinary Medicine, Faculty of Medicine, Public Health, and Nursing (FKKMK) UGM and testing of ROS levels at the Department of Clinical Pathology, FKKMK UGM. A total of nine adult male rats of Wistar strain were used as subjects and randomly divided into three groups: 0.9% NaCl control, 3% hypertonic sodium, and hypertonic sodium lactate (3ml/kg body weight, intravenous injection). Traumatic brain injury was created by using the modified Marmarou's device weight drop model by dropping a weight of 450 grams from a height of 1 meter. All rats were then treated according to the respective groups. ROS levels in the rat brain tissue were evaluated after the treatments. All data were analyzed by SPSS using Pearson Correlation and Independent-Samples T Test. Each p value <0.05 was considered significant.

RESULTS: Hypertonic Sodium Lactate has lower ROS levels better than 0.9% NaCl and 3% NaCl (significant with p <0.05)

CONCLUSION: The ROS levels in rats which received hypertonic sodium lactate was lower than in group of rats that received 3% NaCl or 0.9% NaCl, which is statistically significant. In the future, more study with a larger sample size is expected to be performed.

KEYWORDS: Traumatic Brain Injury, Hypertonic Sodium Lactate, Reactive Oxygen Species (ROS).

INTISARI

PENGARUH PEMBERIAN NATRIUM LAKTAT HIPERTONIK TERHADAP KADAR *REACTIVE OXYGEN SPECIES (ROS)* PADA TIKUS ALBINO GALUR WISTAR (*RATTUS NORVEGICUS*) DENGAN CEDERA OTAK TRAUMATIK

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Latar Belakang: Cedera otak traumatik adalah trauma mekanik pada kepala yang dapat berakibat pada gangguan fungsi neurologis, fungsi fisik, kognitif, psikososial, yang dapat bersifat sementara ataupun permanen. Natrium laktat hipertonik adalah salah satu antioksidan yang memiliki potensi untuk dapat mengurangi kerusakan oksidatif akibat SOD, yang dapat ditemui setelah cedera otak traumatik.

Tujuan Penelitian: Menganalisis perbedaan kadar *Reactive Oxygen Species (ROS)* antara tikus albino galur Wistar (*Rattus norvegicus*) dengan cedera otak traumatik yang diberi natrium laktat hipertonik dan yang tidak diberi natrium laktat hipertonik.

Metode: Jenis penelitian adalah laboratorik eksperimental dengan rancangan acak sederhana. Penelitian dilakukan di Fakultas Biologi, FKH UGM, FKMK UGM dan pengujian kadar ROS di Departemen Patologi Klinik FKMK UGM. Sebanyak 9 tikus jantan dewasa albino galur Wistar digunakan sebagai subjek dan secara acak dibagi menjadi tiga kelompok: kontrol NaCl 0,9%, natrium hipertonik 3%, dan natrium laktat hipertonik (3ml/kg berat badan, injeksi intravena). Cedera otak traumatik tikus diciptakan dengan pengembangan perangkat *Marmarou's weight drop model* dengan menjatuhkan beban seberat 450gram yang diturunkan dari ketinggian 1 meter, kemudian diberi perlakuan sesuai kelompok masing masing. Kadar ROS dalam jaringan otak tikus akan dievaluasi setelah perlakuan. Semua data dianalisis dengan SPSS menggunakan Korelasi *Pearson* dan *Independent-Samples T Test*. Setiap nilai $p < 0,05$ dianggap signifikan.

Hasil: Rata-rata konsentrasi ROS pada tikus galur Wistar (*Rattus norvegicus*) dengan cedera otak traumatik yang mendapatkan natrium laktat hipertonik $497,00 \pm 24.434 (p < 0.001)$, NaCl 3% $840,00 \pm 24.556 (p < 0.001)$, NaCl 0.9% $688.00 \pm 33.045 (p < 0.001)$

Kesimpulan: Terdapat perbedaan signifikan kadar *reactive oxygen species (ROS)* antara tikus galur Wistar (*Rattus norvegicus*) dengan cedera otak traumatik yang diberikan natrium laktat hipertonik dibandingkan yang tidak diberikan natrium laktat hipertonik. ($p < 0,05$)

Kata Kunci: Cedera Otak Traumatik, Natrium Laktat Hipertonik, *Reactive Oxygen Species (ROS)*.