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Oxidative damage in the rat hippocampus and cortex after meningitis induced by *Streptococcus pneumoniae*

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Background

The reactive oxygen species (ROS) was found to be produced in large amounts during pneumococcal meningitis, in part by cells involved in inflammatory response. This cellular response could induce brain damage mainly in the hippocampus and cortex. Thus we here demonstrated oxidative damage in the hippocampus (HIP) and cortex (CX) after meningitis induced by *S. pneumoniae* in rats.

Methods

S. pneumoniae was cultured in Todd-Hewitt broth, washed and resuspended in sterile saline at low dose (LD) (5×10^5 cfu/mL) and high dose (HD) (5×10^9 cfu/mL) protocols. Meningitis was induced by inoculating 10 μL of the *S. pneumoniae* into the cisterna magna in Wistar rats, 60 days old, 250–300 g, after removal of 10 μL of cerebrospinal fluid (CSF), under anesthesia. Meningitis was documented by culture of CSF 16 h after infection followed by antibiotic (ceftriaxone 100 mg/kg bid). Six and twenty four hours after infection the HIP and the CX were removed and oxidative damage was assessed by the thiobarbituric acid reactive species (TBARS), protein carbonyl and sulfhydryl (-SH) groups. Data are presented as mean ± SD in nmol/mg protein. Statistical significance was determined by ANOVA followed by a Newman-Keuls test, $p < 0.05$.

Results

Six hours after meningitis induction we observed an increase in TBARS levels in both HIP and CX in animals submitted to HD protocol. In contrast, we observed a decrease in sulfhydryl groups in both HIP and CX also in HD protocol. Protein carbonylation in both HIP and CX was increased only in LD protocol. Twenty-four hours after meningitis induction we observed an increase in both TBARS levels and protein carbonylation in both HIP and CX in HD protocol and this effect was reversed by antibiotics. Sulfhydryl groups were decreased in both HIP and CX in HD protocol and this effect was also reversed by antibiotics.

Conclusion

Our data support the hypothesis that ROS are present predominantly in the high dose meningitis, and this could be attenuated by antibiotic treatment.

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