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Pinealectomy initiates the oxidative stress response in brain tissue of rats subject to abdominal surgery

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Objectives: Melatonin, the primary substance secreted by the pineal gland, is a molecule common to all aerobic life forms from unicellular organisms to mammals. It has long been recognized that melatonin possesses the ability to increase gene expression and the activities of various antioxidant enzymes. However, the activities of these enzymes do not depend exclusively on melatonin. Using a peritoneal adhesion model in rats, we measured several oxidant-antioxidant parameters in postmortem brain tissue. We believe these parameters are indicative of the impact of peritoneal trauma on the brain.

Methods: During this study, 21 Sprague-Dawley male rats were divided into three groups and a pinealectomy procedure was performed on two of the groups. Fifteen days post-surgery, the peritoneal adhesion model was established by making an incision in the cecum of the rats, followed by suturing. One of the groups that received pinealectomies was administered a single dose (5 mg/kg) of oral melatonin for 15 days. Treatment began immediately following the operation and continued for 15 days. At the end of the 15 days, the rats' abdomens were opened under anesthesia. Apart from evaluation of adhesion lesions, their craniums were opened and their brain tissues were excised. After 15 days, and while under anesthesia, surgery was performed to examine the peritoneal adhesion site and to remove the brain. Malondialdehyde (MDA), superoxide dismutase (SOD), and glutathione peroxidase (GSH-Px) levels were measured in these tissues.

Results: Whereas brain MDA levels significantly increased in the pinealectimized rats, a significant reduction in MDA was observed in the group that received melatonin treatment. SOD and GSH-Px enzyme activities significantly decreased following the pinealectomy procedure. When these groups were given melatonin, GSH-Px enzyme activities nearly increased to control levels; however, SOD enzyme activities remained significantly lower than the control group.

Conclusion: This study clearly demonstrates that the pinealectomy procedure initiates an oxidative stress response in the rat brain, and that administration of melatonin can mitigate this effect.

Biography

He was graduated from 9 Eylul University Medical School at 1997. He has got his Ph.D. degree at 2005 from the department of physiology at Gulhane School of Medicine. He was promoted to Associated Professor at 20012. He worked at University of North Carolina at Chapal Hill a year. His research interests are melatonin, medical ozone and hyperbaric oxygen therapy. He looked for the healing mechanism of oxygen based bio-oxidative therapeutics (i.e., medical ozone and hyperbaric oxygen therapies) in a variety of experimental inflammatory and oxidative stress models. His laboratory is also focused on anti-oxidative and anti-nitrosative efficacy of melatonin in several experimental models.

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