EGG WHITE HYDROLYSATE PREVENTS THE PERIPHERAL DYSFUNCTION AFTER ALUMINUM EXPOSURE IN RATS

Marina Rodrigues 1
Gema Vera 2
Franck Maciel Pecanha 3
Marta Miguel 4
Giulia Alessandra Wiggers Pecanha 5
Caroline Silveira Martinez 6

Resumo:

EGG WHITE HYDROLYSATE PREVENTS THE PERIPHERAL DYSFUNCTION AFTER ALUMINUM EXPOSURE IN RATS. 1. INTRODUCTION Aluminum (Al) is a neurotoxic associated with a number of chronic human diseases (EXLEY, 2004; MARTINEZ et al., 2017). The aim of our study is to investigate the effects of egg white protein hydrolysate (EWH), obtained after enzymatic hydrolysis with Pepsin, with known antioxidant and anti-inflammatory properties, on the peripheral nervous system (PNS) after by Al exposure. 2. METHODS For that, 32 three-month-old male Wistar rats were divided into four groups and treated orally for 42 days: a) Control - ultrapure water; b) AlCl₃ - 100 mg/kg bw (PRAKASH & KUMAR, 2009); c) Hydrolysate - 1 g/kg/day of EWH (MIGUEL et al., 2006); d) Hydrolysate plus Aluminum. Von Frey hair test, plantar test and the spontaneous motor activity were investigated. Reactive oxygen species (ROS), lipid peroxidation and total antioxidant capacity were measured in plasma. Results were expressed as mean and SEM, compared by ANOVA followed by Bonferroni test (P<0.05). Ethics Committee Approval 028/2014 - Unipampa. 3. RESULTS AND DISCUSSION Exposure to Al at 100 mg/kg bw for 42 days decreased the mechanical sensitivity threshold in the middle (21 days) and end of the treatment. The threshold for mechanical sensitivity before treatment was 21.92 ± 1.20 g without differences between groups. In control and EWH groups, this threshold did not significantly change with the treatment, whereas for Al-treated rats the mean threshold value after treatments decreased 40.9 % for Al exposure. The co-treatment with EWH partially prevented this decrease maintaining the threshold value similar to the control rats (Ct: 33.1 ± 4.9; Al: 12.6* ± 2.1; EWH: 20.5 ± 2.4; Al + EWH: 20.6 ± 6.1 g; * vs Ct). The thermal sensitivity tested by the plantar test and the spontaneous motor activity were not modified either by Al exposure or by the co-treatment with EWH. Al increased oxidative stress in plasma as seen by ROS, lipid peroxidation and total antioxidant capacity levels. The co-treatment with EWH was able to prevent the increase on oxidative stress in plasma (ROS: Ct: 197.7 ± 14.2; Al: 346.9* ± 31.6; EWH: 245.1 ± 14.2; Al + EWH: 238.5# ± 27.9 UF; Lipid peroxidation: Ct: 27 ± 3.1; Al: 43.7* ± 5.1; EWH: 26.1 ± 2.7; Al + EWH: 19.6# ± 1.9 mg/MDA/mL plasma; total antioxidant capacity: Ct: 132.9 ± 7.9; Al: 214.1* ± 15.6; EWH: 172.3 ± 13.4; Al + EWH: 157.9# ± 12.3 Frap value). Taken together, these results suggest the presence of mechanical allodynia and oxidative stress after Al exposure which were partially prevented by the EWH treatment. 4. FINAL CONSIDERATIONS Our findings point to the EWH as a possible functional food against the adverse effects of Al on the PNS trying to counteract the development of the neuropathic dysfunction.
EGG WHITE HYDROLYSATE PREVENTS THE PERIPHERAL DYSFUNCTION AFTER ALUMINUM EXPOSURE IN RATS

1 Aluno de graduação. marinadiazr9@gmail.com. Autor principal
2 Outro. gema.vera@urjc.es. Co-autor
3 Docente. franckpecanha72@gmail.com. Co-autor
4 Outro. marta.miguel@csic.es. Co-autor
5 Docente. giuliapecanha@unipampa.edu.br. Orientador
6 Aluno de pós-graduação. caroline.s.martinez@gmail.com. Co-orientador
EGG WHITE HYDROLYSATE PREVENTS THE PERIPHERAL DYSFUNCTION AFTER ALUMINUM EXPOSURE IN RATS

1. INTRODUCTION

Aluminum (Al) is a neurotoxic associated with a number of chronic human diseases (EXLEY, 2004; MARTINEZ et al., 2017). Humans are exposed to Al through dietary and non-dietary sources, and its real consequence perhaps not entirely clear (EXLEY, 2013). The aim of our study is to investigate the effects of egg white protein hydrolysate (EWH), obtained after enzymatic hydrolysis with Pepsin, with known antioxidant and anti-inflammatory properties, on the peripheral nervous system (PNS) after by Al exposure.

2. METHODS

For that, 32 three-month-old male Wistar rats were divided into four groups and treated orally for 42 days: a) Control - ultrapure water; b) AlCl$_3$ - 100 mg/kg bw (PRAKASH & KUMAR, 2009); c) Hydrolysate - 1 g/kg/day of EWH (MIGUEL et al., 2006); d) Hydrolysate plus Aluminum. Von Frey hair test, plantar test and the spontaneous motor activity were investigated. Reactive oxygen species (ROS), lipid peroxidation and total antioxidant capacity were measured in plasma. Results were expressed as mean and SEM, compared by ANOVA followed by Bonferroni test (P<0.05). Ethics Committee Approval 028/2014 - Unipampa.

3. RESULTS AND DISCUSSION

Exposure to Al at 100 mg/kg bw for 42 days decreased the mechanical sensitivity threshold in the middle (21 days) and end of the treatment. The threshold for mechanical sensitivity before treatment was 21.92 ± 1.20 g without differences between groups. In control and EWH groups, this threshold did not significantly change with the treatment, whereas for Al-treated rats the mean threshold value after treatments decreased 40.9 % for Al exposure. The co-treatment with EWH partially prevented this decrease maintaining the threshold value similar to the control rats (Ct: 33.1 ± 4.9; Al: 12.6 ± 2.1; EWH: 20.5 ± 2.4; Al + EWH: 20.6 ± 6.1 g; * vs Ct). The thermal sensitivity tested by the plantar test and the spontaneous motor activity were not modified either by Al exposure or by the co-treatment with EWH. Al increased oxidative stress in plasma as seen by ROS, lipid peroxidation and total antioxidant capacity levels. The co-treatment with EWH was able to prevent the increase on oxidative stress in plasma as seen by ROS, lipid peroxidation and total antioxidant capacity levels. The co-treatment with EWH was able to prevent the increase on oxidative stress in plasma (ROS: Ct: 197.7 ± 14.2; Al: 346.9 ± 31.6; EWH: 245.1 ± 14.2; Al + EWH: 238.5 ± 27.9 UF; Lipid peroxidation: Ct: 27 ± 3.1; Al: 43.7 ± 5.1; EWH: 26.1 ± 2.7; Al + EWH: 19.6 ± 1.9 mg/MDA/mL plasma; total antioxidant capacity: Ct: 132.9 ± 7.9; Al: 214.1 ± 15.6; EWH: 172.3 ± 13.4; Al + EWH: 157.9 ± 12.3 Frap value). Taken together, these results suggest the presence of mechanical allodynia and oxidative stress after Al exposure which were partially prevented by the EWH treatment. The ability of Al to induce peripheral nervous dysfunction was recently seen by our group (MARTINEZ et al. 2017a). Here we show that the EWH should be used as a functional ingredient against the Al adverse effects. The pro-oxidant effects of Al are well documented and have been seen in different target organs and systems in experimental animals (PRAKASH & KUMAR, 2009; YU et al.
Therefore, among the postulated mechanisms of actions of the EWH, its antioxidant capacity seems to be an important one.

4. FINAL CONSIDERATIONS

Our findings point to the EWH as a possible functional food against the adverse effects of Al on the PNS trying to counteract the development of the neuropathic dysfunction.

5. REFERENCES