INTERESTERIFIED FAT CONSUMPTION AND POLYCYSTIC OVARY SYNDROME: IMPACTS ON BRAIN OXIDATIVE STRESS IN WISTAR RATS

Francisco Andrey da Silva e Silva[1]; Roseana Rocha Freitas[1]; Lucas Rosseto Costa[1]; Julia Beier Guedes[1]; Mateus Henrique de Lima Bezerra[1]; Elizabeth Sabryna Sarquis Escalante[1]; Hecson Jesser Segat[1] Silvana Peterini Boeira[1]
[1]Federal University of Pampa, Laboratory of Pharmacological and Toxicological Evaluations Applied to Bioactive Molecules (LAFTAMBIO Pampa), Itaqui - RS, Brazil.

INTRODUCTION: The replacement of trans fats with interesterified fat (IF) in the food industry has raised concerns about its adverse effects on metabolism and the central nervous system. Polycystic Ovary Syndrome (PCOS) is an endocrine-metabolic condition associated with systemic inflammation and oxidative stress. Considering that the brain is highly sensitive to redox imbalance, it was hypothesized that the combination of IF and PCOS could enhance oxidative damage in brain tissue.

OBJECTIVE: To evaluate the impact of chronic consumption of interesterified fat, alone or associated with PCOS, on brain oxidative stress parameters in Wistar rats.

MATERIALS AND METHODS: Wistar rats were divided into four experimental groups: control (soybean oil), IF alone, PCOS induced by letrozole, and IF+PCOS. Oral administration of IF or soybean oil was performed for 90 days, and letrozole was administered during the last 21 days. Brain tissue was evaluated ex vivo for levels of reactive oxygen species (ROS), antioxidant enzyme activities of superoxide dismutase (SOD) and catalase (CAT), and lipid peroxidation levels by TBARS.

RESULTS AND CONCLUSION: The group exposed to IF alone showed significant brain oxidative stress, as evidenced by reduced SOD ($p < 0.05$) and CAT ($p < 0.0001$) activities, along with increased ROS in both IF and PCOS-only groups ($p = 0.0035$). TBARS levels were elevated only in the IF group ($p = 0.0045$), indicating greater structural damage. PCOS alone increased ROS but did not alter antioxidant enzyme activities or cause lipid peroxidation. The IF+PCOS group showed a trend toward increased ROS, with lower TBARS levels compared to the IF-only group, suggesting a possible compensatory adaptive response. These findings indicate that IF alone is a neurotoxic factor due to its disruption of brain redox balance, while PCOS, although exacerbating oxidative stress, does not intensify structural damage. Thus, caution is warranted regarding prolonged interesterified fat consumption, especially in individuals with metabolic disorders.

Keywords: Interesterified fat; Oxidative stress; Brain; Polycystic Ovary Syndrome; Wistar rats.