Effect of Vitamin A (Retinol) on Parameters of Viability and Neurodegeneration in Human Catecholaminergic SH-SY5Y Cells

Kolling, E.A.\(^1\); Pasquali, M.A.B.\(^1\); Gasparotto, J.\(^1\); Moreira, J.C.F.\(^1\) Gelain, D.P.\(^1\)

\(^1\)Centro de Estudos em Estresse Oxidativo, Departamento de Bioquímica, ICBS, UFRGS - Porto Alegre, Brazil.

INTRODUCTION: Therapies based on natural or synthetic retinoids have been increasingly proposed for treatment or prevention of pathologies associated with disruption of cell cycle and oxidative stress, such as cancer and neurodegenerative diseases. In previous studies, it was observed that vitamin A (retinol) may act as antioxidant or pro-oxidant in different concentrations or doses, influencing many cell signaling processes. The aim of this study is to evaluate the effect of retinol on viability parameters, cytotoxicity and neurodegenerative markers in a human neuronal cell line (SH-SY5Y) widely used as a catecholaminergic cellular model in studies on neurodegenerative diseases.

MATERIAL AND METHODS: SH-SY5Y cells were grown in DMEM-F12 (1:1) medium and 10% fetal bovine serum (FBS) and treated for 24 h with retinol from 1 to 20 µM in 1% FBS medium. Parameters of cell viability (MTT reduction and SRB incorporation) and intracellular production of reactive species (oxidation of DCFH-DA) were quantified. Immunoocontent of β-amyloid peptide (Aβ), phosphorylated tau and RAGE were assessed by western blot.

RESULTS AND DISCUSSION: Retinol decreases cell viability and enhances intracellular reactive species production at concentrations above 10 µM. At this concentration, the immunoocontent of phosphorylated tau and RAGE were also increased. Curiously, the content of Aβ was observed to be increased only with retinol 7 µM. Co-treatment with the antioxidant Trolox (100 µM) reversed the effect of retinol on all parameters, suggesting the involvement of reactive species. CONCLUSION: Retinol in concentrations above 10 µM induces loss of viability in SH-SY5Y cells through a redox-dependent mechanism. We will next to study the involvement of retinoic acid receptors (RAR and RXR) in the effects induced by retinol in order to determine the participation of genomic and nongenomic mechanisms in this effect.

Keywords: vitamin A, neurodegenerative diseases, oxidative stress, SH-SY5Y

Financial support: FAPERGS, CNPq, CAPES and PROPESQ-UFRGS