Oestrogenic activity of mimosine on MCF-7 breast cancer cell line through the ERα-mediated pathway

ABSTRACT

Hormone replacement therapy has been a conventional treatment for postmenopausal symptoms in women. However, it has potential risks of breast and endometrial cancers. The aim of this study was to evaluate the oestrogenicity of a plant-based compound, mimosine, in MCF-7 cells by in silico model. Cell viability and proliferation, ERα-SRC1 coactivator activity and expression of specific ERα-dependent marker TFF1 and PGR genes were evaluated. Binding modes of 17β-oestradiol and mimosine at the ERα ligand binding domain were compared using docking and molecular dynamics simulation experiments followed by binding interaction free energy calculation with molecular mechanics/Poisson-Boltzmann surface area. Mimosine showed increased cellular viability (64,450 cells/ml) at 0.1 μM with significant cell proliferation (120.5%) compared to 17β-oestradiol (135.2%). ER antagonist tamoxifen significantly reduced proliferative activity mediated by mimosine (49.9%). Mimosine at 1 μM showed the highest ERα binding activity through increased SRC1 recruitment at 186.9%. It expressed TFF1 (11.1-fold at 0.1 μM) and PGR (13.9-fold at 0.01 μM) genes. ERα-mimosine binding energy was -49.9 kJ/mol, and it interacted with Thr347, Gly521 and His524 of ERα-LBD. The results suggested that mimosine has oestrogenic activity.

Keyword: MCF-7 cell line; TFF1 and PGR genes; Mimosine; Oestrogenic activity