Title:	Role of estrogen receptors in pro-oxidative and anti-oxidative actions of estrogens: A perspective
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Abstract:	Background: Estrogens are steroid hormones responsible for the primary and secondary sexual characteristics in females. While pre-menopausal women use estrogens as the main constituents of contraceptive pills, post-menopausal women use the same for Hormone Replacement Therapy. Estrogens produce reactive oxygen species by increasing mitochondrial activity and redox cycling of estrogen metabolites. The phenolic hydroxyl group present at the C3 position of the A ring of estrogens can get oxidized either by accepting an electron or by losing a proton. Thus, estrogens might act as pro-oxidant in some settings, resulting in complicated non-communicable diseases, namely, cancer and cardiovascular disorders. However, in some other settings the phenolic hydroxyl group of estrogens may be responsible for the anti-oxidative beneficial functions and thus protect against cardiovascular and neurodegenerative diseases. Scope of review: To date, no single review article has mentioned the implication of estrogen receptors in both the pro-oxidative and anti-oxidative actions of estrogens. Major conclusion: The controversial role of estrogens as pro-oxidant or anti-oxidant is largely dependent on cell types, ratio of different types of estrogen receptors present in a particular cell and context specificity of the estrogen hormone responses. Both pro-oxidant and anti-oxidant effects of estrogens might involve different estrogen receptors that can have either genomic or non-genomic action to manifest further hormonal response. General significance: This review highlights the role of estrogen receptors in the pro-oxidative and anti-oxidative actions of estrogens with special emphasis on neuronal cells.
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