

Title – Estrogen-Mimicking Cellular Mechanism and Toxicologic Developmental Effects of BPA Derivatives

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Abstract: Environmental estrogens are chemical compounds which mimic the effects of estrogen via estrogen receptors (ER), including the G-protein coupled ER (GPER). While endogenous estrogen is vital for physiological processes, chronic exposure to estrogen or estrogen-mimicking chemicals can disrupt endocrine processes and cause adverse health issues such as abnormal masculinization and feminization and reproductive failure. Bisphenol A (BPA), used in the manufacturing of plastics, is an environmental estrogen of concern. BPA has been shown to be harmful *in vivo* as it mimics estrogen by binding to the estrogen receptor and regulating gene expression. While BPA has largely been removed from public use, it has been replaced with similarly structured variants, and it is currently unknown if these replacements have similar effects as that of BPA. These experiments use a yeast genetic system to determine if the BPA derivatives are able to mimic the effects of estrogen by inducing an active ER dimer. This yeast system contains both a plasmid expressing the human estrogen receptor alpha (hER α) which is under the control of a copper inducible promoter and a reporter plasmid with an estrogen response element (ERE) driving a *lacZ* gene. Activity of the ER is determined by measuring β -galactosidase activity. The data from these experiments has determined the level of estrogenic response of BPA derivatives, has given information needed for further studies as to their mechanism of action, and indicates chemical compounds that are safer alternatives to BPA. Further studies include testing the dimerization of the hERs (hER α and hER β) as well as the effects these compounds have on the embryonic development of zebrafish.

Christian Worldview Integration: While the world was created in ultimate perfection, it did not stay this way. Sin, sickness, pain, and death all entered the world and have wreaked havoc among creation. There is nothing in our power that we, as stewards of God's creation, can do to right this wrong. The only way full restoration and healing has been made available to us is through the sacrifice of God's holy and perfect son, Jesus, on the cross.

Environmental estrogens like BPA and its derivatives are used as polymers in many different plastic products. They have the potential of inducing transcription of genes controlled by the estrogen response, which has been known to cause adverse effects in the human body. As Christians, we have the responsibility of trying to better creation and all that is in it. The assays performed on these environmental estrogens can indicate the physiological harm that these chemicals can cause and will also allow us to look for better options that will not have such detrimental effects on the body.

While we can do nothing to earn our salvation, we can use the resources and talents God has given us to enrich the lives of others and point them towards Christ. God has granted us with the abilities to analyze the world around us and try to come up to solutions to problems that are the result of being in a fallen world. Additionally, there are many lessons to be learned through the research being conducted. We can marvel at the intricacies of living organisms that clearly point to a sovereign Creator. The frustrations and trials experienced during research can also bring us closer in our walk with the Lord. These cause us to trust Him and know that He is good, even if the results aren't what we want or expect. Ultimately, the goal of this research is to glorify God and be good stewards of the world we have been given.