Application of CALUX Bioassay for Determining Dioxin Toxicity Equivalents

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There are growing concerns about human health effects of dioxin and dioxin like compounds such as polychlorinated dibenzo-*p*-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and polychlorinated biphenyls (PCBs). Earlier studies recognized that 2,3,7,8-tetrachloro dibenzo-*p*-dioxin (TCDD) and structually related dioxin like compounds invoke a number of common toxic responses that are mediated through a high-affinity cytosolic receptor protein, the AhR. Based on studies that indicate th pivotal role of AhR in mediating most, if not all, of the dioxin toxicity, TCDD equivalency factor (TEF) approach was developed. This approach allowed the expression of toxic potential of a complex mixture as one integrated parameter, the toxic equivalency (TEQ) value.

For the determination of dioxin and dioxin like compounds, high resolution gas chromatography/mass spectrometer (HR-GC/MS) has been used as a standard method. Chemical analysis using HR-GC/MS has limitations to its application for large scale screenings. HR-GC/MS requires a lot of complicated processes, so expensive and time-consuming. And chemical analysis only determines the concentrations of known substances with TEFs and can not account for interactive effects such as synergism, additivity, or antagonism among the active and inactive compounds. However, in vitro bioassay may overcome these limitations. Bioassay is sensitive, cost-effective, rapid screening tools and integrate the biological effects of all AhR agonists. Numberous bioassay systems have been developed that are mainly based on the AhR-dependent mechanism. Among them, Chemically Activated LUciferase gene eXpression assay (CALUX assay) is based on the CYP1A1 gene transcription. which is widely used as a functional parameter for AhR activations.

In this study, we tried to establish CALUX bioassay and compare the results with that of chemical analysis. We have carried out CALUX assay for over 200 human blood samples and environmental samples such as korean liver water, sediment, and soil. The correlation between CALUX assay and HR-GC/MS appeared to be very good in human blood sample (r^2= 0.96) and also good in environmental samples except few exceptions from environmental samples.

More detail results will be discussed at the oral presentation.