Coupling HPTLC with bacterial genotoxicity whole-cell bioluminescent reporter

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Abstract

In the past few decades, environmental pollution has become one of the major concerns. Numerous toxic and genotoxic compounds, originating mostly from anthropogenic activities, are being released into the environment. The need for monitoring the potential effects of environmental pollutants has therefore become increasingly important. The traditional approach for detecting chemicals is based on chemical or physical analysis that allow highly accurate and sensitive determination of the exact composition of the tested sample. However, such methodologies fail to provide information regarding the bioavailability of pollutants, their biological effect on living systems and/or antagonist/agonist behavior in a giving sample. Thus, we aim to develop an innovative technological platform for monitoring organic micro-pollutants based on the assessment of their biological effects using our collection of *E. coli*-based bioluminescent toxicity and genotoxicity sensors, applied directly onto the surface of high-performance thin layer chromatography (HPTLC) plates. The sensor strains express the bioluminescent *luxABCDE* genes in the presence of toxic chemicals, thus allowing the detection of toxic compounds separated on the TLC plate. The advantages of using HPTLC allow us to do so in a cost-effective manner, with better analytical precision and dealing simultaneously with multiple samples and standards, combining two complementary approaches for the detection of genotoxic compunds. In this study, we have demonstrated a dose-dependent response to various model genotoxicants compounds using a recA-based bioreporter applied directly on the surface of HPTLC plate. In conclustion, this innovative platform proves to be an effective aprroach as a tool for effect directed analysis for the detection of genotoxic compounds.

Keywords: luxCDABE, HPTLC, genotoxicity

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