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ATP SENSING PAPER WITH SMARTPHONE BIOLUMINESCENCE-BASED DETECTION

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ATP-driven bioluminescence relying on the D-luciferin-luciferase reaction is widely employed for several biosensing applications where bacterial ATP detection allows to verify microbial contamination for hygiene monitoring in hospitals, food processing and in general for cell viability studies. Rapid ATP kit assays are commercially available but the development of an ATP biosensor characterized by low-cost, portability, and adequate sensitivity where the reagents are immobilized is highly valuable to facilitate the early detection and rapid screening.
Thanks to low-cost wax printing technology and an innovative freeze-drying procedure, we developed a user-friendly, ready-to-use and stable ATP sensing paper biosensor that can be integrated in a portable light detector, including smartphone-integrated photocameras. The developed ATP sensing paper is able to quantify in 10 minutes as low as 10^{-14} moles of ATP in liquid samples. As proof-of concept, we analysed urinary microbial ATP as a biomarker of Urinary Tract Infection (UTI), confirming the capability of the ATP sensing paper to detect the threshold for positivity corresponding to 10^5 colony-forming units (CFU) of bacteria per mL of urine.

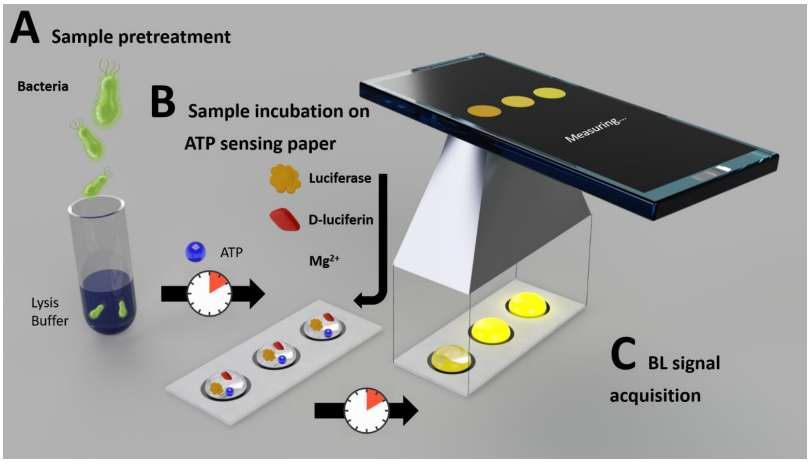

Figure 1. Schematic representation of the optimized ATP sensing paper assay.