Sawasdee-AMP: Highly Efficient, Portable and Low-Cost Point of Care Test Kit for Future Emerging RNA/DNA Diseases Diagnosis

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Coronavirus, an RNA virus that causes COVID-19, has spread widely around the globe. However, not only RNA-type viruses, but DNA-type also exist. An accurate and portable diagnostic technique can effectively limit the spread of such viruses. Nowadays, Polymerase Chain Reaction (PCR) and antigen test kits (ATK) are widely used. Although PCR is highly reliable, it is expensive, complicated, and laboratory-use-dependent. While the ATK is simple and cheap, its results can be unreliable. To cope with this problem, a novel test kit called Sawasdee-AMP was developed. Sawasdee-AMP integrates an isothermal amplification with a novel formulated, pH-sensitive dye to deliver a blue-to-green color result that is visible to the naked eye with 96% accuracy, and 10 times higher sensitivity than the RT-PCR, with the detection limit approaching 10 copies of the targeted genetic materials. A portable, 5-dollar test box provides approximate efficiency to a thousand-dollar PCR machine, and a 5-min, equipment-free, genetic materials extraction procedure was also established. These have made the whole diagnosis process takes less than 1 hour from sampling to visible readout within a cost of 2 dollars, namely 4-6 times faster, and 10-fold cheaper than conventional PCR methods. To demonstrate the versatile detection capability of our platform, the Sawasdee-AMP testing solution was slightly modified by changing pathogen-specific primers, then challenged with various target DNA and RNA viruses, bacteria, and parasites representing human, animal, and plant infections. The results were shown correctly, highlighting its potential of being a model for emerging point-of-care disease diagnoses in the future.

Awards Won:
Fourth Award of $500
U.S. Agency for International Development: USAID Science for Development First Award - Global Health