Addressing Challenges in the Application of Molecular Diagnostics for Global Health

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The Klapperich Laboratory at Boston University is focused on setting-appropriate technologies for disease detection and diagnosis. Our mission is to create devices to deliver high quality healthcare to traditionally underserved populations while keeping costs low and operation simple. We have fabricated thermoplastic microchips that can isolate nucleic acids from bacteria, viruses and mammalian cells in complex biological matrices including whole blood, urine, nasopharyngeal swabs and stool. Target organisms include influenza A and bacteria that cause infectious diarrheas. We have successfully isolated and concentrated DNA, total RNA and mRNA in small quantities clean enough to template downstream amplification assays including the polymerase chain reaction (PCR) and isothermal methods. We are currently working on a portable no-power nucleic acid isolation instrument for field use. While these are positive advances, there remain many significant engineering challenges to achieving true point-of-care diagnostics that are completely untethered from the laboratory. This talk will cover recent advances in the literature with the potential to address these challenges and will present a critical review of issues that remain neglected. Suggestions for the formulation of a list of "best practices" will be made, and strategies for interdisciplinary innovation will be discussed.