Firebird Molecular

xNA-targeted Diagnostics

Resistance in microbes against antibiotics comes in two broad categories with respect to molecular origins. In the first, a gene naturally within the genome of the microorganism has mutated. This is exemplified by gyrase mutations that confer resistance to fluoroquinolines, important (for example) in *Clostridium*. In the second, the microbe has acquired an additional genetic element (e.g., a lactamase that creates cephalosporin resistance in *N. gonorrhoeae*). Responsive to the challenge solicitation, **the clinically significant concern being addressed** here is the detection, in *one* assay, of *all* possible *added* genetic elements in simple workflows, in less than 30 minutes, with component costs < $1.00. As **specific intended use**, the assay will be run either in inpatient or outpatient settings, the second include personal physician offices, elderly care facilities, school infirmaries, and ambulances. Using another set of innovations, these assays will be extended to the first category, but in more complex workflows that require their application in in-patient settings. These specs are possible because of technology at Firebird that begins by understanding that DNA/RNA (xNA) targets are expensive (in time, personnel, instruments, and disposables) *because of defects in the xNA molecules themselves*. These defects can be fixed by synthetic biology, to create new kinds of xNA that allow detection of the primary pathogens, the xNA that confers resistance, and prognosticative xNA. Reviewed in: Benner et al. (2015) (Next-generation DNA in pathogen detection, surveillance, and CLIA-waivable diagnostics. SPIE Digital Library doi:10.1117/12.2183481), these inventions include (all patented) expanded xNA systems that make assays extremely clean, self-avoiding molecular recognition systems that allow effortless multiplexing, self-sterilizing sample collection and readout architectures that eliminate biohazards to the user and prevent forward contamination, biversal nucleobases that manage pathogen sequence divergence, terminators that allow the detection of mutations that confer antibiotic resistance, and low temperature isothermal amplification architectures that dispense with expensive instruments and expensive disposables.