Harnessing nuclease biology for the development of diagnostic and therapeutic strategies

Over expression of nucleases has been reported as promising biomarker for infectious diseases, and other human conditions such as cancer and autoimmune diseases. In our studies, we have demonstrated the capability of nucleases for detecting specific bacteria in animal models of disease. With this strategy we developed nucleic acid probes with high sensitivity and specificity that allows *in vivo* detection of bacteria in 45 min, clearly demonstrating the great potential of this technology for targeting applications where nuclease activity is present. Therefore any method based on this property (nuclease degradation activity) represents a novel alternative for diagnostic and therapeutic intervention.

As a proof-of- concept, we have previously developed a novel molecular imaging approach that rapidly and specifically detects *S. aureus* infections via fluorescent probe activation by a specific nuclease (micrococcal nuclease)secreted by *S. aureus* (Hernandez *et. al.* Nat Med. 2014, 20, 301-306). To overcome the limitations with the fluorescence-based probes regarding tissue penetration and background signal, we are now pursuing a novel approach based on activatable contrast agents that can be measured with magnetic resonance imaging (MRI).

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