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Development of an entropy-driven DNA strand displacement reaction for the colorimetric detection of species-specific DNA sequences

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Isothermal detection of specific DNA sequences has the potential to be an extremely beneficial tool both inside and outside of a laboratory setting. By coupling DNA strand displacement with the activation of peroxidase-like g-quadruplexes, we have developed a number of DNA-based colorimetric sensors that rapidly identify the presence of species-specific DNA sequences. We set out to demonstrate that this type of reaction can be integrated into a cyclical hybrization chain reaction to amplify the minimum detection limits of these sensors. While the use of bioinformatic software is essential to develop individial components of these HCR reactions, we observed that some basic rules expedited the screening of potential reaction designs. We further demonstrated that this reaction mechanism can effectively detect specific DNA sequences under idealized conditions, and can be readily adapted to new target sequences. The optimization of this rapid and cost-efficient methodology will serve as one component in a work flow to differentiate between species in a field-based laboratory setting.

Biography

Peter Kuhn has completed his PhD in Cancer Biology at the University of Wisconsin-Madison in 2010. His Post-doctoral work focused on role of transcriptional reguation in quroum sensing in yeast. He has been a Faculty Member at Edgewood College in Madison, WI for the past five years, developing DNA sensors using strand-displacement to activate G-quadruplexes.

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