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A BIOPOLYMER-BASED FLUORESCENT NANOBIOSENSOR FOR EARLY BREAST CANCER DIAGNOSIS

For more information, contact
Zheng Wei Wong at
hyxzw1@nottingham.edu.my

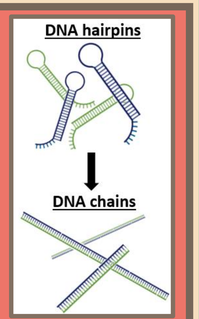
Zheng Wei Wong, Siu Yee New

BACKGROUND

- **Early detection** improves the 5-year survival rate of breast cancer patients.
- Current methods (mammography, ultrasound) have their limitations (i.e. **expensive**, **limited sensitivity**, **invasive**).
- We have developed a nanobiosensor based on the fluctuating levels of breast cancer microRNA (**miRNA-155**).

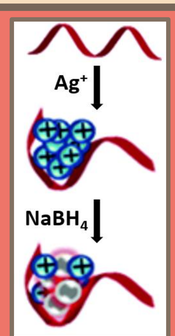
1. Hybridization Chain Reaction (HCR)

- **Autonomous** amplification similar to polymerase chain reaction (PCR), but **simpler**; only **DNA hairpins** required and runs at **constant temperature** without the need of expensive instrument.
- With target, DNA hairpins **(monomers)** open and hybridize to form long nicked dsDNA chains **(biopolymer)**.



2. Silver Nanoclusters (AgNCs)

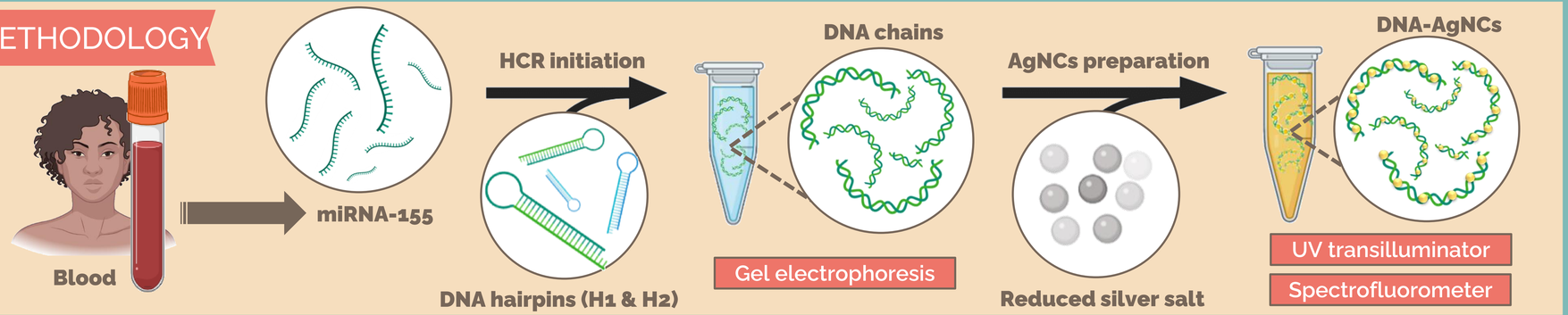
- Built-in **fluorescence probe** that simplifies **downstream analysis** of analytes.
- **Biocompatible** in biological systems, **non-toxic**, and **photostable**, with **tuneable fluorescence emission** colour.
- AgNCs can be **cost-effectively** prepared on the spot with **ease**.



OBJECTIVE

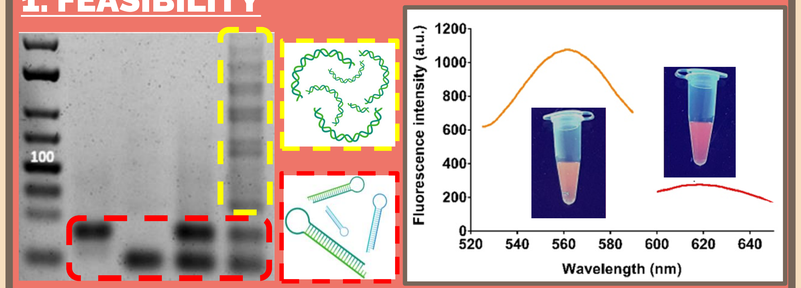
- **Simplify** the detection of miR-155 with a functional HCR-AgNCs nanobiosensor.
- Improve its overall performance (i.e. **sensitivity**, **selectivity**, and **real sample analysis**), that is comparable to current detection methods.

METHODOLOGY

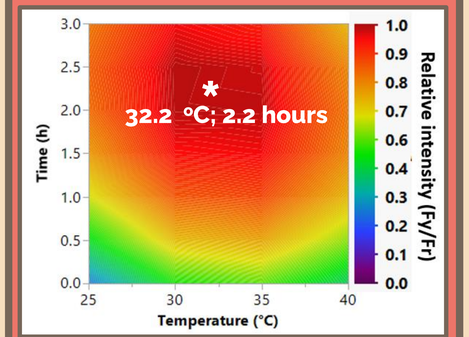


RESULTS

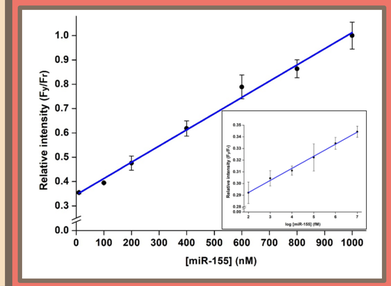
1. FEASIBILITY



2. OPTIMIZATION

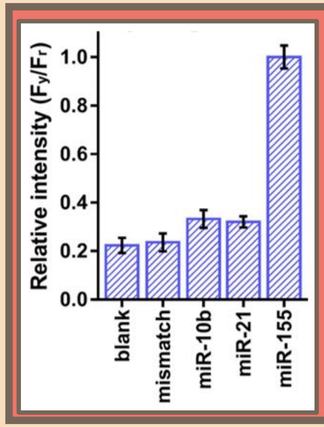


3. PERFORMANCE

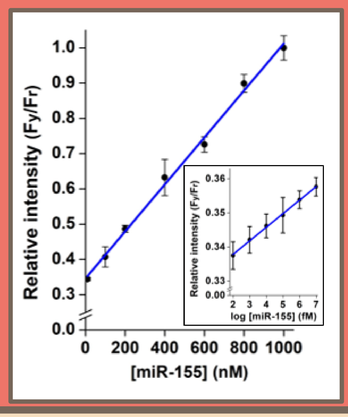


REAL SAMPLE

SELECTIVITY



SENSITIVITY



CONCLUSION

- HCR-AgNCs optical nanobiosensor, with **two fluorescence emission** (**RED** and **YELLOW**).
- **High sensitivity -** wide linear range; LOD 1 .13 fM.
- **High selectivity -** discrimination of single base mismatch and non-targets.
- **High performance in complex serum sample -** reproducible and stable fluorescence response.
- Proposed nanobiosensor offers a better alternative, in terms of **time, cost** and **effort** required, towards the **detection of miR-155** and **point-of-care early diagnosis of breast cancer**.

REFERENCES

- Liu, J.; Huang, W. H.; Yang, H. X.; Luo, Y. *Biotechnol. & Biotechnol. Eq.* 2015. 29:5, 840-843.
- Dirks, R. M.; Pierce, N. A. *Proc. Natl. Acad. Sci.* 2004, 101 (43), 15275–15278.