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DEVELOPMENT OF A SIMPLE OPTICAL NANOBIOSENSOR FOR EARLY DETECTION OF BREAST CANCER

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BACKGROUND

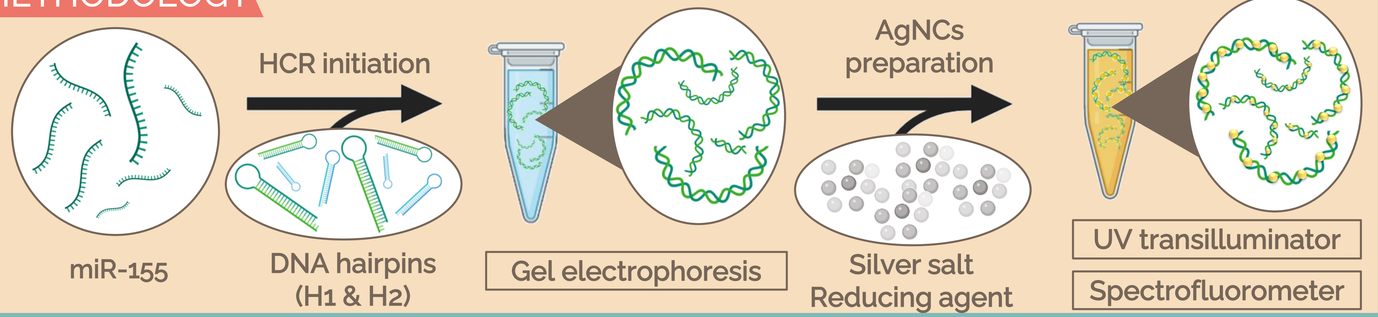
- Breast cancer (2020) - **2.3 million** cases; **685,000** deaths.
- **Early detection** improves the 5-year survival rate of breast cancer patients.
- Current methods (mammography, ultrasound) are **inaccessible** and **unaffordable** to everyone, especially in developing nations.
- **Nanotechnology** have emerged as building blocks for **sustainability applications** and **development**.
- We have developed a nanobiosensor based on the levels of breast cancer microRNA (**miR-155**).
- Our research work targets **SDG 3: Good Health and Well-being**.
- Our optical nanobiosensor comprises:

1. **Hybridization chain reaction (HCR)**
   Amplification strategy with PCR-like sensitivity. Requires only **DNA hairpins** and runs at **constant temperature** without the need of expensive instrument.
2. **Silver nanoclusters (AgNCs)**
   Built-in **fluorescence probe** that simplifies detection of analytes. **Biocompatible** in most biological systems, **non-toxic**, and **simple synthesis**.

OBJECTIVE

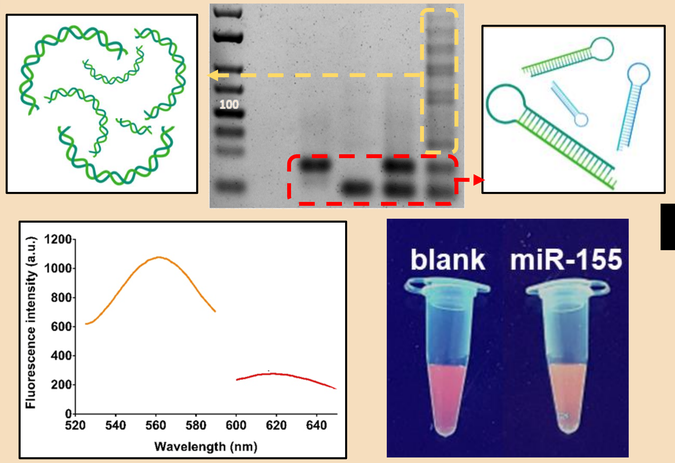
- **Simplify** the detection of miR-155 with a functional HCR-AgNCs nanobiosensor, to make it **more accessible** and **affordable** for everyone.
- Improve its overall performance (i.e. **sensitivity**, **selectivity**, and **real sample analysis**), that is comparable to current detection methods.

METHODOLOGY

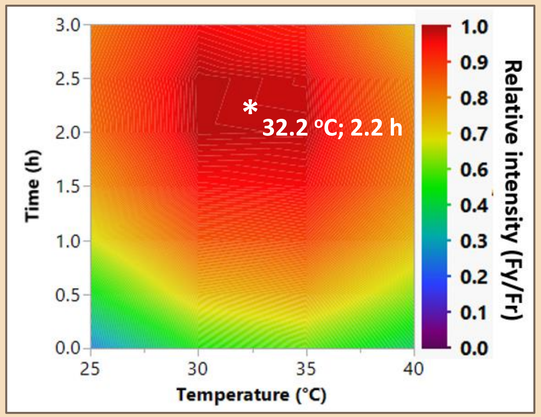


RESULTS

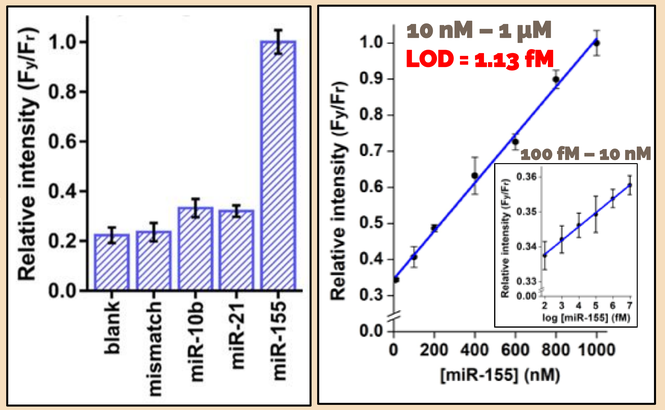
FEASIBILITY



OPTIMIZATION



PERFORMANCE



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 -** 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**.