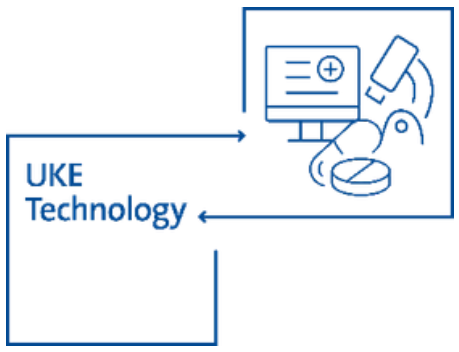

Innovative Probe Design for Early and Accurate Nucleic Acid Detection

Background & Innovation

Nucleic acid detection is a cornerstone of modern diagnostics, from infectious disease testing to genetic analysis. Existing methods such as PCR and isothermal amplification are widely used but face limitations in multiplexing capacity, specificity, and compatibility with different polymerases. Conventional probes (e.g., TaqMan) often require polymerases with exonuclease activity and are restricted in the number of targets they can differentiate within a single reaction.
The invention introduces a novel reporter probe system designed to overcome these limitations. The reporter probe increases multiplexing potential, improves detection specificity and enables broader applicability across PCR, qPCR, dPCR and isothermal amplification methods (e.g. LAMP).

Technical Description

The reporter probe consists of two complementary oligonucleotides: a head oligo and a tail oligo.

- The head oligo binds to a first target region of the nucleic acid and overlaps partially with the tail oligo.
- The tail oligo binds to an adjacent target region and carries a fluorophore-quencher pair within a labeling portion.

When both oligos anneal to their respective adjacent target regions, they also anneal to each other at their overlap portions, forming a triplex structure with the target nucleic acid.

In this state:

- The fluorophore remains quenched while single-stranded.
- Upon polymerase-mediated ex-tension, the labeling portion becomes double-stranded, spatially separating the fluorophore and quencher.
- This separation triggers a detectable fluorescence signal, indicating specific target binding.

The design ensures that fluorescence occurs only when both target regions are correctly bound, greatly enhancing detection accuracy.

Competitive advantage

- **High specificity:** Signal is only generated when both adjacent target regions are bound, reducing false positives.
- **Superior multiplexing:** Multiple reporter probes with distinct melting temperatures or fluorophores can be used simultaneously, expanding the number of targets in a single reaction.
- **Versatility:** Compatible with PCR, qPCR, digital PCR and isothermal amplification methods (e.g., LAMP, RPA).
- **Polymerase flexibility:** Does not require exonuclease activity. Works with (non-) hydrolyzing polymerases.
- **Robust performance:** Suitable for clinical diagnostics, genetic polymorphism analysis (e.g., SNP detection) and pathogen panel testing.
- **Commercial adaptability:** Can be developed into kits with multiple probes, offering scalable diagnostic solutions.

FOCUS SECTORS

- Medtech
- Molecular diagnostics
- Clinical laboratories
- Infectious disease testing
- Genetic testing & SNP analysis
- Research & life sciences

PROJECT KEY WORDS

- Probe design
- Multiplexing
- SNP detection
- Fluorescent assay
- PCR, LAMP, RPA, etc.

DEVELOPMENT STATUS

- Proof of concept demonstrated
- Laboratory validation ongoing
- Prototype assays under development

PATENT PROCEDURE STATUS

- EP Patent application filed

POTENTIAL FOR COOPERATION

- R&D Cooperation
- Licensing

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