

Accurate Point-of-care Outfit for Pain Evaluation(apocope)

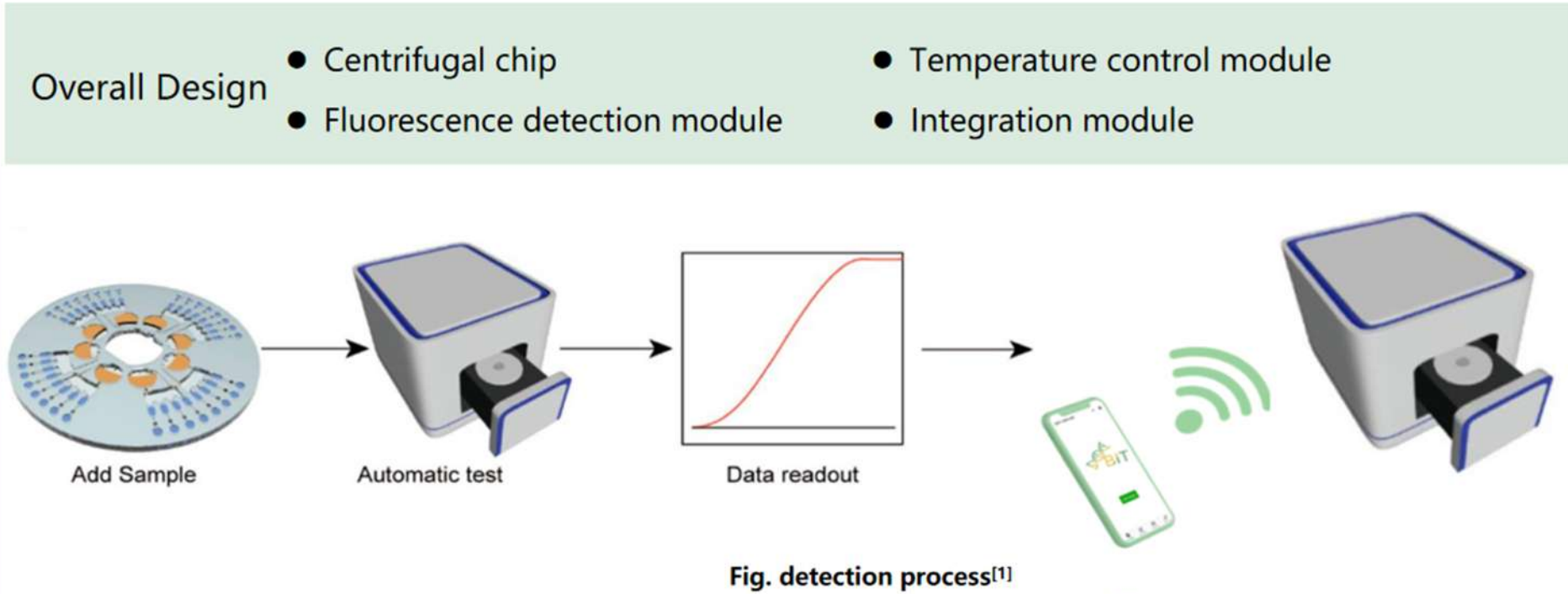
Background | What is pain?

According to the latest definitions from the International Academy of Pain (IASP), pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or an experience similar to this.

- Pain severity and quality assessments are primarily achieved through the use of subjective rating scales. **However** those scales are essentially a series of questions designed to capture self-reported clinical pain, which is subjective and has many uncertainties in its assessment.
- At present, hospital pain doctors rely too much on their own experience to classify pain and lack effective physiological indicators or auxiliary devices for objective assistance.
- Subjective evaluation of the patient at the time of diagnosis leads to abuse of painkillers, reducing sensitivity to pain.

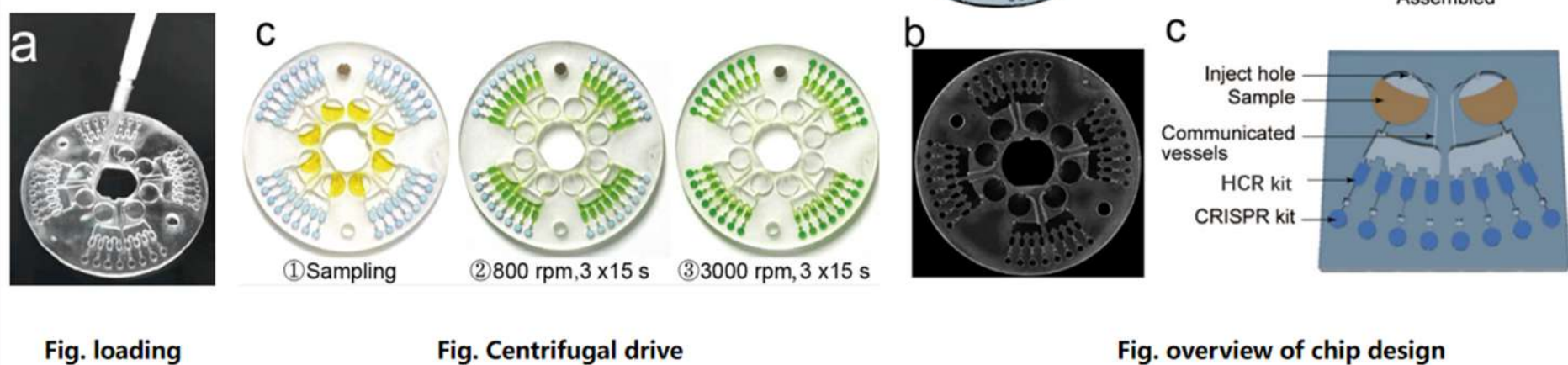
Hardware

The overall design of Hardware

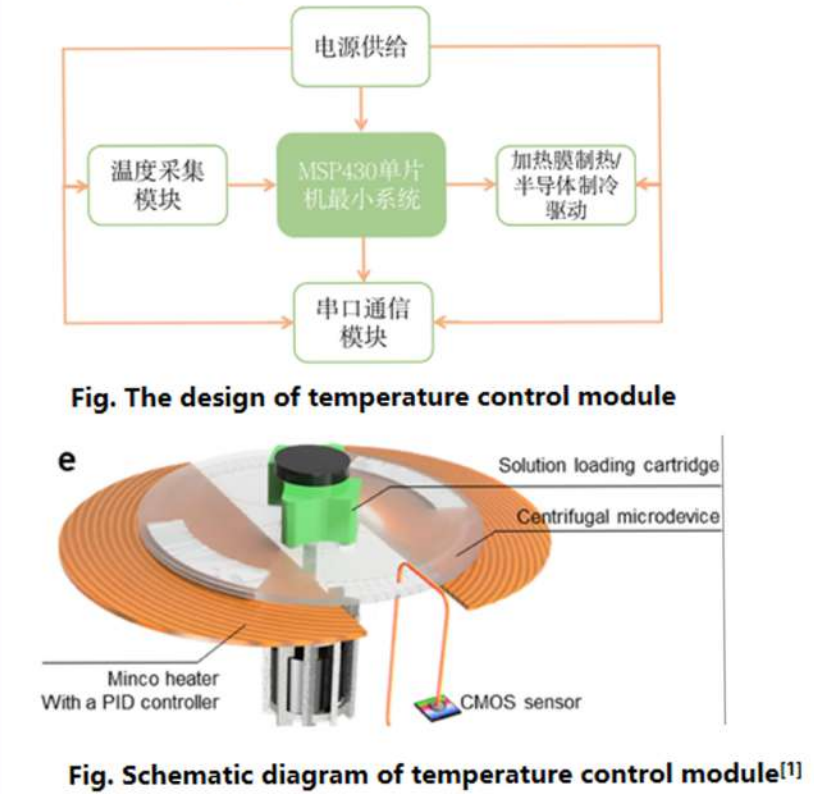


The design of centrifugal chip

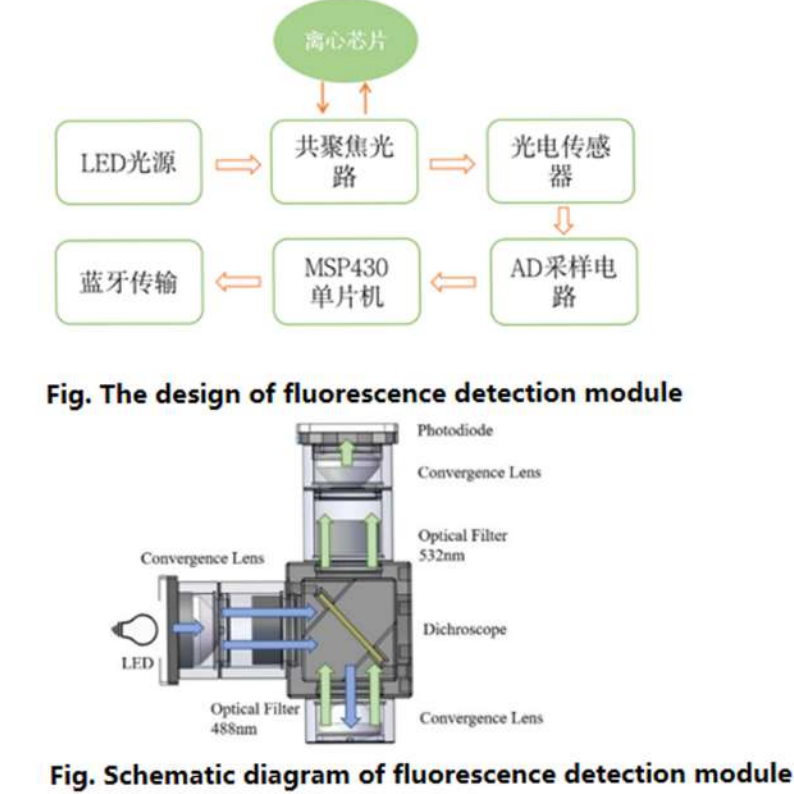
In order to integrate biosensing methods, a high-throughput centrifuge chip^[1], which integrated functions such as reagent pre-embedding and liquid control, was constructed in this project to provide a reaction platform for HCR reaction and CRISPR reaction.



The Temperature Control Module



The Fluorescence detection module

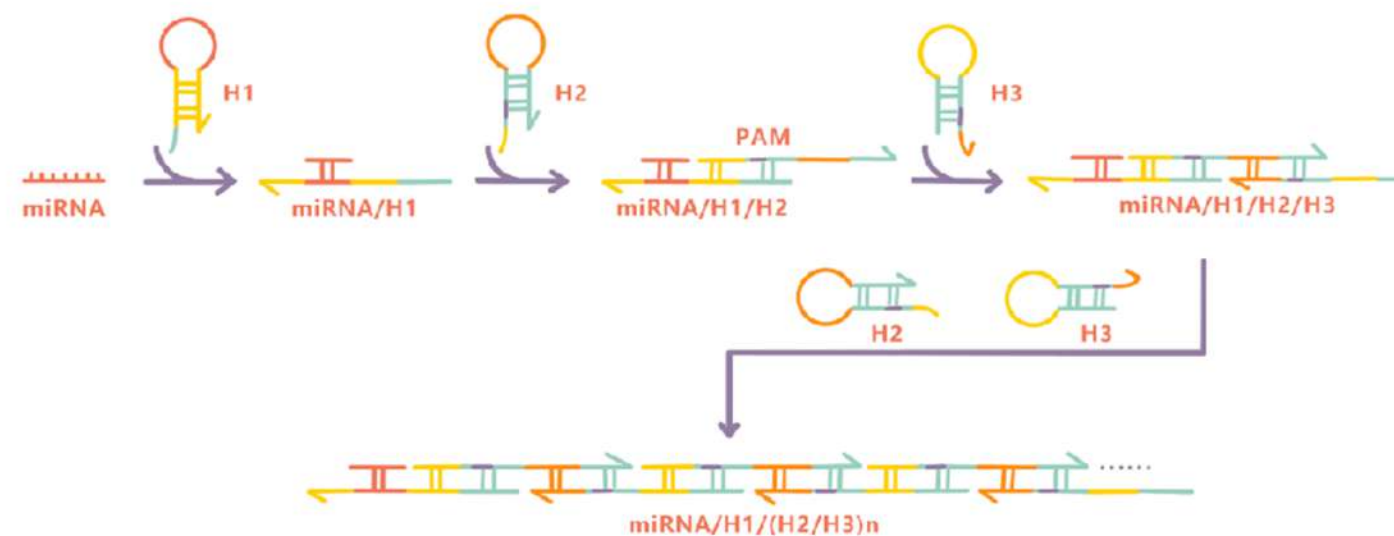


Biology Theory

Hybridization chain reaction (HCR)

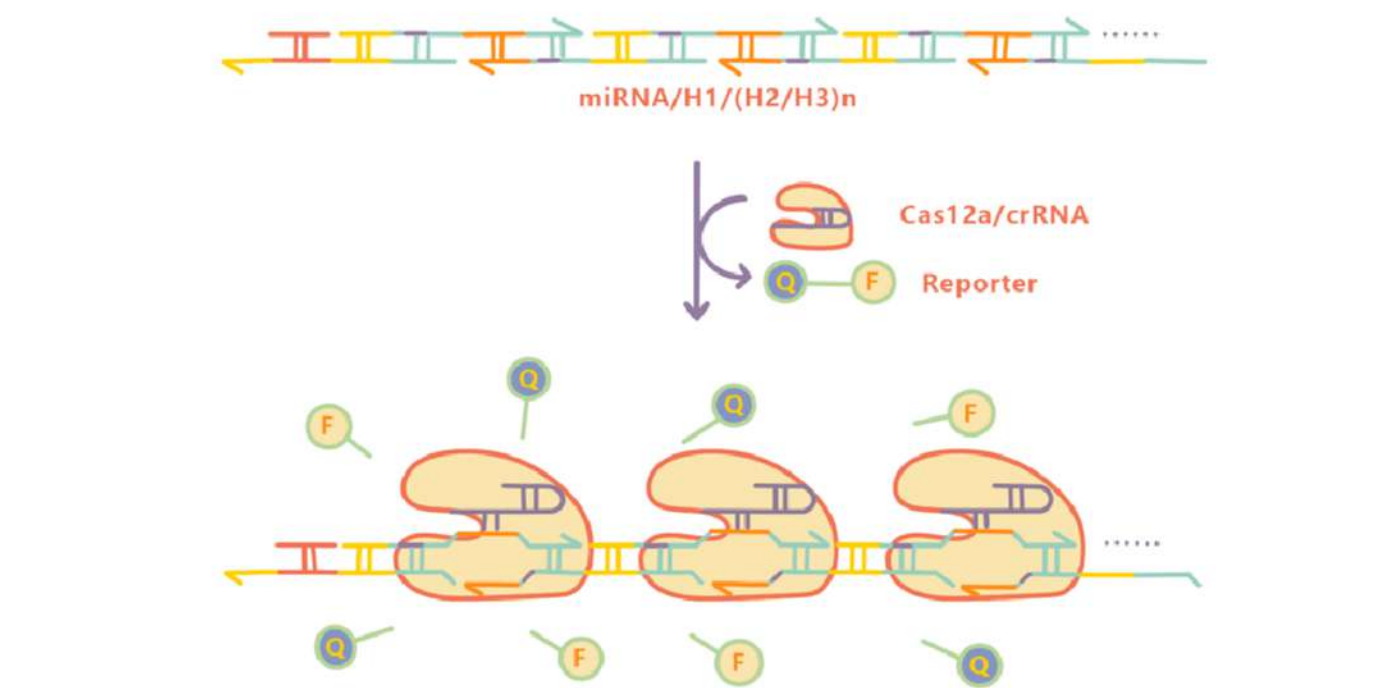
As a special DNA circuit, Hybridization chain reaction (HCR) is a triggered self-assembled and non-enzyme process, in which single nucleotide input initiates a cascade hybridization events to form a DNA duplex output .

In addition to the signal transduction, programmability and non-enzymatic amplification capabilities of HCR, its reaction conditions are relatively mild, so we hope to use HCR to achieve high-sensitivity quantitative detection of miRNA.



CRISPR/Cas system

CRISPR/Cas system, especially the Cas12a, Cas12b and Cas-13a, which with collateral cleavage activity, has drawn strong attention in the field of analytical diagnostics. The collateral cleavage activity of Cas protein initiated by the recognition of the target DNA can cleave nucleicacid labeled fluorophore quencher (FQ) non-specifically with high turnover efficiency, endowing CRISPR/Cas system with remarkable self-signal amplification ability.



Advantages

1. Design different HCR systems according to the required miRNA sequence, and can realize the detection of miRNA;
2. Try a one-step reaction to simplify the detection process
3. Combined with the design of the chip, different miRNAs can be detected in different chambers to achieve multi-target detection.