

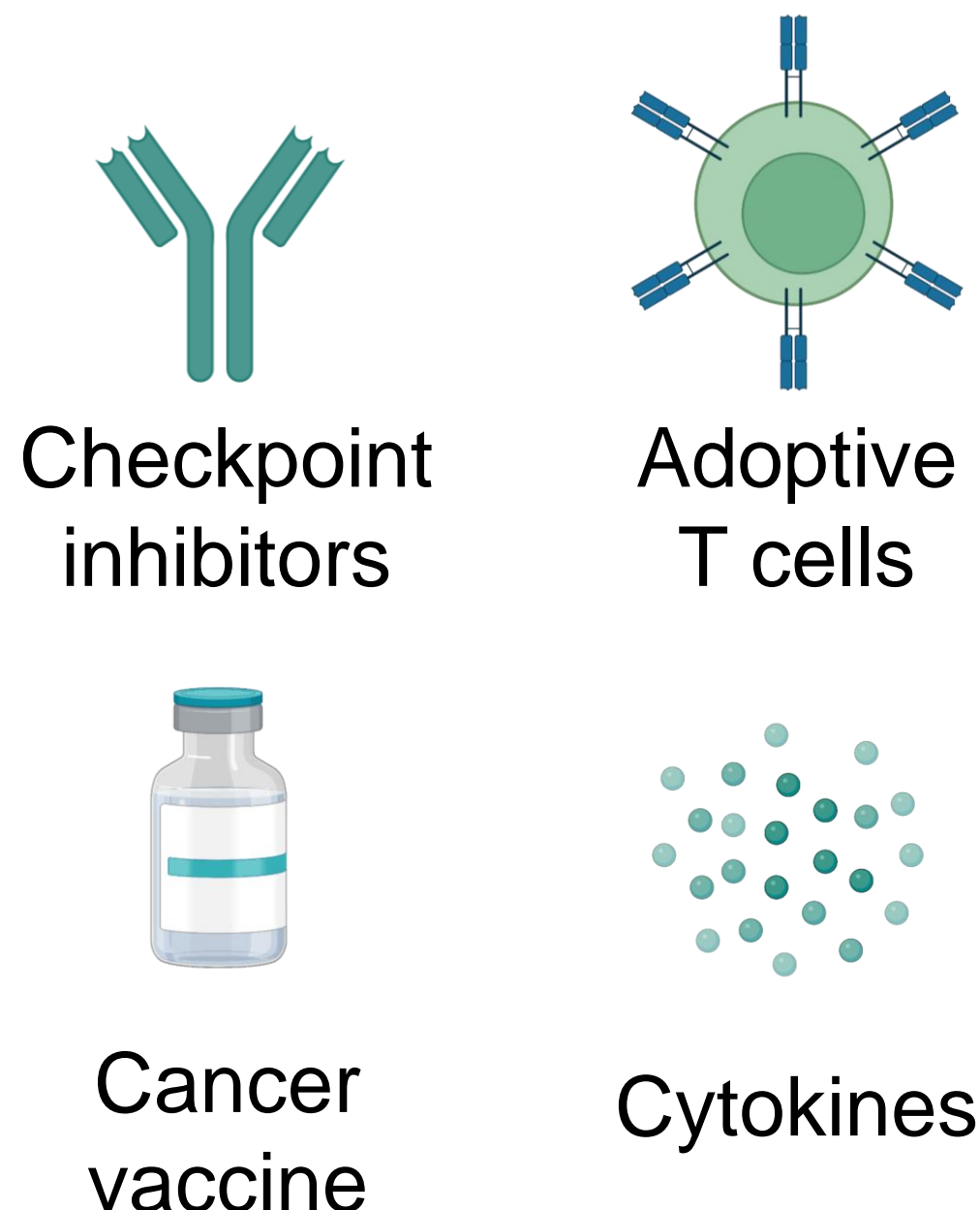
FET-based Multiplexed Sensing Towards Clinical Applications in Cancer Immunotherapy

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OUR VISION

Nanoelectronics holds the potential to go beyond early diagnosis in cancer research and revolutionize current clinical technologies in immunotherapy.

Immunotherapeutic agents



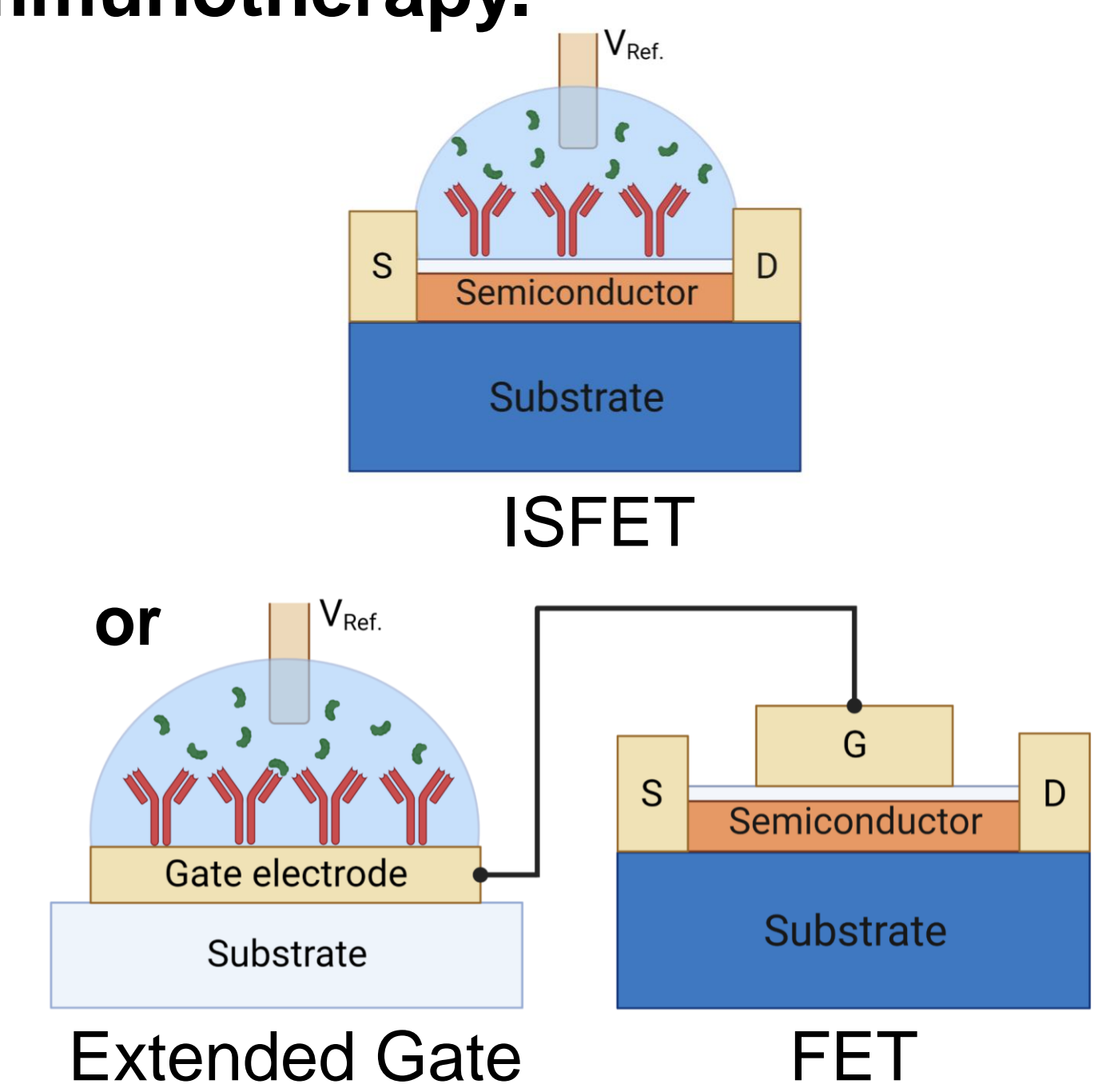
Immunotherapy

Targeted treatment
Long-term response
Incomplete understanding
Immune-related side effects
Limited production
Expensive

FET-based sensors

Portable
Realtime monitoring
Fast turnover time
Sensitive
Analyte-saving
Cost-effective

Our goal: safer, more precise, and affordable cancer treatment



OUR WORKS

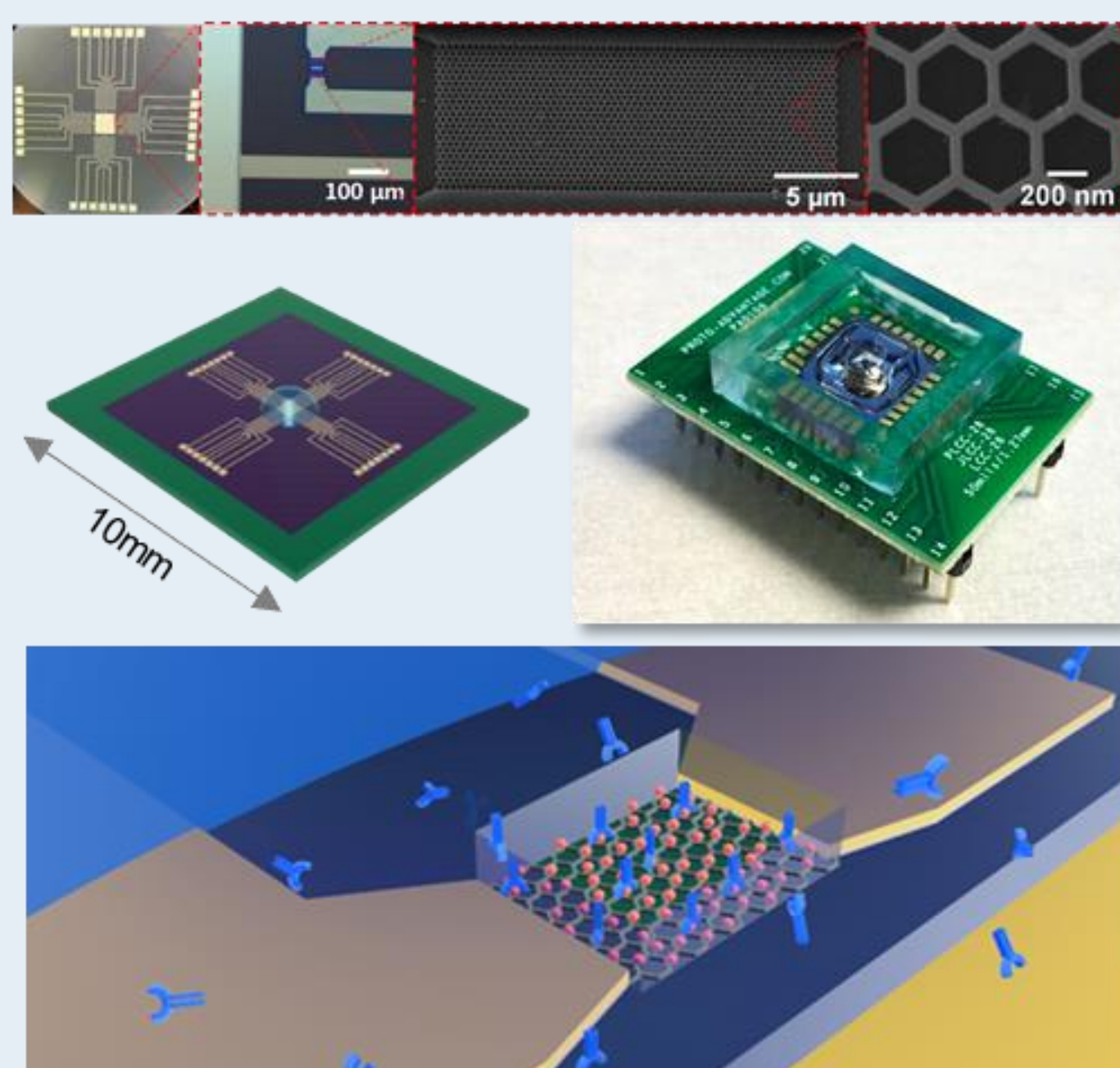
Research phase

TM screening
CAR T cells verification
Pharmacokinetic/dynamic testing

Clinical practice

TM / cytokines monitoring
Abnormality detection

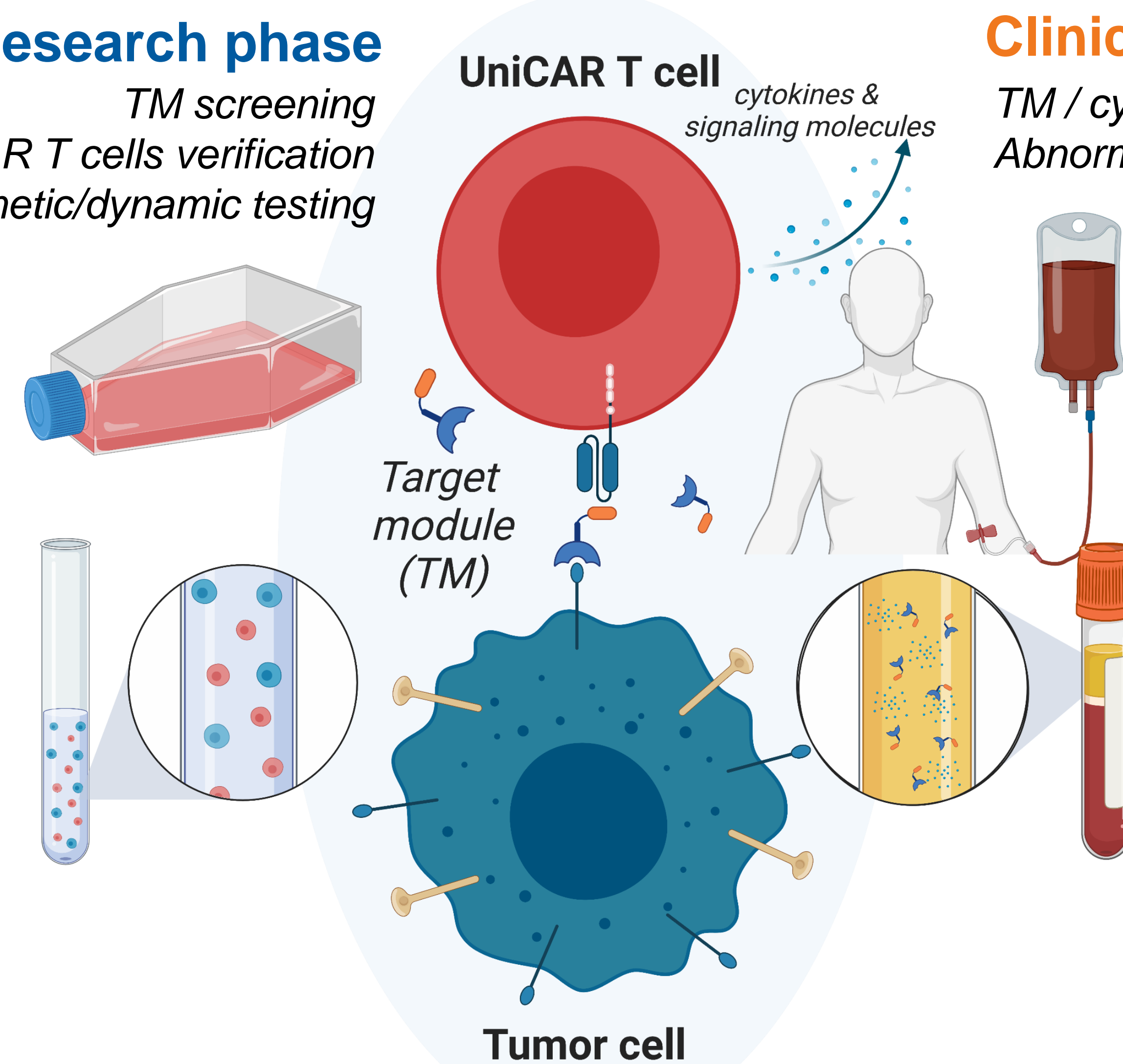
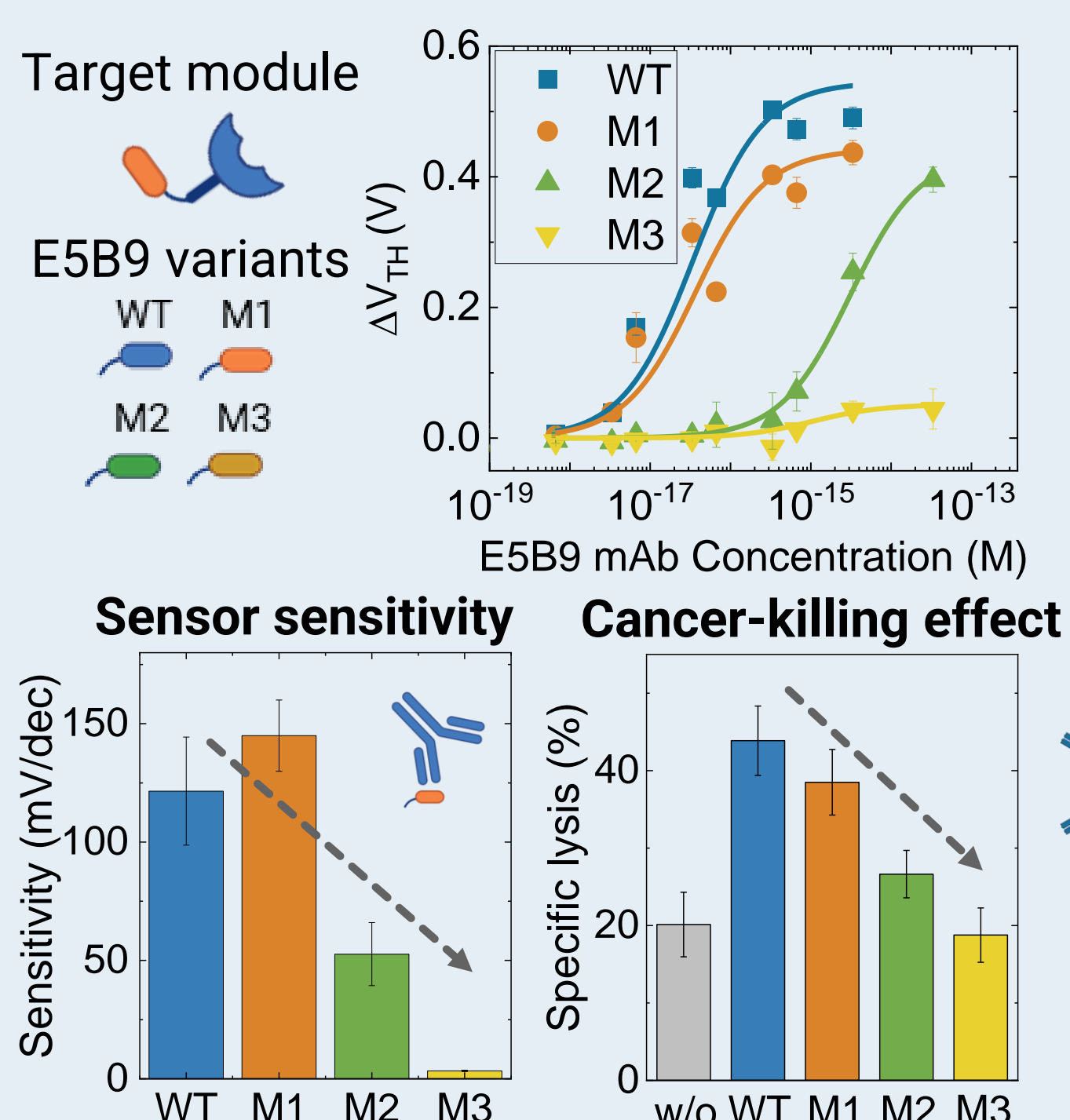
Highly-sensitive silicon nanowire sensor (SiNW FET)



- ✓ Ultrahigh sensitivity
- ✓ Extremely analyte-saving
- Difficult handling and integration
- Low chemical resistance
- Complex fabrication process

Drug screening

Screen a library of peptides for the most effective cancer-killing effect

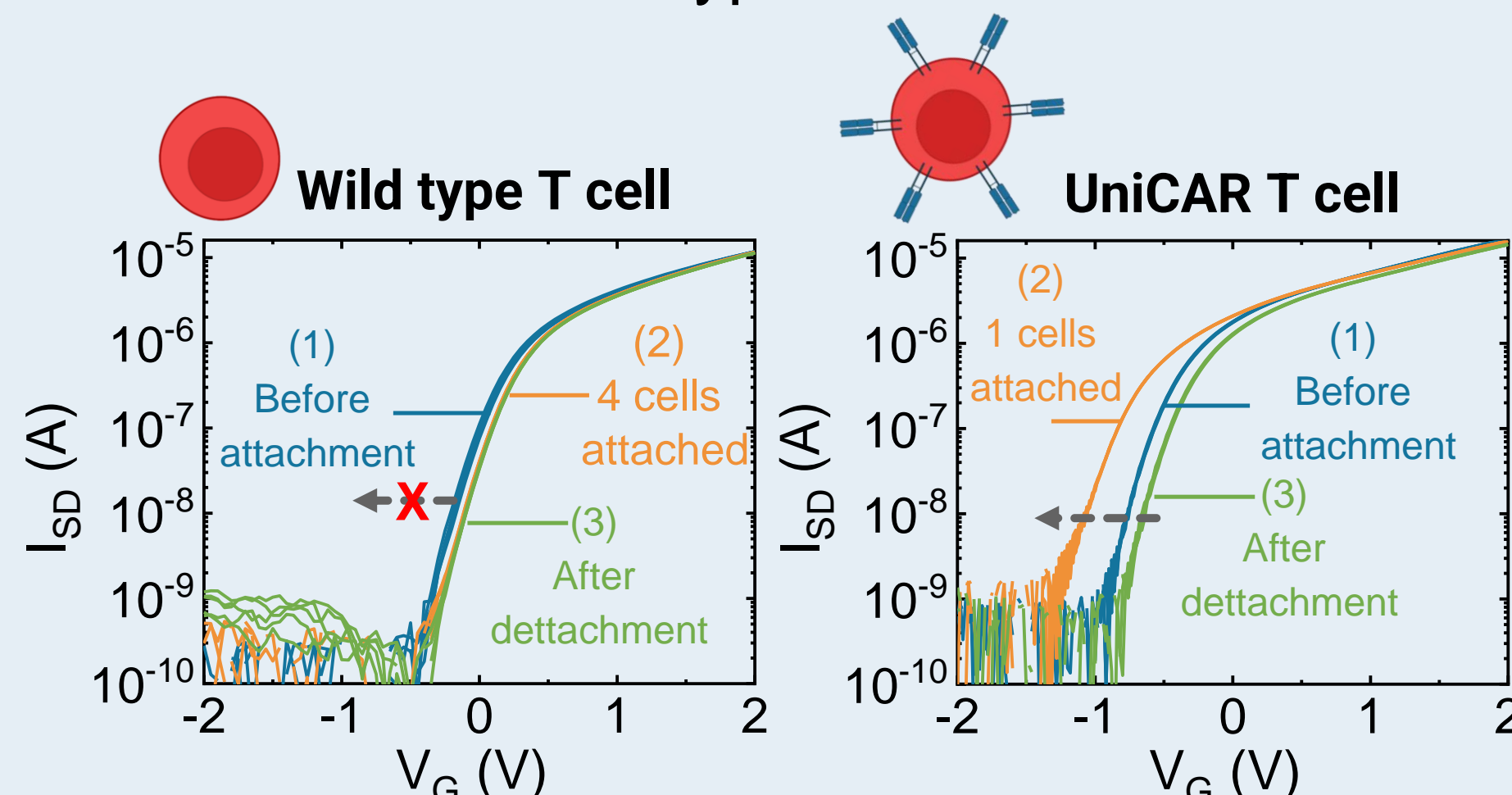


| | SiNW FET | EG FET | ELISA |
|--------------------|---------------------|---------------------|---------------------|
| Readout | Electrical | Electrical | Optical |
| Labeling | No | No | Yes |
| Preparation time | 20 minutes | 20 minutes | 95 minutes |
| # Sensing unit | 16 | 32 | 96 |
| Sample volume/unit | 10 uL | 1000 uL | >5000 uL |
| Detection limit | 10 ⁻¹⁷ M | 10 ⁻¹⁵ M | 10 ⁻¹¹ M |

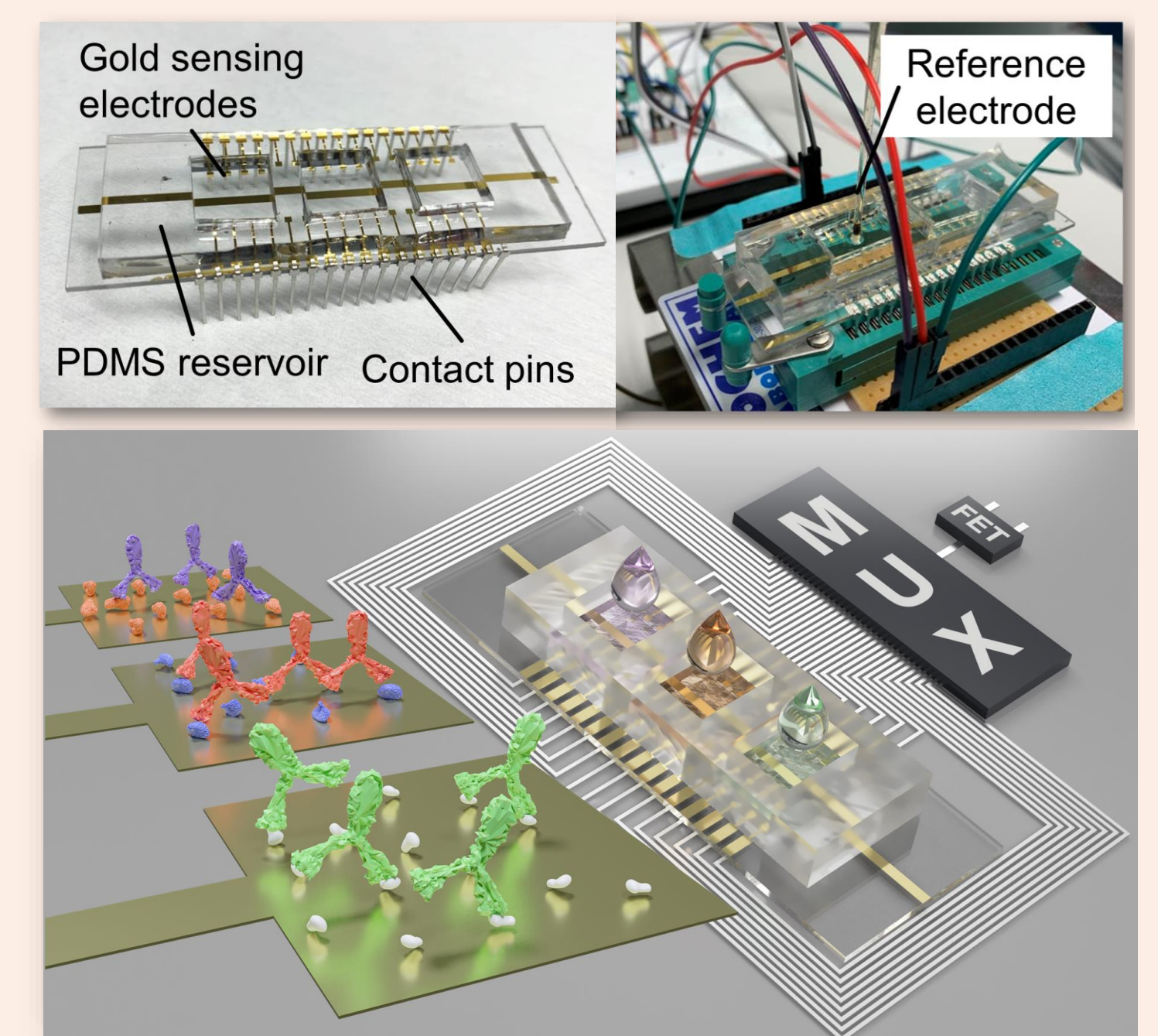
* Benchmarking with WT E5B9 peptides and anti-5B9 antibodies

CAR T cell identification

Distinguish between modified CAR T cells and wild-type T cells.



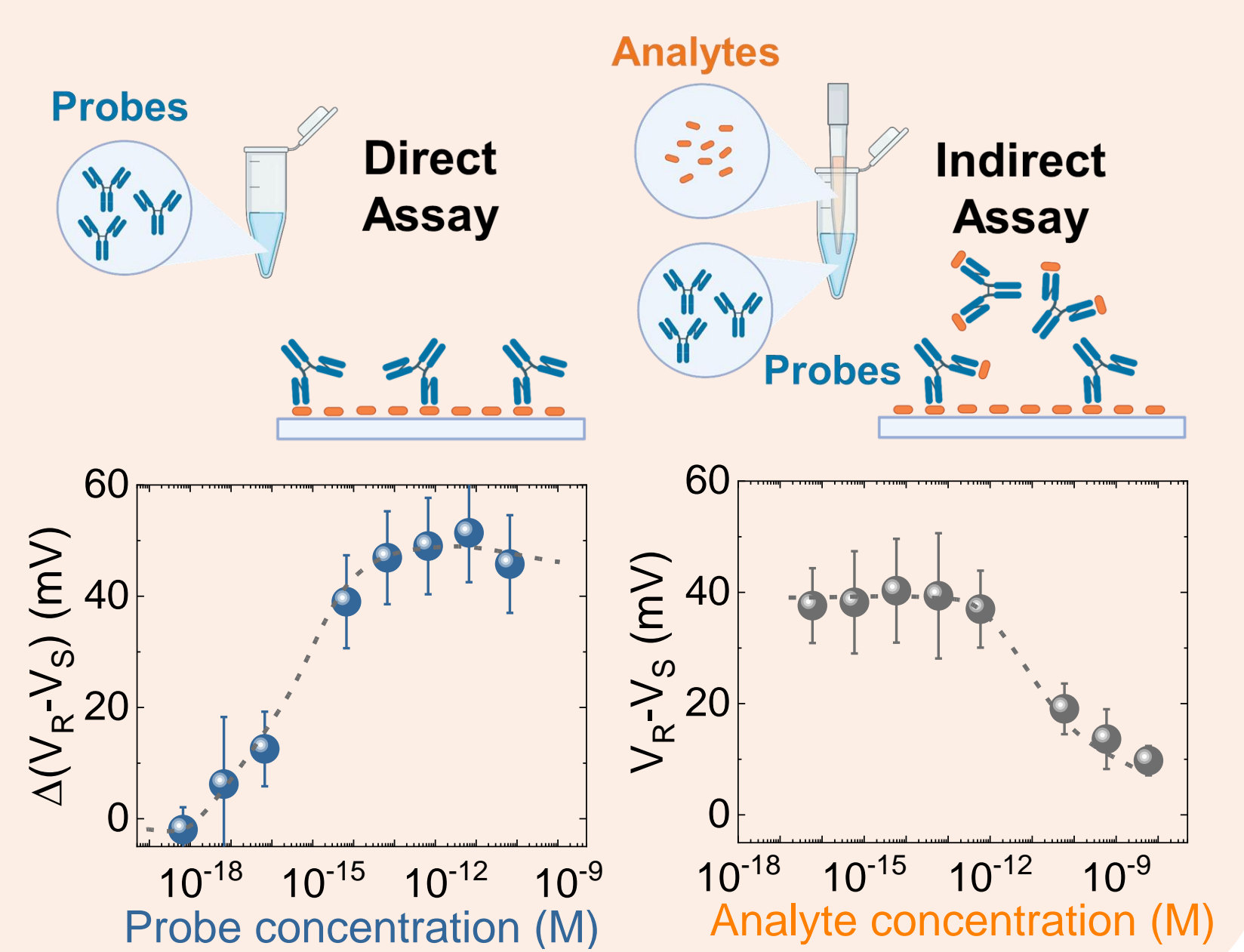
Extended-gate sensor with portable readout (EG FET)



- ✓ Design flexibility
- ✓ Easy handling
- ✓ Disposable and low-cost
- Reduced sensitivity levels
- Increased noise coupling

Active drug monitoring

Quantify the concentration of active therapeutic agents during treatment. Both in a direct and indirect manner.



OUTLOOK

- Enhance sensitivity and reproducibility of EG FET sensor by optimizing chip fabrication, surface modification, reference electrode, and readout approach.
- Multiplexing: monitor an array of cytokines – crucial signaling molecules that regulate the immune response during immunotherapy.
- Integrate EG FET sensor in cell culture model for comprehensive in vitro response characterization during immunotherapy.

