



Abstract

Fertility hormone testing provides vital information for women undergoing In Vitro Fertilization, ectopic pregnancies, miscarriages, and polycystic ovary syndrome. However, the current methods of testing pose many accessibility barriers to women around the world. At-home urine tests lack the sensitivity and specificity of blood tests that healthcare providers desire. However, blood tests require the patient to rely on testing centers. At these centers, extensive sample preparation is required, and results can take days.

The goal of our research is thus to devise a test that can detect fertility hormones in whole blood in the comfort of the patient's home. To achieve this goal, genetically engineered microbial cells will be used as a robust sensing platform. However, the function of microbial cells in blood has not yet been well established.

Goal: Enable at-home blood tests

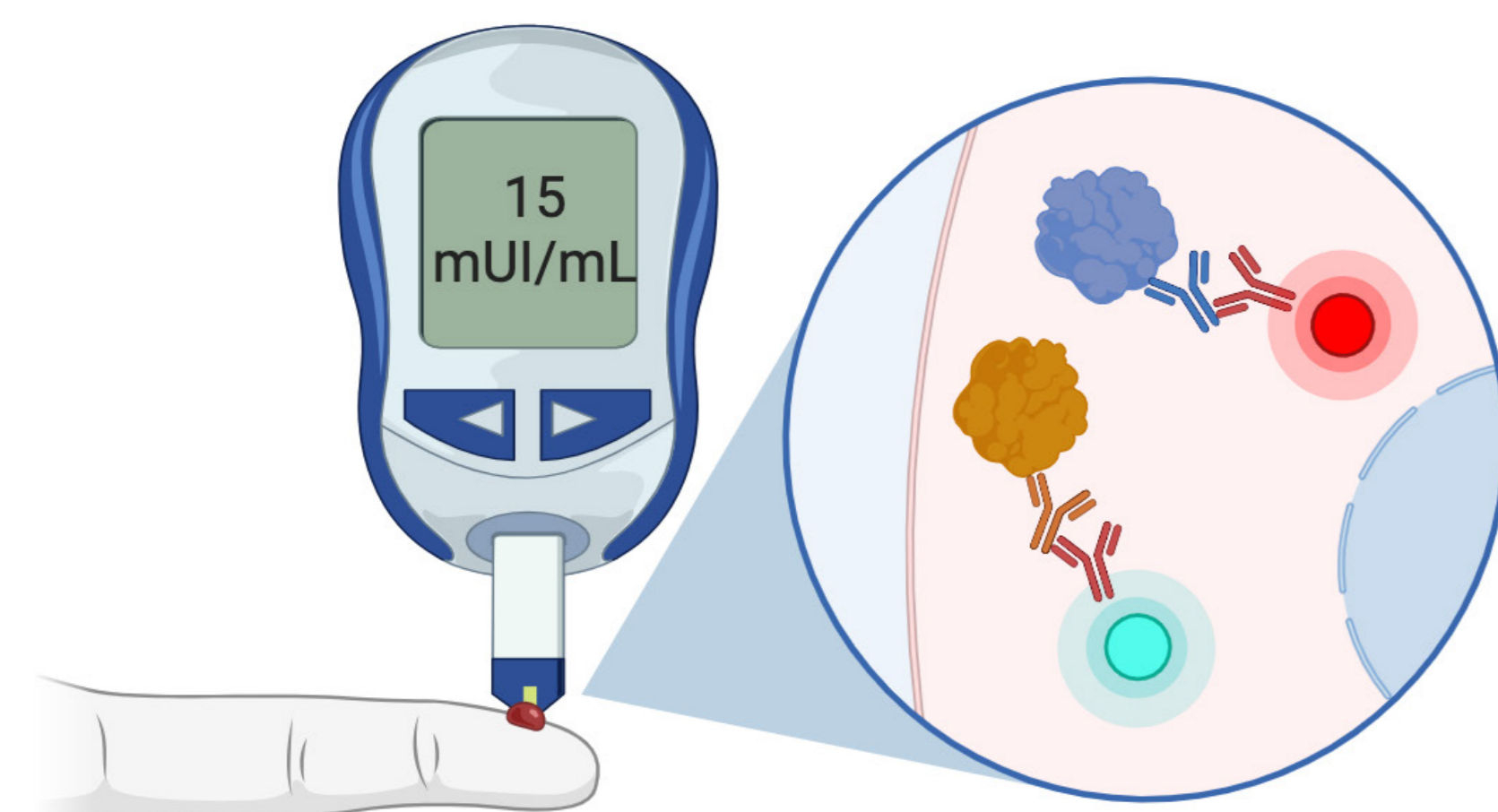
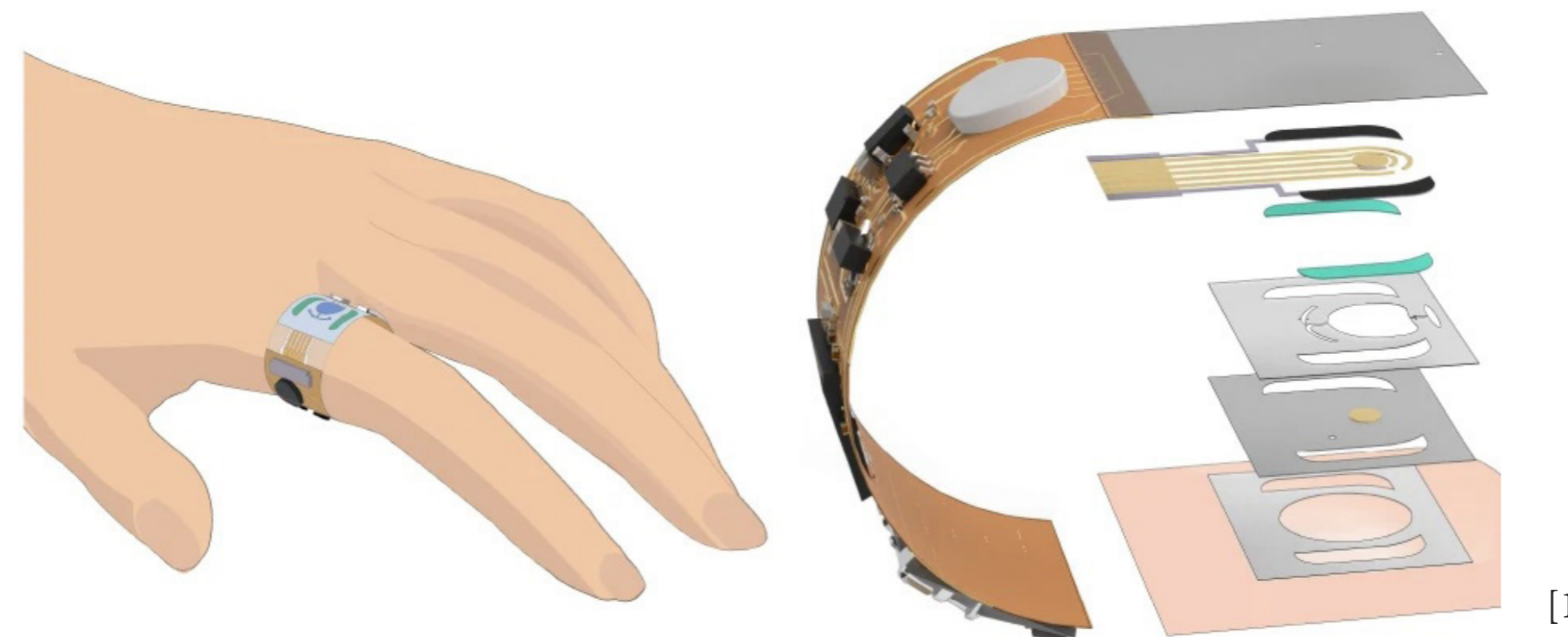
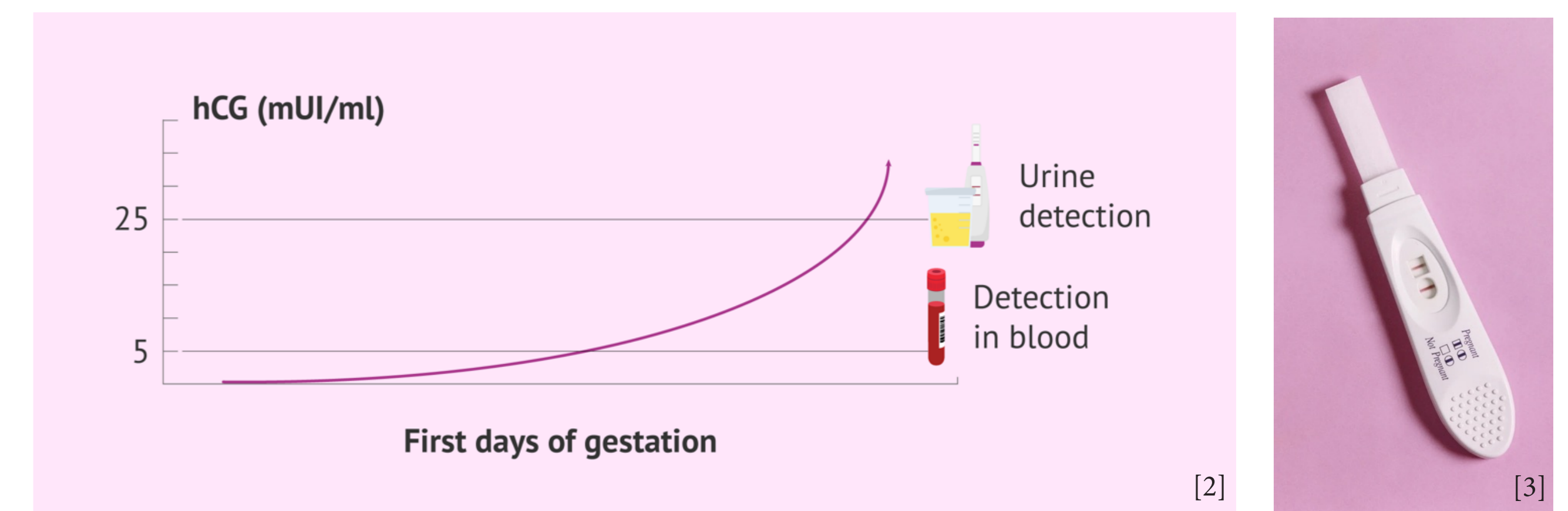


Image created on biorender.com

Limitations of current at-home tests



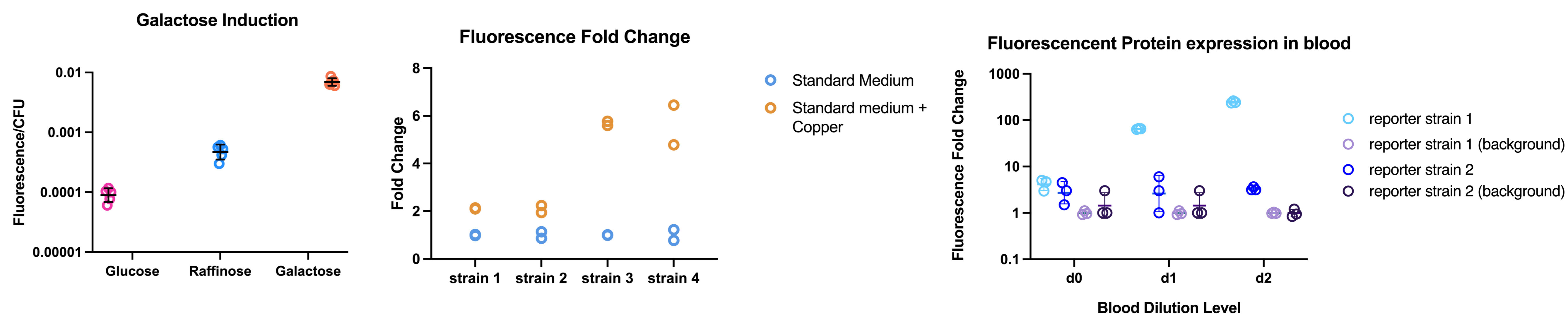
References:
 [1] Ye, C., Wang, M., Min, J. et al. A wearable aptamer nanobiosensor for non-invasive female hormone monitoring. *Nat. Nanotechnol.* 19, 330–337 (2024). <https://doi.org/10.1038/s41565-023-01513-0>
 [2] S. Fernández, M. Embleton, C. Goosman. What are the normal values of beta-hcg hormone?. *inviTRA*. <https://www.invitra.com/en/beta-hcg-levels-during-pregnancy/>
 [3] Barth, L. (2020, June 2). Are pink dye pregnancy tests better?. *Healthline*. <https://www.healthline.com/health/pregnancy/pink-dye-pregnancy-test>



Commercially available and up and coming tests:

- Only detect steroid hormones
- Are not quantitative
- Are impacted by how hydrated the person is
- Need a much higher concentration to be detected

Strategy: Designing Inducible Fluorescent Reporters



Future Work

Now that these strains have been established, their behavior in whole blood may be explored. Viability and Fluorescence of the strains in whole blood and other bodily fluids will be tested.

These results will inform the development of our fertility hormone sensors and break down barriers to reproductive healthcare.

We aim to develop an at-home hormone sensor that can:

- Provide quantitative results
- Be comparable to the current gold standard
- Test glycoprotein hormones

Learn more about our group!

group website
elmig.org

