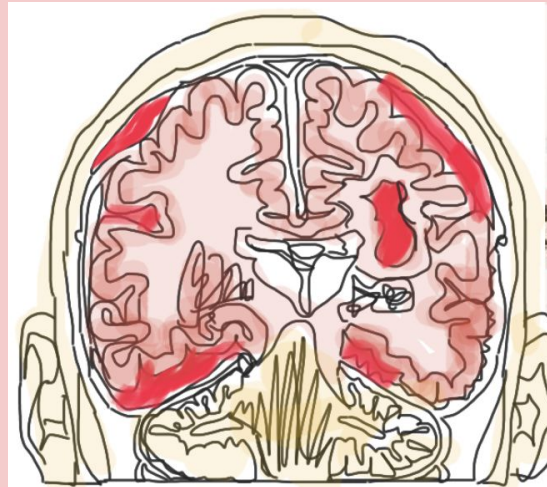


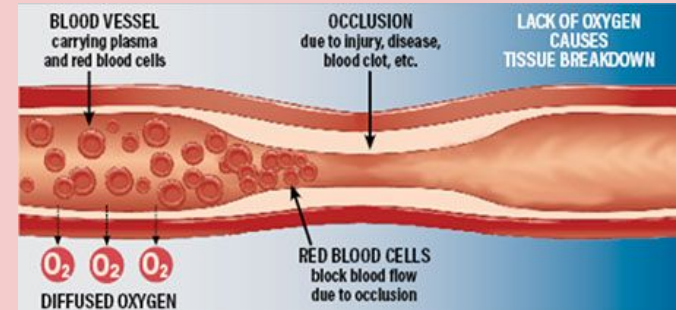
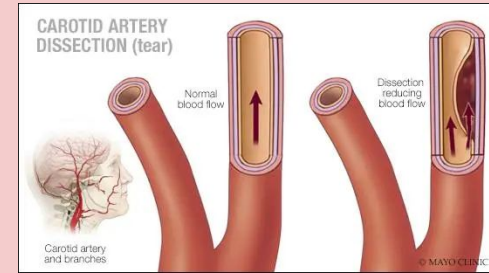
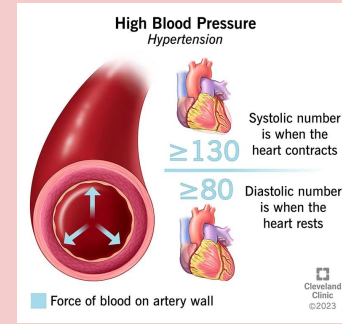
Early Detection of Intracerebral Hemorrhage via Oxygen-Detecting Microchip

Prajanya Kannan, Mihira Gutti, Jaretzy Figueroa, and Aditi Mulaka



Background

- Symptoms:
 - Hypertension + Spike in Blood Pressure
 - Risk of rupturing arteries
 - Blood into brain tissue
 - Insufficient oxygen/blood supply
 - Internal bleeding
- 13% of all strokes



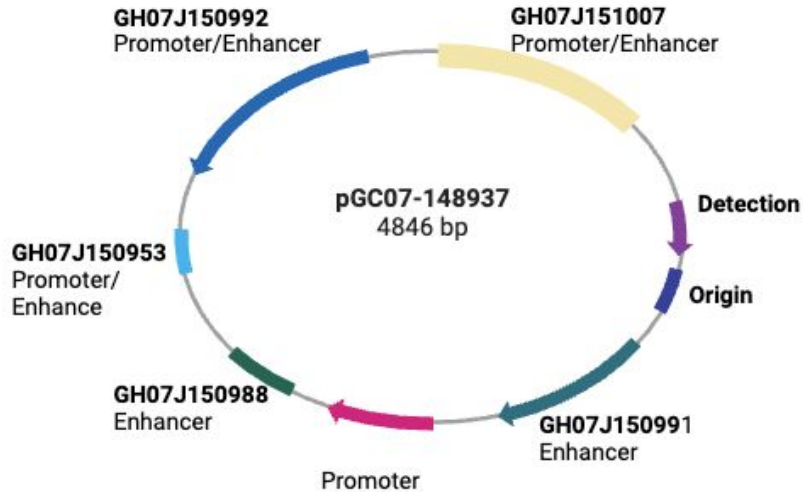
Device's Origin

- **Why NOS3 gene?**
 - Proved by a previous study to be an effective biomarker
 - Regulates nitric oxide to increase blood/O₂ flow and ease arteries
- **Microchip**
 - Detects low levels of oxygen through reading the NOS3 gene
 - Uses infrared radiation to check temperatures (normal: 38.5 degrees Celsius)



Plasmid Vector Design

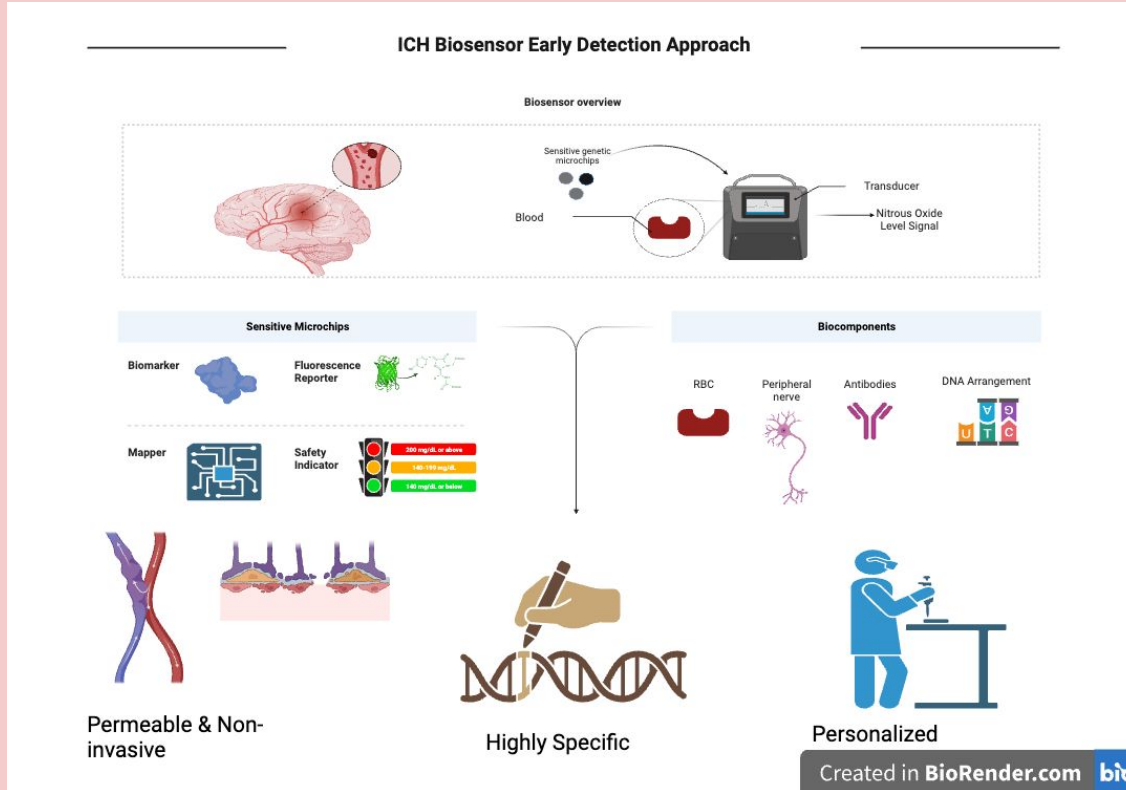
Intra Cerebral Hemorrhage Plasmid Vector Map of NOS3 gene



Created in [BioRender.com](https://www.biorender.com)



Experimental & Procedural Design

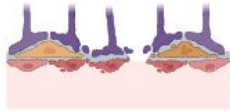


Safety and Ethical Guidelines

- E. Coli cells are under BSL-1, so using appropriate gear is essential
- Autoclave/Treat E. Coli cells with 10% bleach solution before disposal.
- Use fluorescence microscope and miniprep kits appropriately.
- The microchip is prescribed and implanted by neurologists.
- Consider possibility of surgical site infections, blood-borne diseases, etc.
- The gene plasmid vector must be treated carefully in order to ensure safety and security.
- In vitro assays and animal testing must be conducted

Strengths

- Highly specific and personalized



Permeable & Non-invasive



Highly Specific



Personalized

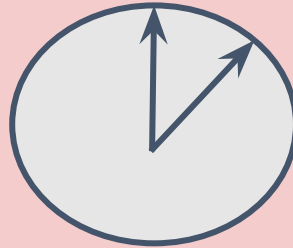
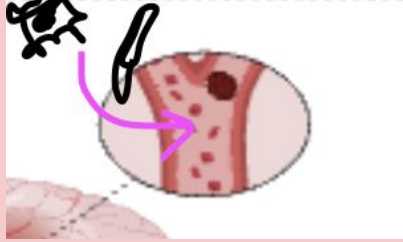
Created in [BioRender.com](https://www.biorender.com) 

- Indication of Safety



Future Implications

- Invasive approach
- Expensive
- Human testing
- Length of Study
- Other health conditions



References

1. Chen, Kejing, et al. “Nitric Oxide in the Vasculature: Where Does It Come from and Where Does It Go? A Quantitative Perspective.” *Antioxidants & Redox Signaling*, vol. 10, no. 7, July 2008, pp. 1185–1198, www.ncbi.nlm.nih.gov/pmc/articles/PMC2932548/, <https://doi.org/10.1089/ars.2007.1959>.
2. Cleveland Clinic. “Brain Bleed/Hemorrhage (Intracranial Hemorrhage): Causes, Symptoms, Treatment.” *Cleveland Clinic*, 4 May 2020, my.clevelandclinic.org/health/diseases/14480-brain-bleed-hemorrhage-intracranial-hemorrhage.
3. “Healthy Human Brains Are Hotter than Previously Thought.” *Www.ukri.org*, www.ukri.org/news/healthy-human-brains-are-hotter-than-previously-thought/#:~:text=In%20healthy%20men%20and%20women.
4. Nguyen, Thi Mai, et al. “Predicting High Blood Pressure Using DNA Methylation-Based Machine Learning Models.” *Biomedicines*, vol. 10, no. 6, 14 June 2022, p. 1406, <https://doi.org/10.3390/biomedicines10061406>. Accessed 21 July 2022.
5. “NOS3 Support - Dirty Genes.” *Seeking Health*, www.seekinghealth.com/collections/dirty-genes-nos3-support/#:~:text=Your%20NOS3%20gene%20helps%20make.
6. NOS3 Gene - Genecards | NOS3 Protein | NOS3 Antibody, www.genecards.org/cgi-bin/carddisp.pl?gene=NOS3. Accessed 15 Sept. 2023.
7. Ringer, Andrew. “Intracerebral Hemorrhage (ICH), Hemorrhagic Stroke, Stroke | Cincinnati, OH Mayfield Brain & Spine.” *Mayfieldclinic.com*, Apr. 2018, mayfieldclinic.com/pe-ich.htm.
8. The Polymorphism G894 T of Endothelial Nitric Oxide Synthase, www.researchgate.net/publication/326657352_The_polymorphism_G894_T_of_endothelial_nitric_oxide_synthase_eNOS_gene_is_associated_with_susceptibility_to_essential_hypertension_EH_in_Morocco/fulltext/5b5b561caca272a2d66e49f6/The-polymorphism-G894-T-of-endothelial-nitric-oxide-synthase-eNOS-gene-is-associated-with-susceptibility-to-essential-hypertension-EH-in-Morocco.pdf. Accessed 15 Sept. 2023.
9. Created by BioRender.com

Thank You!

Managed by IGEM Team

Credits to the Lecturers and Sources