



UppSense Team  
Uppsala University  
Sweden

# Developing an electrochemical biosensor for the detection of Hemagglutinin protein of Influenza A virus subtype H1N1 in artificial saliva



UppSense



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CSAC 2021: 1st International Electronic Conference on  
Chemical Sensors and Analytical Chemistry



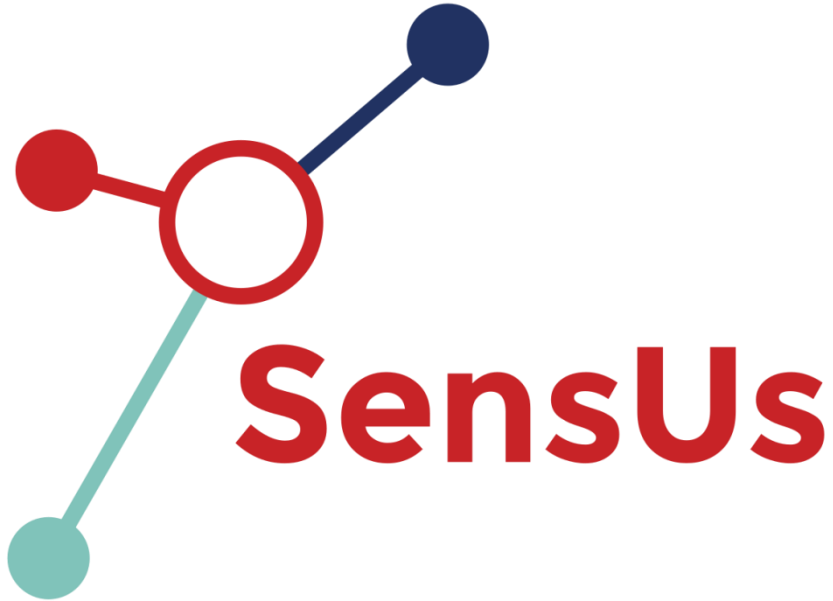




UppSense is a team composed by Master students from Biology, Medicine, Chemistry, Physics and Engineering



# SensUs community



Sensus.org

**“SensUs is a yearly international Student Competition on sensors for health. By involving students, industry, and health partners we strive to accelerate the development of sensors for better healthcare.”**

**The theme of 2021 is H1 protein of Influenza Virus AH1N1**



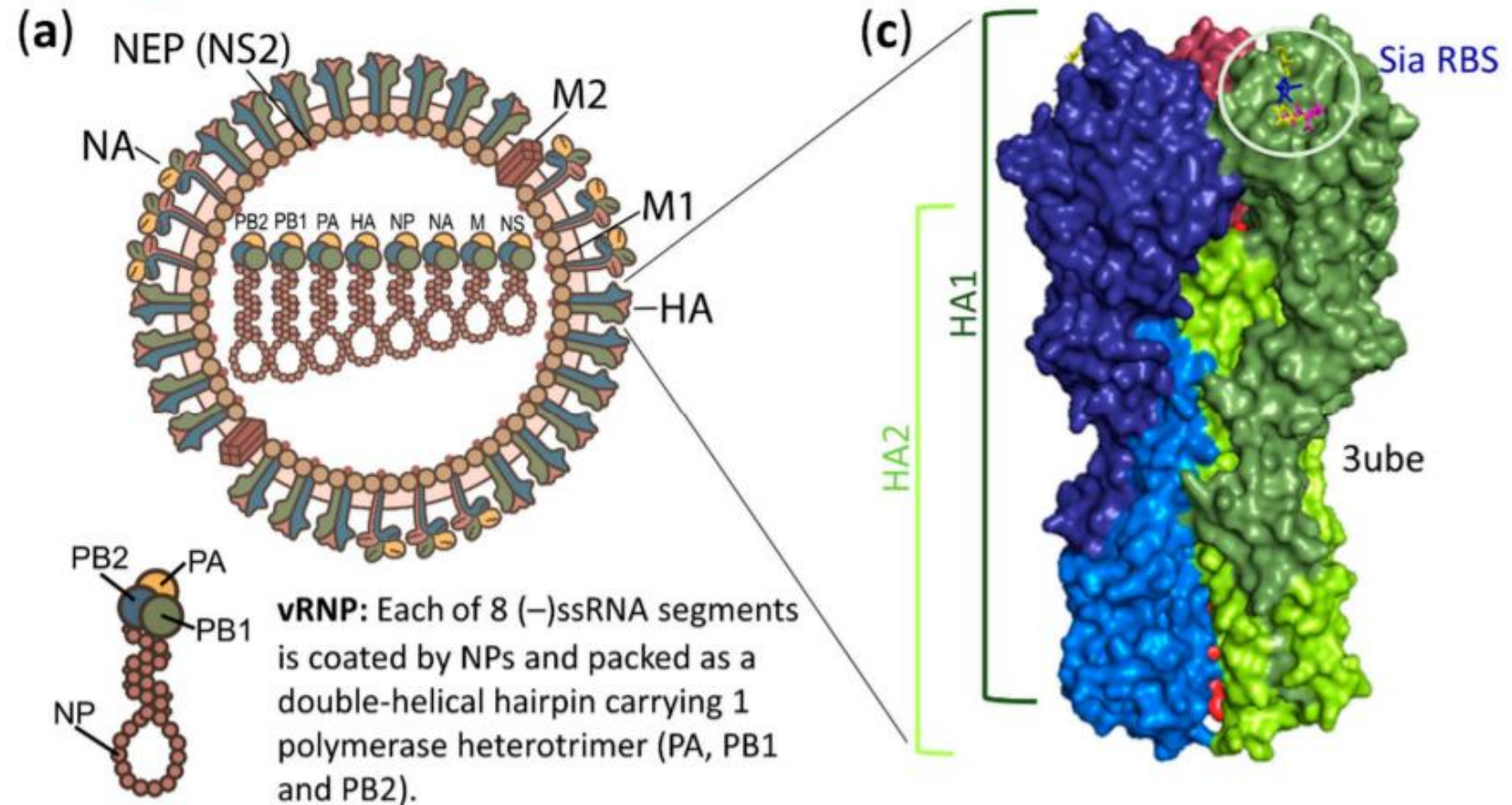
@SensUsCompetition





# H1N1

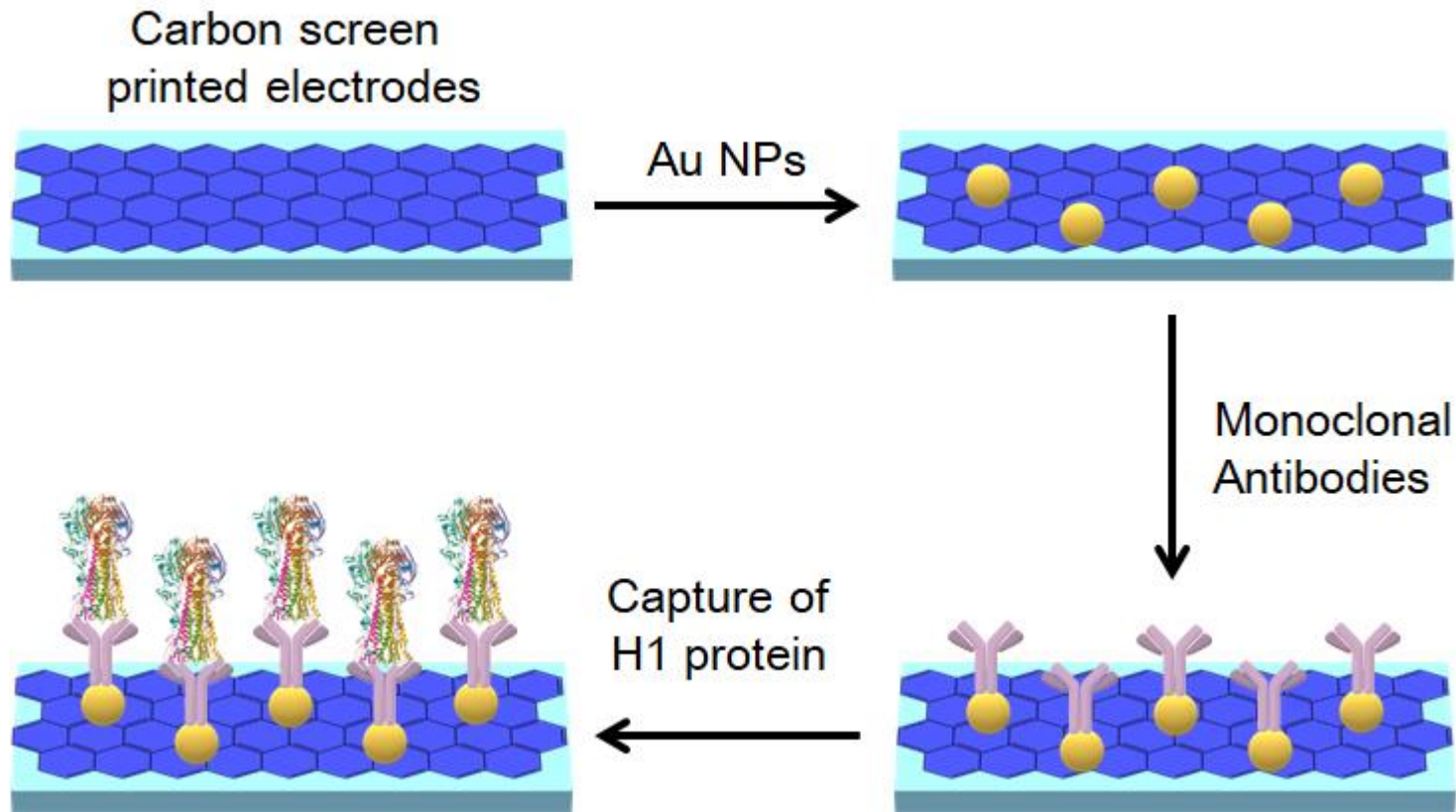
- **Influenza A virus** subtype.
- Single-stranded RNA virus.
- Coating proteins:
  - Hemagglutinin (HA).
  - Neuraminidase (NA).



Sriwilaijaroen, N., & Suzuki, Y. (2020). Host Receptors of Influenza Viruses and Coronaviruses—Molecular Mechanisms of Recognition. *Vaccines*, 8(4), 587.



# Electrochemical approach

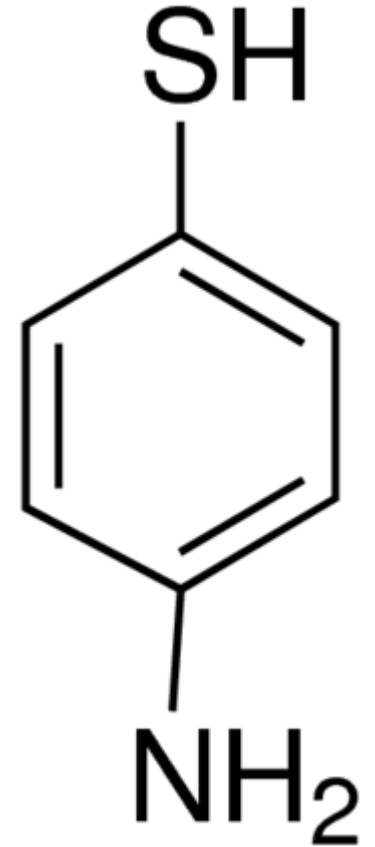


Capture of H1 produces a blocking effect over  $[\text{Fe}(\text{CN})_6]^{3-/4-}$  and the current detected by differential pulse voltammetry is less than in the absence of H1



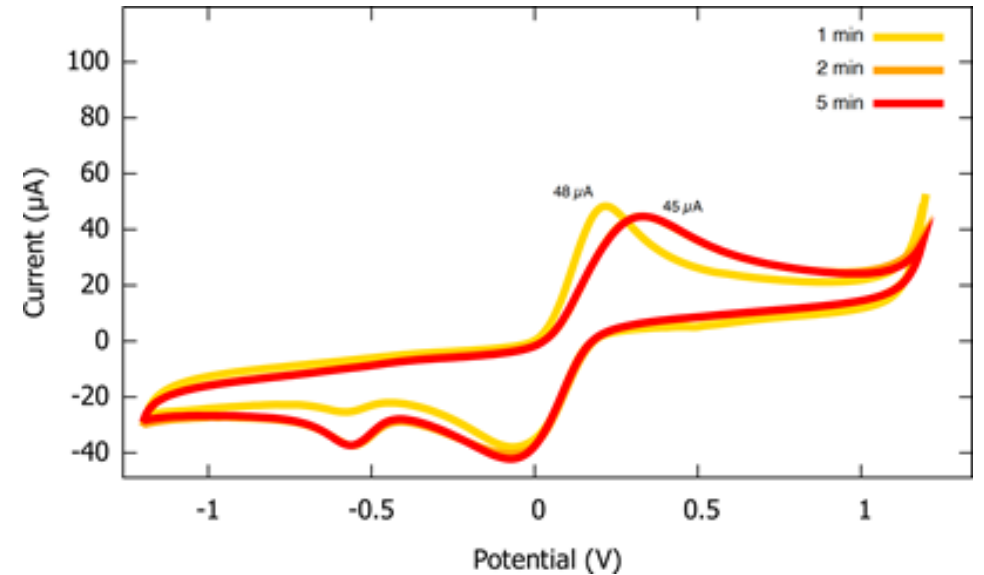
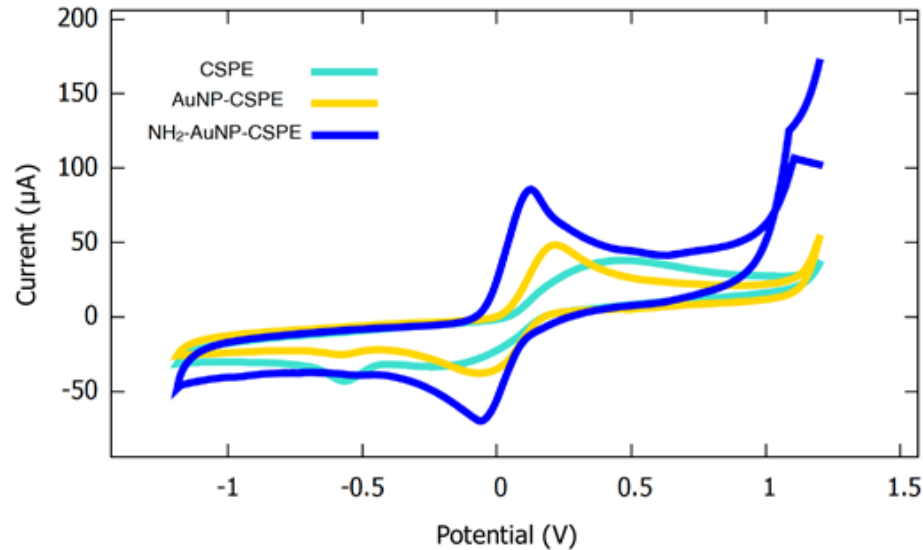
# Experimental

- Modification of electrodes
  - Gold nanoparticles
  - 4-aminothiophenol
- Characterization of electrodes
  - Cyclic voltammetry
  - Electrochemical impedance spectroscopy
- Sandwich Elisa test
  - Affinity of antibodies





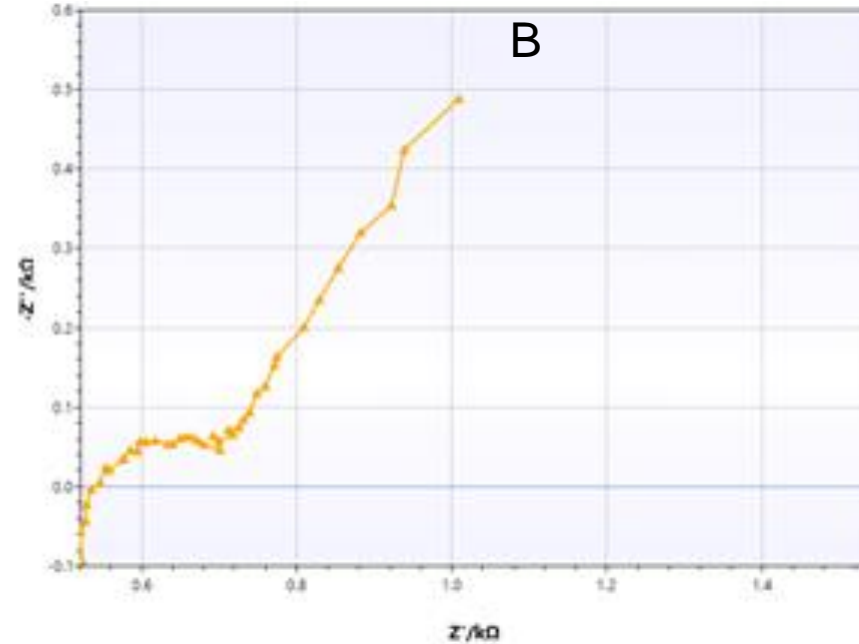
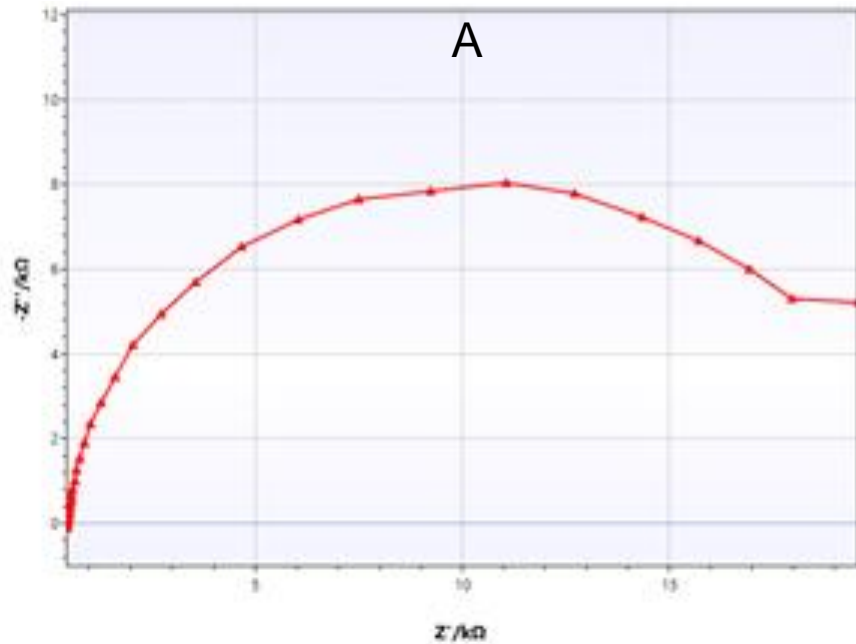
# Results – Cyclic voltammetry



- The electrodes show good electrochemical properties in the presence  $[\text{Fe}(\text{CN})_6]^{3-/4-}$
- The length of the gold electrodeposition reaction was optimized to 1 minute.



# Results – Electrochemical impedance spectroscopy

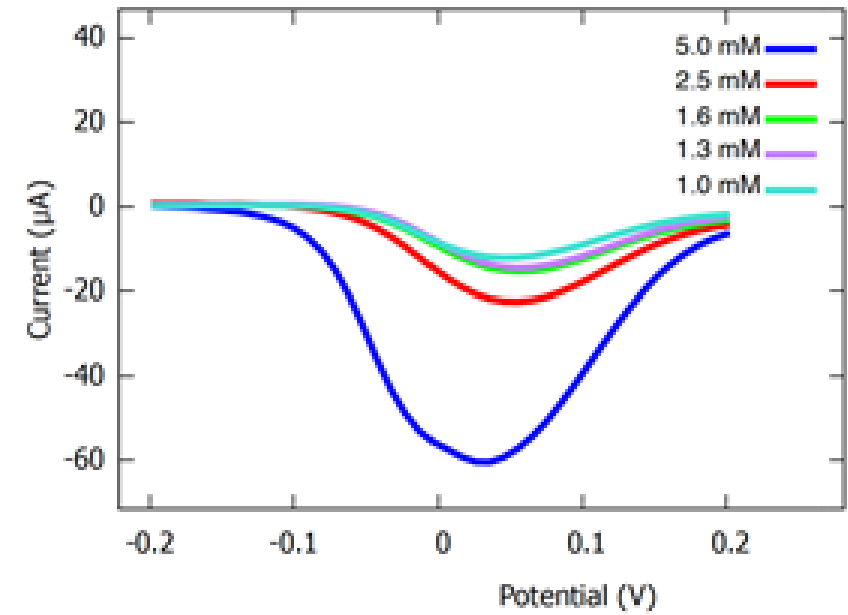
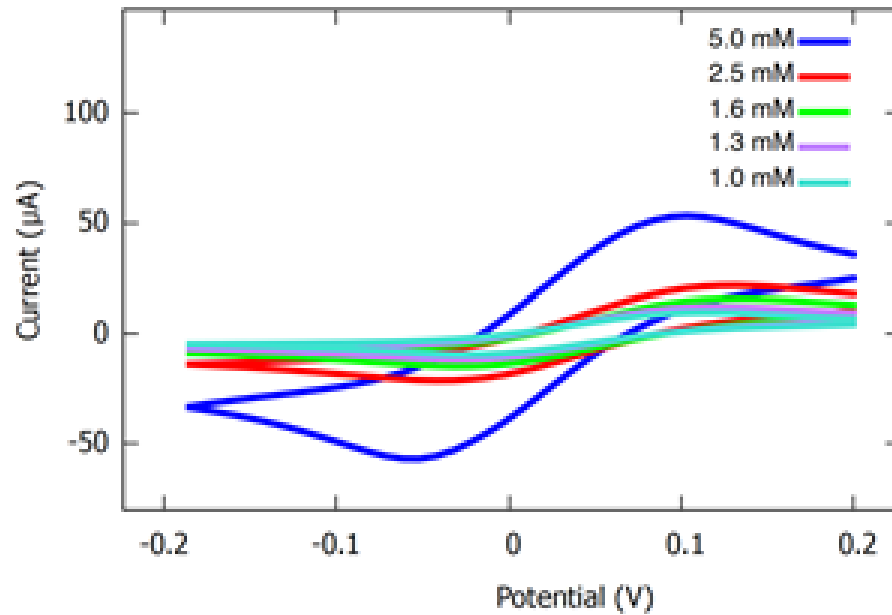


- (A) Unmodified carbon screen printed electrodes (CSPE) showed higher impedance than the (B) CSPE modified with gold nanoparticles and 4-aminothiophenol.



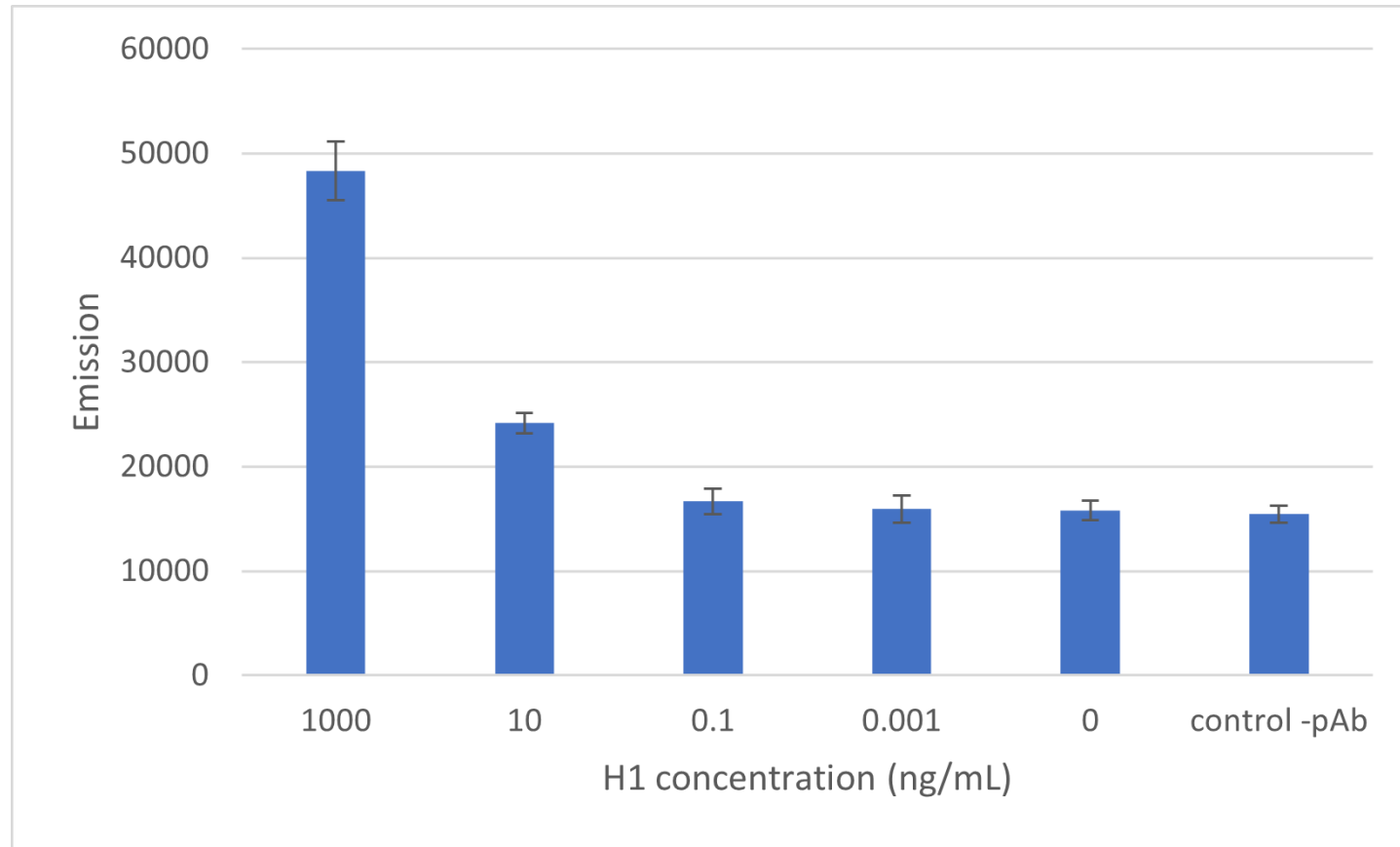


# Varying the concentration of $[\text{Fe}(\text{CN})_6]^{3-/4-}$





# Antibodies characterization





# Future work

- Coupling of antibodies onto the modified electrodes
- Testing for the presence of H1 in artificial saliva
- Determination of sensibility and detection limits by differential pulse voltammetry
- Further characterization of electrodes





# Acknowledgments

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Institute

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Thanks for your attention!