Glutathione detection in Chinese Hamster Ovary Cells Using Scanning Electrochemical Microscopy

Indrė Padvilikytė[1,2], Agnė Boguševičė[2], Inga Morkvėnaitė[2,3], Tomas Mockaitis[1,2]

[1]Vilnius TECH, Department of Chemistry and Bioengineering, Vilnius 10223, Lithuania
[2]State Research Institute Centre for Physical Sciences and Technology, Department of Nanotechnology, Vilnius 10257, Lithuania
[3]Vilnius TECH, Department of Electrical Engineering, Vilnius 10223, Lithuania
indre.padvilikyte@stud.vilniustech.lt

Primary metabolites are essential molecules that support core cellular processes such as growth, energy metabolism, and reproduction (Martinez, 2023). Among them, reduced glutathione (GSH) and NADH play central roles in maintaining intracellular redox homeostasis. GSH is a major cellular antioxidant and participates in detoxification, nutrient metabolism, regulation of proliferation, and apoptosis. In reproductive biology, higher oocyte GSH levels have been associated with improved developmental competence, supporting a more reduced intracellular environment and serving as an electron donor for antioxidant enzymes (Yurttancikmaz et al., 2024; Wang et al., 2017).

Scanning electrochemical microscopy (SECM) is a powerful tool for investigating whole-cell surfaces by positioning an ultramicroelectrode (UME) above the sample and recording Faradaic currents generated by oxidation or reduction of a redox mediator at the tip (Morkvenaite-Vilkonciene et al., 2017). These measurements can provide spatially resolved information on cell topography and local redox activity.

In this study, intracellular GSH-related redox behaviour in Chinese hamster ovary (CHO) cells was probed using three mediators with distinct electrochemical properties: ferrocenecarboxylic acid (FcCOOH), ferrocenemethanol (FcMeOH), and menadione.