Biological applications of carbon-based electrodes modified in adenine solution

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Electroanalytical determination of adenosine (ADO) in media containing adenylic nucleotides requires sensors that are selective, stable, and sensitive. In this context, carbon-based electrodes modified in adenine solution present a viable approach for the selective detection and quantification of adenine at physiological pH [1]. This study investigates the use of carbon paste electrodes (CPE) and glassy carbon electrodes (GCE), modified with adenine polymer films, for the quantitative analysis of ADO in human bronchial epithelial cell (HBEC) cultures. The electrodes were modified in 0.5 mM adenine solution by applying 1.3 V (vs. Ag/AgCl, KCl(sat)) for 12 minutes. Cyclic voltammograms recorded in ferricyanide solutions revealed that the modified electrode surfaces undergo acid-base interactions, modulating their electrochemical kinetics toward negatively charged species in a pH-dependent manner. Furthermore, chloride ions were found to significantly interfere with the analysis, with the extent of interference varying by concentration. Differential pulse voltammograms were obtained from HBECs grown in standard culture medium and subsequently prepared in phosphate buffer solution (PBS), with and without chloride. These measurements confirmed that ADO detection is viable in the absence of chloride. However, microscopy showed cell detachment in chloride-free PBS, highlighting the need for rigorous buffer optimization. These findings position the modified electrodes as a promising tool for ADO quantification in biological assays.

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References:

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