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Case Report on Pregabalin Modified Carbon Paste Electrode for Simultaneous Electrochemical Determination of Acetaminophen and Folic Acid

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Introduction

Acetaminophen, also known as paracetamol, or N-acetyl-p-aminophenol, or APAP, is a painkiller and antipyretic. Although it is safe to use in human medicine in clinical doses, studies indicate that an overdose of APAP can cause liver and kidney damage and even death . Because paracetamol is one of the most consumed drugs in overdoses and intentional self-intoxication in many nations [1]. The majority of APAP at therapeutic doses is metabolized by sulphation (20–30%) and glucuronidation (45–55%), while cytochrome p450 (CYP 450) enzymes convert percent to N-acetyl-para-benzoqinonimine (NAPQI), a highly reactive metabolite . Reduced glutathione (GSH) transforms NAPQI into a nontoxic active form, which is responsible for the APAP-induced hepato-nephrotoxicity . However, the CYP2E1 enzyme system largely metabolizes glucuronidation and sulphation to NAPQI at APAP overdose because the pathways are saturated . NAPQI eventually depletes the intracellular GSH stores. NAPQI binds to cellular proteins after GSH depots have been depleted by about 70%, causing an increase in endonuclease G and apoptosis-inducing factor, which in turn causes cell damage. As a result, mitochondrial oxidative stress is exacerbated when APAP is used .

The production of reactive oxygen species (ROS) is the cause of the damage brought on by oxidative stress. Free radicals can then interact with macromolecules, altering cellular functions or causing excessive free radical production in tissues when the balance between the generated ROS (such as superoxide radical-O2, hydroxyl radical-OH, nitric oxide-NO) and antioxidants is disrupted [2]. As a result, antioxidants play a crucial role in this regard. In APAP hepatotoxicity, antioxidant systems in the cells, like hepatic GSH, are very important for preventing cell damage. NAC is right now perceived overall as a cure to APAP harming. because NAC boosts liver GSH synthesis and replenishes GSH stores. Vitamins and antioxidants have been used to protect against APAP toxicity in several compounds. As a result, new treatment options for APAP poisoning cases remain intriguing.

Folic acid (FA), also known as Vitamin B9, is an important vitamin for many metabolic processes in living things. It is crucial, particularly in the production of nucleic acids and the preservation of DNA structure . FA is effective against ROS, according to studies . Additionally, FA regulates GSH biosynthesis and has an impact on the GSH transport system, making it an essential effector in mitochondrial redox homeostasis [3]. Since electrochemical sensor fabrications meet numerous requirements like sensitivity, selectivity, specificity, quick response, and simplicity, they have gained popularity in recent years. Neurotransmitter detection and drug analysis rely heavily on electrochemical sensors. Because the drugs at the therapeutic levels above cause a wide range of side effects, their rapid detection method significantly contributes to providing patients with early treatment and aids in accurate disease diagnosis. Acetaminophen, also known as paracetamol, is a pain and fever medication. An analgesic and antipyretic class of drugs. Paracetamol is a weak acid with a pKa value of 9.5 and is a white, crystalline powder with a melting point of 169°C. It is an oral medication that is rapidly absorbed in the gastrointestinal tract, quickly distributed, and excreted through urine as metabolites . By inhibiting the sedating hypothalamic heat regulating center, paracetamol effectively reduces body temperature in fever [2]. It is a drug that does not cause cancer and is used to treat ovarian cancer and osteoarthritis [3]. Paracetamol is ideal for patients who are allergic to aspirin [4]. Paracetamol is the primary component of cold and influenza medications [5,6]. However, paracetamol overdose can result in liver and kidney damage and even death [7]. Consumption of alcohol raises risk [8, 9], so it is critical to identify Paracetamol. The phenolic hydroxyl group in paracetamol is electrochemically active and simple to oxidize. Capillary electrophoresis and high-performance liquid chromatography (HPLC) spectrophotometry are two of the many methods used to determine paracetamol.

Folic acid (FN-[p-[(2-amino-4-hydroxy-6-pteridinyl) methyl] amino-l glutamic acid), which is also known as vitamin M, and folacin, also known as folate, fall under the category of vitamin B. Most vegetables contain this water-soluble vitamin. In addition to being synthesized by bacteria, folic acid can be found in vegemite or marmite in amounts of up to 100 mg per 5 g portion. By participating in cell division, growth, gene expression, and nucleotide synthesis, it contributes significantly to human health. Folic acid deficiency is a common cause of anemia and increases the risk of heart attack and stroke [10-12]. One of the essential nutrients for women, particularly those who are preparing for pregnancy, is folic acid. A lack of folic acid during pregnancy is a sign of defects in the neural tube and getting enough folate before conception helps prevent a number of congenital anomalies [14]. Subsequently, the examination for folic corrosive is vital. Folic acid is essential for men who plan to father children in order to reduce the risk of birth defects . The RDA recommends 600–800 mg of folate for pregnant women and 400 mg for non-pregnant women. HPLC, colorimetry, the microbial method, spectrophotometry, flow inoculation, capillary electrophoresis, and electrochemical techniques are among the reported methods for detecting folic acid . The synthetic form of the B vitamin folate, folic acid, is required for the nervous system's production of norepinephrine and serotonin. It primarily

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functions in the brain and nervous system. Few substances, including aspirin, ibuprofen, and paracetamol, can prevent the body from absorbing folic acid. Long-term use of paracetamol and other anti-inflammatory medications raises folic acid requirements [20]. As a result, the conventional method is required for the direct determination of folic acid and paracetamol. High selectivity, quick response, cost-effectiveness, and simplicity are some of the advantages of electrochemical methods. Adams first reported the use of carbon paste as an electrode in 1958. Because of their low cost, chemical inertness, and good electron transfer, carbon paste electrodes are widely used in electroanalysis. It is a particular kind of diverse carbon electrode that uses silicon oil as a binder and a mixture of graphite powder.

Modifying the carbon paste electrode could increase the electrode's electrocatalytic activity. The selectivity and sensitivity of the electrode are both enhanced by these modifiers. Various materials, including organic polymers, dyes, surfactants, transition metal complexes, metal, and metal oxide nanoparticles , were used to modify conventional electrodes. The ability of customized carbon paste electrodes to catalyze the electrode process by reducing the overpotential significantly in relation to the relatively selective interaction of the electron mediator with the target analyte in a coordinated manner is their most important property. The electroanalytical selectivity is significantly enhanced by the modified carbon paste electrodes .

A class of anti-epileptic medications is pregabalin. It is being used to treat post-herpetic neuralgia and diabetic neuropathy . Pregabalin's effectiveness in controlling the neuropathic twinge has been demonstrated through both preclinical and clinical research. Pregabalin's value and magnitude-dependent effect on relieving pain and related symptoms, whether used alone or in combination with analgesics, has also been demonstrated by clinical studies. The current work aimed to create a simple, sensitive sensor; To determining paracetamol and folic acid, the newly constructed pregabalin-modified carbon paste electrode was successfully utilized with a low detection limit and high selectivity.

Equipment and chemicals for the experimental section A model CHI-660c (CH Instrument-660 electrochemical terminal) will be used for the electrochemical experiment. Throughout the entire experiment, a conformist three-electrode cell was used. Operational, reference, and counter electrodes were provided by the model calomel electrode, the Pregabalin-adapted carbon paste electrode (MCPE), and platinum wire, respectively. Srini pharmaceuticals ltd (AP, India) supplied pregabalin, while Himedia Chemicals provided silicone oil, sodium dihydrogen orthophosphate (Na2HPO4), disodium hydrogen phosphate (Na2HPO4), and paracetamol. We purchased NaOH, graphite powder, and folic acid from Merck, all of which were of analytical grade. In a solution of 0.1 M NaOH, folic acid was made. Water that had been double distilled was used to make solutions of paracetamol, potassium ferrocyanide, and KCl. Preparation of the electrode For the Pregabalin-specific carbon paste electrode, a mortar and pestle was used to manually grind 3 mg of the drug, graphite powder, and silicon oil in a ratio of 70:30 (w/w), until a homogeneous paste was achieved. After tightly packing the paste into the hole of a household electrode, the exterior was refined by rubbing it on weighing paper to produce a uniform glittery appearance. The bare carbon paste electrode was constructed in the same manner without the addition of Pregabalin.

Analyzing the commercially available paracetamol tablet using the standard addition method was used to evaluate the applicability of the fabricated electrode. This allowed for the detection of paracetamol in pharmaceutical dosage. For the spiked standard solution of paracetamol, the electrochemical response at the fabricated pregabalin electrode was recorded and the percentage of recovery was calculated. The results are presented in . The results that were obtained were acceptable and showed that the made-from-pregabalin-modified carbon paste electrode could be used effectively to measure paracetamol in pharmaceutical preparations.

Conclusion

The present study concludes that a pregabalin-modified carbon paste electrode was successfully utilized for the selective and sensitive determination of paracetamol and folic acid. The made electrode has a low detection limit, is easy to prepare, and has good electrocatalytic ability, selectivity, and sensitivity. The manufactured electrode could be useful for determining the presence of paracetamol in pharmaceutical formulations. The positive results of the manufactured carbon paste electrode for the drug pregabalin will expand its use for the electrochemical analysis of other drugs and neurotransmitters.

References

1. Company M, Karsa DR (2007) Handbook for Cleaning/ Decontamination of Surfaces, Amsterdam, the Netherlands, Elsevier BV
2. Hauthal HG Wagner G (2004) Household Cleaning, Care and Maintenance Products: Chemistry, Application, Ecology and Consumer Safety, pub1. Verlag Fur chemische Industrie H Ziolkowsky GmbH
3. H Abdel-Wahab (1998) Surfactants Selector a Guide to the Selection of I&I and Household Product Formulations, Akcros Chemicals (now part of Akzo Nobel Surface Chemistry AB).
4. Further formulation information available from Akzo Nobel Surface Chemistry AB, S 444 85 Stenungsund, Sweden, on request.
5. Valappil K, Lalitha S, Gottumukkala D, Sukumaran R K, Pandey A (2015) White Biotechnology in Cosmetics. Indus BiorefinWhite Biotech 607-652.
6. Baroni L, Cenci L, Tettamanti M, Berati M (2007) Evaluating the environmental impact of various dietary patterns combined with different food production systems". Eur J Clin Nutri 61:279-286.
7. Complexing agents Environmental and Health Assessment of Substances in Household Detergents and Cosmetic Detergent Products. Danish Environmental Protection Agency Accessed.
8. Schrodter (2008) Klaus Bettermann Gerhard Staffel, Thomas; Wahl, Friedrich; Klein, Thomas; Hofmann, Thomas Phosphoric Acid and Phosphates. Ullmann's Ency Ind Chemistry.
9. Oxford Dictionaries English (2016) glycerol Definition of glycerol in English by Oxford Dictionaries". Archived from the original.
10. Christophe Ralf, Schmidt Bernd, Steinberner Udo, Dilla Wolfgang, Karinen Reetta (2006). Glycerol. Ullmann's Encyclopedia of Industrial Chemistry.
11. Sullivan Carl J, Kuenz Anja, Vorlop Klaus-Dieter (2018) "Propanediols". Ullmann's Encyclopedia of Industrial Chemistry Weinheim Wiley-VCH.
12. Lohrey Jackie (2018) Ingredients in Hand Sanitizer. LIVE STRONG.COM 06-11.
13. Quack mail (2015) you shouldn't Fall For the Internet's Newest Fool, The Food Babe". Butterworth, Trevor. Forbes.
14. G. Jackson, R T Roberts and T Wainwright (1980). Mechanism of Beer Foam Stabilization by Propylene Glycol Alginate. J Ins of Brew 86: 34-37.