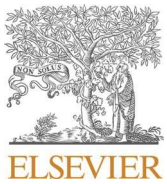
Microchemical Journal 199 (2024) 109923



Contents lists available at ScienceDirect

Microchemical Journal

journal homepage: www.elsevier.com/locate/microc

Review Article

# Electrochemical sensors for the determination of antipyretic and antibiotic drugs in environmental and biological samples

Amit Lochab, Shalini Baxi, Purnima Tiwari, Shourya Bardiya, Reena Saxena *

*Department of Chemistry, Kirori Mal College, University of Delhi, Delhi 110007, India*

ARTICLE INFO

*Keywords:*
Antibiotic
Antipyretic
Drugs
Electrochemical
Sensors

ABSTRACT

Antipyretic and antibiotic medications are the most commonly used drugs to treat pain, fever, inflammation and bacterial infections. But an overdose can be harmful to the human being, and unregulated discharge into environments poses serious threats to the environment. Conventional analytical methodologies have been replaced by electrochemical sensors, which have tremendous potential for selective and sensitive determination of pharmaceutical drugs in various biological and environmental samples at low cost. The current review provides an overview of electrochemical sensors fabricated by various nanomaterials, polymer and biological compounds for the determination of antipyretic and antibiotic drugs. These modifiers provide additional functional groups, surface area and conductivity which enhance the recovery response of the sensors. Additionally, other analytical performances like linear range, limit of detection, real sample analysis and detection technique have been provided. Finally, this review finishes by going through potential future developments, difficulties, and opportunities for developing economical and environment friendly electrochemical sensors.

## 1. Introduction

The significance of drugs is undeniable, serving as pivotal agents in the prevention, treatment, and management of a myriad of health conditions. As drugs contribute significantly to human well-being, it becomes imperative to safeguard not only their intended therapeutic effects but also to assess and manage their impact on the surroundings. Also, in order to ensure proper formulation, quality and stability, quantitative measurement of drugs is crucial during various stages of drug research and at the production step. Toxicology testing in pharmacology and during the clinical trial phase for observing bioavailability, pharmacokinetics, and potential drug abuse are some other important domains. Due to the requirement for simultaneous determination of several compounds inside extremely complex sample matrices and at trace levels, the measurement of antipyretic and antibiotic drugs is particularly difficult. Although this is the case, effective monitoring continues to face significant analytical and technical challenges, and there is no suitable standard limit for the possible dangers of long term exposure to these antipyretic and antibiotic drugs [1].

The unusual increase in body temperature brought on by non–contagious or viral factors is referred to as fever. In regular healthcare area, up to 36 % of patients have fever. It is a symptom, not a disease as such in which there is a rise in oxygen consumption and metabolic rate. There is concern that such higher physiological demands caused by pyresis could be harmful to health. Thus, an antipyretic medication may be taken to lessen difficulties brought on by fever. Although various types of drugs, including paracetamol, diclofenac and ibuprofen etc. are utilised, paracetamol is considered the most frequently used antipyretic in modern practise. While antibiotic drugs are used to treat bacterial diseases and used to fight infections but are ineffective against viral infections. Abnormal medication reactions affecting one or more organ systems are the most common kind of antibiotic side effects. Despite the fact that most antibiotics are safe given how frequently they are used, some of them have the potential to cause adverse effects that could be fatal. Different antibiotic classes have different side effects depending upon their activity like drug rash, lipid abnormalities, lipodystrophy, ototoxic potential, impaired platelet aggregation etc. [2,3]. We have selected antipyretic and antibiotic class of drugs as they are generally complimentary to each other and prescribed simultaneously. As fever is a protective reaction to infection, so treating it with antipyretics is debatable, so in addition to that antibiotics are given empirically [4].

The following analytical technique is employed for the determination of anti–pyretic and antibiotic drugs: capillary electrophoresis, Liquid Chromatography–Mass Spectrometry (LC–MS), Gas

* Corresponding author.
*E-mail address:* rsaxena@kmc.du.ac.in (R. Saxena).

https://doi.org/10.1016/j.microc.2024.109923
Received 29 September 2023; Received in revised form 27 December 2023; Accepted 4 January 2024
Available online 7 January 2024