

# Chapter 6

## Counterfeit Medicine Detection Using Blockchain Technology

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### ABSTRACT

*Counterfeit medicine is a major problem in the pharmaceutical industry that threatens public health. The fake drugs are often inefficient, toxic, and can even cause death. This chapter presents a counterfeit medicine detection system using blockchain that prevents counterfeit drugs from entering into the supply chain. The system uses blockchain to create a secure and transparent record of the entire supply chain of medicines, from manufacturer to distributor to the end consumer. It allows for real-time tracking of medicines, providing transparency and accountability at every step. Smart contracts automate the verification process, reducing the potential for human error and improving efficiency. When a medicine enters the supply chain, a smart contract is created with its unique identifier, manufacturer, and distribution details. It ensures that every medicine can be traced back to its origin, and counterfeit medicine can be easily identified and removed from the supply chain. The presented system also provides a platform for customers to verify the authenticity of their medicines.*

### 1. INTRODUCTION

The counterfeiting of drugs is currently becoming increasingly complex. The counterfeiting of pharmaceuticals poses a severe risk to public safety. Not only can fake medications negatively impact people's health, but they also cost real pharmaceutical manufacturing companies money. In the pharmaceutical sector, fake medications are also caused by a flawed supply chain structure (Alam et al., 2021). Drug counterfeiting has grown to be a worldwide problem that has to be addressed. The alarming statistic the World Health Organization provided indicates that around 10.5% of pharmaceuticals sold globally are counterfeit or of inferior quality. While most widespread medicine counterfeiting occurs in underdeveloped

DOI: 10.4018/979-8-3693-2359-5.ch006

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and low-income countries, fraudulent or subpar drugs are also entering affluent countries, including the USA, Canada, and Europe (Pathak et al., 2023). The prevalence of fake medicines in the global market has become a serious and growing concern in recent years. Counterfeit drugs are intentionally made to look like genuine medicines, but they lack the efficacy and safety of original products. These fake drugs not only put patients' health at risk but also damage the pharmaceutical industry's reputation, which is supposed to be responsible for ensuring the safety and efficacy problem of counterfeit medicines. It is not limited to developing countries but also affects developed countries, where it is estimated that up to 1% of drugs in developed countries are fake. The World Health Organization reports that up to 10% of medicines in developing countries are counterfeit, reaching up to 30% in some cases (Siyal et al., 2019). India is a developing country and has a large population, which leads to counterfeit drugs as a significant concern for the health industry. As per the report of the World Health Organization, 25% of drugs sold in India are fake and lack efficacy, making it one of the world's largest markets for counterfeit drugs in the world (Singh, 2023).

These fake drugs pose a major threat to public health and our upcoming generation, leading to increased mortality rates, the spread of drug resistance, and loss of trust in the healthcare system (Kumar & Tripathi, 2019). There are several ways that counterfeit medications might enter the market, with local distributors and pharmacists playing a significant role. A pharmacy might profit handsomely by purchasing counterfeit medications from unlicensed sellers for less money. The major causes of the increase in productivity of counterfeit medicines are varied, ranging from the high cost of genuine drugs and the lack of regulation and corruption in some countries to the rise of online pharmacies. Due to the easy manufacture and distribution of these counterfeit drugs, along with the lack of regulatory authorities, makes it hard to control the prevalence (Ofori-Parku & Park, 2022). Now, the fight against the problem of fake medicines has become urgent and needs a powerful solution. Emerging technologies such as blockchain offer a promising solution to find counterfeit medicine. Blockchain provides a secure and transparent record of transactions. It helps to detect and prevent counterfeit drugs from entering the supply chain and ultimately protects people's health and safety (Keerthi et al., 2021).

### **1.1. Motivation and Contribution**

Counterfeit medicines in India are often sold under the name of well-known and trusted brands, which makes it difficult for consumers to identify fake drugs because they look exactly like the original ones. Counterfeit medicines in India contain harmful ingredients, such as rat poison, floor wax, human sperm cells, and even human urine (Badhotiya et al., 2021). The prevalence of counterfeit medicines in India is a significant contributor to the rise of drug-resistant infections, which are estimated to kill more than 58,000 infants in India each year. The lack of an effective drug-tracking system is one of the contributors to the prevalence of fake medicines in the medicine market (Kumar & Tripathi, 2019). It gives the best opportunity for anyone to introduce fake medicine in the market because there is no way to trace the origin of the drug. Traditional methods of detecting counterfeit drugs are often ineffective. The supply chain for pharmaceuticals is complex, with multiple players involved, making it difficult to track and verify the authenticity of drugs. This lack of transparency and accountability in the supply chain creates opportunities for counterfeiters to introduce fake drugs (Anand et al., 2020)(Gökalp et al., 2018). Blockchain technology can be used to detect counterfeit medicine to ensure the safety and well-being of patients worldwide (Singh, 2023).

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