# Repurposing FDA-Approved Drugs for Emerging Infectious Diseases: Opportunities and Challenges

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**ABSTRACT**

Emerging infectious diseases (EIDs) such as COVID-19, Ebola, Zika, and Nipah virus outbreaks continue to pose substantial threats to global public health. The time-consuming and costly process of de novo drug discovery often falls short in addressing these rapidly evolving threats. In this context, drug repurposing—identifying new therapeutic uses for FDA-approved drugs—offers a strategic and time-efficient approach. This paper explores the potential of drug repurposing in combating EIDs, analyzing its pharmacological, regulatory, and clinical implications. It also examines the methodologies used in identifying candidate drugs, such as high-throughput screening, in silico modeling, and real-world evidence from electronic health records. Despite its promise, drug repurposing presents challenges including intellectual property issues, dosage optimization, off-target effects, and limited pathogen-specific efficacy. This paper highlights notable success stories, such as remdesivir for COVID-19, while emphasizing the need for robust clinical trial frameworks and public-private collaborations. Through an integrated analysis of pharmacological data, literature, and case studies, the paper underscores that while drug repurposing cannot replace novel drug development, it is an invaluable tool in the fight against rapidly emerging pathogens.

**Keywords**: Drug Repurposing, Emerging Infectious Diseases, FDA-Approved Drugs, Clinical Trials, Drug Repositioning, Remdesivir, Antiviral Agents

## 1. Introduction

Emerging infectious diseases (EIDs) are characterized by their sudden appearance, rapid spread, and potential for high mortality. The 21st century has witnessed several such outbreaks, including Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS), Ebola virus, and most recently, COVID-19. These diseases often arise in contexts where little to no therapeutic options are available, placing immense pressure on global health systems.

The traditional drug development pipeline, which spans 10–15 years from discovery to approval, is ill-suited for these emergencies. Consequently, drug repurposing—the practice of finding new indications for existing, FDA-approved drugs—has gained prominence. Since these drugs have already passed safety and toxicity trials, their clinical adoption for new diseases can be accelerated. This paper critically evaluates the feasibility, methodology, and outcomes of drug repurposing in the context of EIDs.

## 2. Literature Review

The idea of repurposing is not new; drugs like thalidomide (originally developed for morning sickness) have been repurposed for multiple myeloma. Several studies support the utility of repurposed drugs for EIDs:

- **Remdesivir**, initially developed for Ebola, was granted emergency use authorization for COVID-19 (Beigel et al., 2020).
- **Chloroquine and hydroxychloroquine**, anti-malarial agents, were investigated for SARS-CoV-2 with mixed outcomes (Geleris et al., 2020).
- Computational studies by Pushpakom et al. (2019) outline frameworks for identifying repurposing candidates using data mining and AI.

While the benefits are evident, risks such as unanticipated side effects, drug-drug interactions, and efficacy variability across populations remain concerns (Ashburn & Thor, 2004). The literature also

emphasizes the need for multidisciplinary approaches combining computational biology, pharmacology, and clinical expertise.

## 3. Research Methodology

This study is based on a mixed-methods approach, combining qualitative literature analysis with quantitative data from published clinical trials and in silico screenings.

### 3.1 Data Collection

- Peer-reviewed publications from PubMed, Scopus, and Google Scholar
- Clinical trial databases (e.g., ClinicalTrials.gov)
- DrugBank and PubChem for pharmacokinetic and pharmacodynamic data

### 3.2 Inclusion Criteria

- Studies focused on FDA-approved drugs repurposed for EIDs between 2003 and 2024
- In silico modeling, high-throughput screening, and randomized clinical trials

### 3.3 Analytical Approach

- Thematic analysis of qualitative data to identify common challenges and opportunities
- Meta-analysis of clinical outcomes for repurposed drugs in treating EIDs

## 4. Results and Discussion

### 4.1 Notable Successes

- **Remdesivir** showed efficacy in reducing COVID-19 hospital stays by 4 days (Beigel et al., 2020).
- **Favipiravir**, an influenza drug, demonstrated broad-spectrum antiviral activity in vitro and is under investigation for Ebola and COVID-19 (Shiraki & Daikoku, 2020).

### 4.2 Challenges Identified

- **Pharmacokinetic Limitations**: Dosing regimens for new indications may vary; e.g., higher plasma concentrations may be needed for antiviral effects.
- **Regulatory Barriers**: Re-approval processes for new indications can be cumbersome despite existing safety data.
- **Intellectual Property Issues**: Off-patent drugs lack financial incentives for manufacturers to invest in new clinical trials.

### 4.3 Technological Enablers

- **AI and Machine Learning**: Platforms like DeepDrugScan use molecular docking to predict efficacy.
- **Real-World Evidence (RWE)**: Electronic health records help detect off-label benefits in large populations.

## 5. Conclusion

Drug repurposing provides a timely, cost-effective strategy to address the treatment gaps in emerging infectious diseases. While the approach has produced several notable successes, it is not without challenges. Regulatory reform, funding incentives, and multidisciplinary collaboration are essential to maximize its potential. Future research should focus on establishing standardized methodologies for candidate identification, validation, and clinical translation. In a rapidly evolving infectious landscape, repurposing FDA-approved drugs stands as a critical bridge between immediate patient need and long-term pharmaceutical innovation.

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