

India Launches Nafithromycin: A Game-Changer in the Fight Against Antimicrobial Resistance

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ARTICLE DETAILS

Research Paper

Accepted: 26-02-2025

Published: 14-03-2025

Keywords:

Indigenous antibiotic, macrolide antibiotic, antimicrobial resistance, Nafithromycin, healthcare, lactone ketolide

ABSTRACT

The demand for new antibiotic has never been more crucial as the global antibiotic resistance continues to surge. This review explores the release of a newly launched indigenous antibiotic, the review also deals to address the limitations of the current available options . With the ongoing threat of resistant pathogens, this indigenous antibiotic represents a promising alternative as compared to those available options, offering unique properties that may help mitigate the global AMR crisis. The review deals with the structural and functional aspects of this antibiotic, highlighting its structure-activity relationship (SAR) and how its molecular design provides enhanced efficacy, stability, and specificity in combating a wide range of bacterial infections. By comparing this new drug with existing antibiotics, the review emphasizes its potential advantages, including better pharmacokinetics, reduced resistance profiles, and lower side effects the paper also explores how this discovery could positively impact local drug

development and support long-term, sustainable production of antibiotics within the region. In the end, this new antibiotic is a big step forward in the battle against bacterial infections, offering important lessons for creating better treatments in the future.

DOI : <https://doi.org/10.5281/zenodo.15030291>

Introduction

Recently on 20 November 2024, India accomplished a significant milestone in the global fight against antimicrobial resistance (AMR) with the launch of novel drug Nafithromycin. This ground-breaking discovery comes after years of extensive research and huge capital investment by the Indian pharmaceutical company Wockhardt. Nafithromycin is a novel macrolide antibiotic that is first to be discovered in its class for over 3 decades. This novel drug is designed to tackle the drug resistance bacteria which cause community acquired bacterial pneumonia (CABP) this discovery offers a much needed breakthrough in the fight against antimicrobial resistance (AMR).Based on research data it is said that Nafithromycin stands out as it is 10 times more effective than currently available treatments. It also provides great patient compliance, requiring only a three-day course. It shown to be active against wide range of bacteria .This breakthrough is a significant achievement, making Nafithromycin the first novel macrolide antibiotic discovered in over three decades. Further-more, Nafithromycin's development highlights India's growing role in the global fight against AMR, beyond improving patient outcomes. The government is boosting efforts with better surveillance, awareness programs, and international collaborations, reinforcing India's commitment to tackling this urgent public health challenge on a global scale. (SINGH, 2024)

History And Discovery of Antibiotics

The first antibiotic was discovered by Sir Alexander Fleming in the year 1928. This was a game changing discovery that played a pivotal role in the history of medicine. This unexpected breakthrough led to the creation of antibiotics, a game-changer for modern medicine. But it wasn't an overnight success. It took years of research before penicillin could be mass-produced and widely used, which happened around 1945. Nowadays antibiotics are widely used in the treatment of various diseases. Penicillin was the first antibiotic to be discovered. Since then many antibiotics have been discovered.

They are obtained from both natural and synthetic sources. The first antibiotic penicillin was obtained from fungi. Since the discovery of antibiotics it has become much easier to treat infectious diseases. The antibiotics are classified generally into 2 main categories, bacteriostatic and bactericidal. They are categorised on the basis of their influence on the bacteria

Fleming's discovery saved countless lives by making it possible to treat infections that would have once been deadly, even from a small wound. Antibiotics also made surgeries much safer and helped protect people with weaker immune systems, like children and the elderly. (michal letek, 21/1/2020).

Lactone Ketolide

There are many drugs that fall under this class of antibiotics. These are widely used in the treatment of community-acquired bacterial pneumonia (CAPB), this class of drug works by inhibiting the bacterial protein synthesis by binding to the ribosome, but their unique structure allows them to bind more effectively to resistant bacteria.

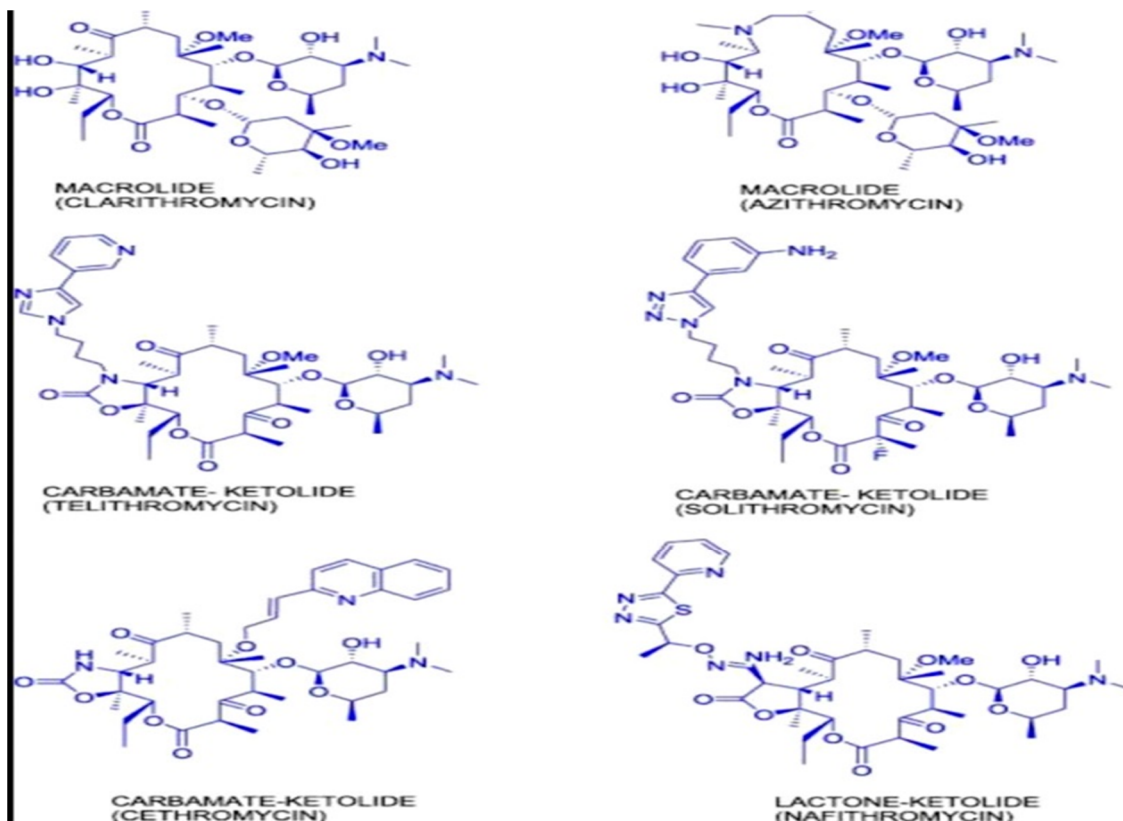


Fig 1: Different drug of macrolide class (Satish Bhavsar, 30 DECEMBER 2022)

Mechanism of Action

Antibiotics show their activity depending upon the type of drug, some work by targeting specific structures of bacterial organism or by inhibiting the growth of bacteria or by killing the bacteria. Based on this they can be categorised as bactericidal and bacteriostatic. It is known to show its activity against wide range of resistant bacteria. The drugs which act by killing the bacteria are referred as bacteriocidal. The drugs which show their action by inhibiting the growth of bacteria are referred as bacteriostatic. The diagram provides a better understanding of the mechanism of action of nafithromycin

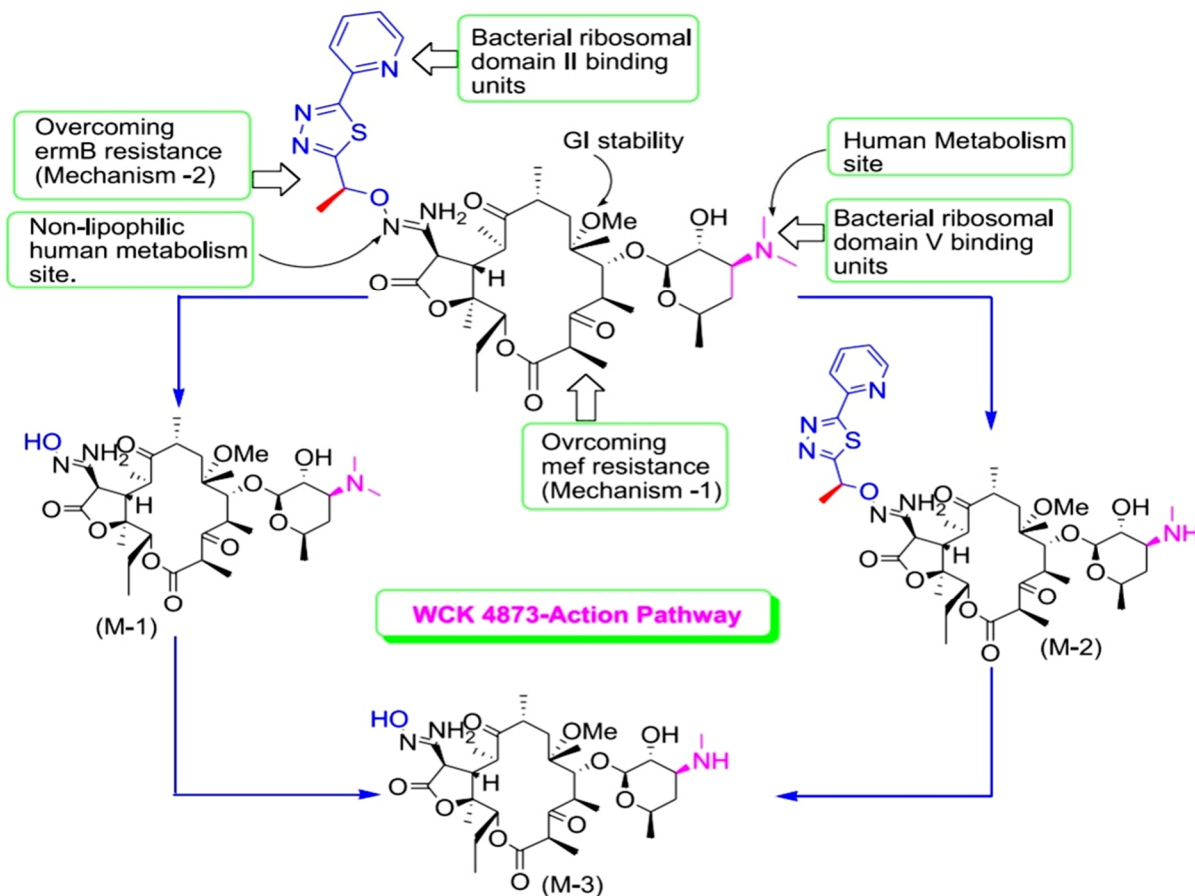


Fig2.mechanism of action (Satish Bhavsar, 30 DECEMBER 2022)

The antibacterial activity of Nafithromycin effects primarily through the inhibition of bacterial protein synthesis as it is a macrocyclic antibiotic the mechanism of action of Nafithromycin is explained below along with reference.



Binding to Ribosomal Subunits: Nafithromycin shows its action by targeting the 50S subunit of the bacterial ribosome. Nafithromycin binds itself to the peptidyl transferase center of the ribosome, this center is crucial for the protein synthesis and growth of bacteria

Inhibition of Peptide Bond Formation: The formation of peptide bonds during translation is intervened by the binding of Nafithromycin to the ribosomal sub-unit, The elongation of the nascent polypeptide chain is prevented due to this action of binding.

Inhibition of Translocation: translocation is a vital step in protein synthesis, The translocation step is inhibited by Nafithromycin, This activity of translocation is crucial which is essential for moving the ribosome along the mRNA strand it plays a major role in protein synthesis. This further contributes to its ability to halt protein synthesis which inhibits the growth of bacteria.

Bacteriostatic Effect: The combined effect of these actions is that Nafithromycin exhibits a bacteriostatic effect, this signifies that it inhibits bacterial growth rather than killing the bacteria . This is particularly important in treating bacterial infections, allowing the host's immune system to clear the infection. (Satish Bhavsar, 30 DECEMBER 2022)

A Brief Overview of Key Antibiotic Discoveries and Antimicrobial Resistance(Amr)

Several antibiotics have been discovered throughout the history that played a significant role in patient healthcare. These antibiotics were widely used in treatment of various cases such as bacterial infection. As the use of these agents increased the antimicrobial resistance surfaced throughout the world.in this the microorganisms were evolving to withstand the effect of the drugs. The following image reflects the key discoveries and the antimicrobial resistance throughout our history.

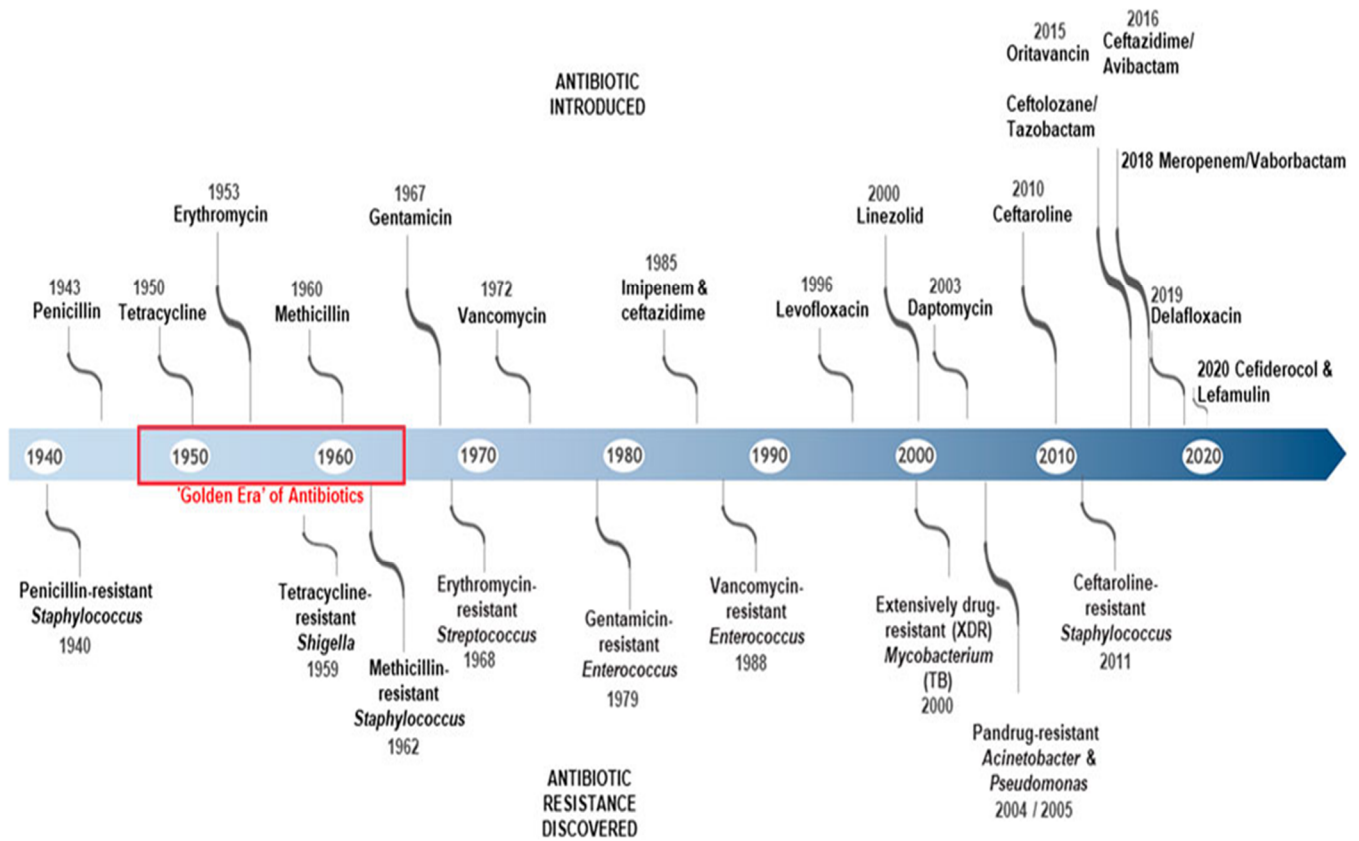


Fig 3. An overview of key events of antibiotic discoveries and antimicrobial resistance(AMR) (Ka Wah Kelly Tang, 28 JUNE 2023)

Antimicrobial Resistance(Amr)

Antimicrobial resistance is a condition which arises when the microorganisms such as fungi, bacteria, and viruses evolve to withstand the effect of antimicrobial drugs. This usually arises due to overuse, misuse of antibiotics or any other factor. The effectiveness of drugs declines due to constantly evolving pathogens, due to this AMR poses a serious global health threat.

Throughout the globe the rise of antibiotic resistance is alarming and a major public health concern, this makes it difficult to treat infections. The complexity of the treatment increases and ultimately this leads to longer stays in the hospital which increases the expenses of treatment and increases deaths. The development of new antibiotics is a major challenge (gazala muteeb, 15 november 2023). The use of antibiotics has been rapidly escalating globally, causing antibiotic resistance to emerge as a more serious and urgent issue (Hamed Tahmasebi, 2025)



Nafithromycin : A Milestone For Public Health

The successful introduction of nafithromycin marks a major leap which is notable in the fight against antimicrobial resistance (AMR), this offers new hope for tackling antimicrobial resistance with greater efficacy. Its introduction signifies a historic milestone in antibiotics, as it is said to be the first antibiotic of its class to be introduced globally in the past 30 years. This remarkable milestone offers a new and much-needed option to fight AMR. This novelty designates India's strong foothold in biotechnology. Nafithromycin is an indication to India's growing capabilities in the pharmaceutical innovation and its dedication for healthcare. This discovery plays a significant role in the diagnosis of various infectious diseases and tackling the antimicrobial resistance with much better efficiency. It demonstrates its action against wide range of resistant bacteria.

Why Choose Nafithromycin Over Other Available Options?

The first question that usually arises in our minds is, why this when we have other available options?

Nafithromycin is considered more effective than existing treatments due to several key advantages:

1. **Effective Drug-Resistant Bacteria:** Nafithromycin is specifically designed to treat both typical and atypical drug-resistant bacteria, this helps by addressing a significant challenge in antimicrobial resistance (AMR).
2. **Enhanced Efficacy:** Based on studies we can conclude that Nafithromycin is reported to be ten times more effective than current treatments like azithromycin, which enhances its potential to combat infections effectively, due to such properties it is considered more effective and reliable.
3. **Shorter Treatment Regimen:** Additionally, it offers a three-day treatment regimen, which results in improving patient compliance and potentially leading to better health outcomes.
4. **Superior safety Profile:** The drug offers superior safety, minimal side effects, and no significant drug interactions, when it is compared with the available options, thus making it a safer option for patients.

These properties collectively position Nafithromycin as a crucial advancement in the fight against AMR and improve patient outcomes significantly. (SINGH, 2024)

Conclusion

This review was designed to highlight advancements in the antibiotics that is going to play a game changing role in the fight against antimicrobial resistance. This discovery plays a significant role in the



diagnosis of various infectious diseases and tackling the antimicrobial resistance with much better efficiency.

By summarizing the evidence that was presented, it shows the critical role of Nafithromycin in the fight against antimicrobial resistance. Nafithromycin is a indication to India's growing capabilities in the pharmaceutical innovate on and its dedication for healthcare.it is a remarkable achievement for our country which highlights the strength of our biotechnological advancements in the field of human healthcare.

To summarize the benefits of discovery of the novel indigenous antibiotic Nafithromycin :

- It reduces the mortality and health complications caused by drug resistant infections.
- Improves the access to efficient treatment by combating AMR, especially considering children and senior citizens
- It is the first antibiotic of its class to be discovered in over three decades.
- It is proved to be effective against broad range of resistant bacteria.
- It is proved to be much more effective than the existing remedies that are being used currently.
- Provides shorter treatment regimen with better safety profile.
- It is testament to India's leading role in addressing the fight against global AMR crisis.

Future perspectives on development of antibiotic.

- Various approaches can be adopted for discovery of new antibiotics by using the AI-driven drug discovery. Artificial intelligence has proved to be a powerful tool in research and many other fields. By utilizing AI it becomes much easier as it reduces required time and effort for analysing vast databases.
- Halicin a broad spectrum antibiotic was discovered using artificial intelligence. The researchers utilized machine learning algorithm.
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- AI driven models can be used for predicting the possible drug interactions. It can also be employed to optimize the existing drug formulations.
- The AI algorithms are designed in such a way that can process extensive biological and chemical data to analyse and identify potential antibiotic compounds with more efficiency in less time and effort as compared to human.
- By combining AI with antibiotic research, the scientist can accelerate the drug discovery process. It reduces the cost and save time. As we move forward, the desire for more novel drugs will



increase. AI has proved to be helpful in other fields, so we should adopt AI for developing novel drugs and enhancing global healthcare.

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