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Mycobacterial Diseases

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Perspective

# Study of Drug Resistance Mechanism in *Mycobacterium marinum*

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## DESCRIPTION

Mycobacterium, a genus of bacteria, includes species such as *Mycobacterium tuberculosis*, the causative agent of tuberculosis, and *Mycobacterium leprae*, the causative agent of leprosy. *Mycobacterium abscessus* is another species that is increasingly being recognized as an opportunistic pathogen. *Mycobacterium avium* Complex (MAC) and *Mycobacterium marinum* are other important species of the *Mycobacterium* genus. *Mycobacterium marinum* is a slow-growing species of *Mycobacterium* that is commonly found in soil and water. It has been implicated in causing infections in humans, particularly in individuals with compromised immune systems. *Mycobacterium marinum* is a difficult organism to grow in the laboratory and it can take several weeks to obtain a result. Therefore, early identification and susceptibility testing of *Mycobacterium marinum* are important for optimal patient management.

Drug resistance is a significant challenge in the treatment of mycobacterial infections. Resistance can develop through a variety of mechanisms, including mutations in the target genes, efflux pumps, and enzymatic modification of the drug. Understanding the drug resistance patterns of *Mycobacterium marinum* is essential for effective treatment of infections caused by this species. *Mycobacterium marinum* is known to be susceptible to many antibiotics commonly used in the treatment of mycobacterial infections. These include rifampicin, isoniazid, streptomycin, ethambutol, and clarithromycin. However, there have been reports of drug resistance in *Mycobacterium marinum*, particularly in isolates from patients with chronic infections. Resistance to rifampicin is of particular concern, as this drug is a key component of first-line treatment regimens for mycobacterial infections. Rifampicin resistance in *Mycobacterium marinum* has been reported in several studies, with resistance rates ranging from 0 to 12.5%. In one study of 16 *Mycobacterium marinum* isolates, four (25%) were resistant to rifampicin, while resistance to other drugs was not observed. Another study reported resistance rates of 2.9% for rifampicin and 1.4% for isoniazid in *Mycobacterium marinum* isolates from patients with pulmonary infections.

Resistance to clarithromycin, a macrolide antibiotic commonly used in the treatment of mycobacterial infections, has also been reported in *Mycobacterium marinum*. In one study, two isolates of *Mycobacterium marinum* were found to be resistant to clarithromycin, while susceptibility to other drugs tested was maintained. Similarly, in another study, one isolate of *Mycobacterium marinum* was resistant to clarithromycin but susceptible to other drugs tested. Resistance to other antibiotics, including ethambutol and streptomycin, has also been reported in *Mycobacterium marinum*. However, these drugs are not typically used as first-line treatment for mycobacterial infections, and resistance rates to these drugs in *Mycobacterium marinum* are generally low.

The mechanisms of drug resistance in *Mycobacterium marinum* are not well understood, but several studies have identified mutations in the genes encoding the drug targets as a common mechanism of resistance. For example, mutations in the *rpoB* gene, which encodes the beta subunit of RNA polymerase and is the target of rifampicin, have been reported in rifampicin-resistant *Mycobacterium marinum* isolates. Similarly, mutations in the *embB* gene, which encodes the arabinosyltransferase involved in the biosynthesis of the mycobacterial cell wall and is the target of ethambutol, have been reported in ethambutol-resistant *Mycobacterium marinum* isolates.

## CONCLUSION

Drug resistance is a significant challenge in the treatment of mycobacterial infections, including those caused by *Mycobacterium marinum*. While *Mycobacterium marinum* is generally susceptible to many antibiotics commonly used in the treatment of mycobacterial infections, there have been reports of drug resistance in this organism. Resistance to rifampicin, a key component of first-line treatment regimens for mycobacterial infections, is of particular concern. Mechanisms of resistance in *Mycobacterium marinum* are not well understood, but mutations in the genes encoding the drug targets have been identified as a common mechanism of resistance. Efflux pumps and enzymatic modification of drugs have also been suggested as potential mechanisms of resistance.

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