Deaths attributable to antibiotic resistance, annually, by 2050. From AMR-Review.org: Statistics show that there have been a minimum of at least 2,049,442 illnesses and 23,000 deaths in 2013 from bacterial resistance in the United States alone. It is essential for scientists to keep on developing new ways to fight against drug resistant bacteria or else the death toll will continue to increase over the years. That is why scientists have been using different methods to confront this issue and slow the processes of bacterial resistance down.

Below are several strategies utilized to fight against drug resistance:

- **New classes of antibiotics**, particularly against Gram-negative bacteria, are in great demand. However, the development of new antibiotics is never in parallel with the microbial to acquire resistance.
- **Co-administer appropriate non-antibiotic drugs with failing antibiotics**, which restores sufficient antibacterial activity. The use of such antibiotic resistance breakers (ARBs) to salvage antibiotics is exemplified by the long-standing, successful and widespread co-administration of β-lactamase inhibitors, such as clavulanic acid, with β-lactam antibiotics, such as amoxicillin.
- **Novel combinations of existing classes of antibiotics** could also be investigated; for example, macrodilides may be able to synergize with β-lactams and fluoroquinolones.
- **Repurposing previously known drugs**, the method I am using, is a more favorable approach because the drug has already been well studied and established, so that the pharmacokinetic properties are already known.

**Ciclopirox**

- Ciclopirox is a topical antimycotic agent belonging to the chemical class of hydroxypyridones and not related to azoles or any other class of antifungal agents. Its antimicrobial profile includes nearly all of the clinically relevant dermatophytes, yeasts and moulds, and is therefore broader than that of most other antifungics.
- The high affinity of ciclopirox for trivalent metal cations, resulting in inhibition of the metal-dependent enzymes that are responsible for the degradation of peroxides within the fungal cell, appears to be the major determinant of its antimicrobial activity, affect active transport, cell respiratory processes, autophagy and membrane integrity.

**Synthesis of Ciclopirox and its Analogue**

We found that the ratio between 3 and 4 is very important for the success of this reaction. With this compound in hand we can make ciclopirox and a library of its derivatives. The activities of these compounds will be evaluated by our collaborators Future research will still need to be done to determine ciclopirox’s mode of inhibition.

**References**


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