New antibiotics to fight resistant bacteria

Summary

Profile type
Technology offer

Company's country
Spain

POD reference
TOES20230801017

Profile status
PUBLISHED

Type of partnership
Research and development cooperation agreement

Commercial agreement with technical assistance

Targeted countries
• World

Contact Person
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Term of validity
29 Aug 2023
28 Aug 2024

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29 Aug 2023

General Information

Short summary

A Spanish university has discovered a new family of molecules with a novel molecular structure that can effectively combat bacteria resistant to conventional antibiotics, including tuberculosis. They have a reduced degradation in the biological environment and a simple synthesis procedure. Chemical and/or pharmaceutical companies interested in acquiring this technology for commercial exploitation through patent licensing agreements are sought.

Full description

Antibiotic resistance is one of the greatest threats to public health worldwide. According to the World Health Organization (WHO), around 700.000 people die each year due to antibiotic-resistant infections, and it is estimated that this figure will rise to 10 million by 2050 if urgent action is not taken.

In addition, the development of new antibiotics has stagnated in recent decades, leading to a decrease in the availability of therapeutic alternatives.

Consequently, the need for new antibiotics is in great demand by society and, in fact, is one of the WHO's preferred lines of action.

Currently, the molecular structure 2-(pyrrolidin-1-yl)thiazole, and its respective carboxylic acid, has provided low

antibacterial activity results. Therefore, there is a need to look for appropriate substituents in this type of molecular structure that would significantly increase the antibiotic power against resistant bacteria.

In order to solve the problems described above, a new family of molecules has been discovered (by a Spanish research group) that can effectively combat bacteria resistant to conventional antibiotics, including tuberculosis.

The present invention refers to a set of molecules or compounds with the general formula shown in Figure 1, as well as to a pharmaceutically acceptable formulation (ester, carboxylic acid or carboxylic acid salt) comprising at least one compound of this formula in Figure 1.

These compounds can be synthesised in the laboratory in three simple steps under mild reaction conditions:

1. Pyrrolidine or pyrrolidine derivative is obtained by reaction of iminoesters and electrophilic alkenes via a 1,3-dipolar reaction (see Figure 2).
2. A condensation reaction of the above pyrrolidines with benzoyl isothiocyanate is then carried out (see Figure 3).
3. Finally, haloketones are added to the synthesised thioureas to obtain the final thiazole-pyrrolidine structure (see Figure 1).

The technology described is at an early stage of development (TRL = 4), but has great potential to address one of today's greatest medical challenges: antibiotic resistance.

These compounds have been shown to be effective in in vitro assays at the laboratory level, suggesting that they have great potential to be a valuable tool in combating infections caused by resistant bacteria. However, more clinical trials are still needed to determine the safety and efficacy of these new compounds in humans.

The patent describes several specific examples of chemical compounds and their antimicrobial activity against different bacterial strains.

The cytotoxic activity of the molecules described in the present invention was tested using different lines of microorganisms to establish their antimicrobial efficacy in in-vitro studies. For this purpose, antibacterial assays were performed with different molecules against standard bacterial strains of Staphylococcus aureus, Bacillus subtilis, Aeromonas hydrophila, Escherichia coli and Acinetobacter baumannii.

An anti-tuberculosis assay was also performed to determine the minimum inhibitory concentration (MIC) of the newly synthesised compounds against the standard strain H37Rv of Mycobacterium tuberculosis.

The bioactivity results correlate with the presence of different substituents at various positions of the general formula structure (see Figure 1), and may induce higher bioactivity by modifying certain substituents at specific positions.

This new set of molecules can be applied in:
• Pharmaceutical industry: as antibiotics to treat a wide variety of infections caused by resistant bacteria.
• Medical sector: to treat resistant bacterial infections in patients.
• Scientific research: to research and develop new antimicrobial compounds.
• Agricultural sector: as antimicrobial agents in the production of food and animal feed.
• Veterinary sector: to treat resistant bacterial infections in animals.

Advantages and innovations

This novel technology has the following advantages:
1) Antibiotic efficacy demonstrated in in vitro tests.
2) Less degradation in the biological environment.
3) Greater therapeutic effect.
4) High antibiotic activity against different bacteria resistant to conventional antibiotics.
5) Greater specificity towards antibiotic-resistant bacteria, including Mycobacterium tuberculosis, an infectious disease that is increasingly difficult to treat with existing antibiotics.
6) Enables treatment of infections that were previously difficult or impossible to cure due to bacterial resistance.
7) Potential to prevent future resistance by being effective against bacteria that have already developed resistance to other antibiotics.
8) Wide field of application in the field of pharmaceutical chemistry and medicine in general.
9) The synthesis procedure of these compounds is very simple: only three steps.
10) The synthesis procedure is carried out under mild reaction conditions.
11) The synthesis procedure allows good yields of the final compound.

Its potential to save lives and prevent future resistance makes it a valuable and promising technology for the future of medicine.

INNOVATIVE ASPECTS OF THE TECHNOLOGY

The main innovation lies in the molecular structure of these chemical compounds, which allows them to be effective against bacteria that have developed resistance to other antibiotics, representing a very significant advance in the effective fight against this type of bacteria, which is a growing and worrying problem worldwide.

The new compounds described in this patent can treat a wide variety of infections caused by resistant bacteria, which can significantly improve the therapeutic options available.

These molecules can be used as active species against different types of microorganisms, preferably in the prevention and/or treatment of infections such as tuberculosis.

Technical specification or expertise sought

Stage of development

Under development

IPR Status

IPR applied but not yet granted

Sustainable Development goals

- **Not relevant**

Partner Sought

Expected role of the partner

Currently, there are no commercial products related to these structures. In this sense, companies interested in acquiring this technology for commercial exploitation through patent licensing agreements are sought.

Company profile sought:
- Pharmaceutical industry.
- Chemical industry.

Type of partnership

Research and development cooperation agreement

Commercial agreement with technical assistance

Type and size of the partner

- **Big company**
- **SME 11-49**
- **SME 50 - 249**

Dissemination

Technology keywords

- **05001004 - Organic Chemistry**
- **06001018 - Virus, Virology/Antibiotics/Bacteriology**

Market keywords

- **05007002 - Pharmaceuticals/fine chemicals**
- **05009004 - Plant health**
- **05003005 - Drug delivery and other equipment**
- **05009003 - Animal health**

Targeted countries

- **World**

Sector groups involved

Media

Images

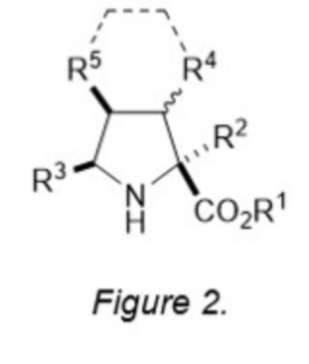

Figure 2.

Figure 2

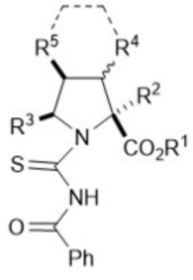

Figure 3.

Figure 3

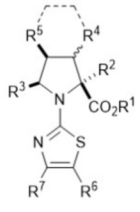

Figure 1: Thiazoles with a pyrrolidine ring as a substituent and their acid derivatives

Figure 1