

# Beta-lactam antibiotics – Treatment of bacterial infectious diseases

## The innovation

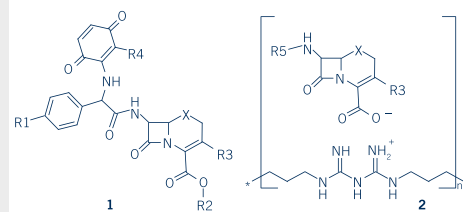
The present invention relates to novel antimicrobial agents and compositions that are based on beta-lactams and used for the treatment of bacterial infections. Such infections, caused by either Gram-negative or Gram-positive pathogens, are more and more difficult to handle in human and veterinary health care, due to the increasing occurrence and/or development of multi-resistant pathogenic germs. Antibiotic resistance refers to these microorganisms' ability to withstand the effects of one or more antibiotics, and consequently is particularly prevalent in environments where antibiotics are extensively being used, i.e. in hospital-settings (so-called nosocomial infections). In the US, it is estimated that roughly 1.7 million infections are caused by multi-resistant germs, eventually contributing to about 100,000 deaths each year. Most important and dangerous categories of germs to be mentioned in this context are methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE) and hospital-acquired pneumococci (HAP).

In a first aspect, a brought array of innovative beta-lactams of the general formula 1 has been generated by amination of – preferentially – hydroquinones via laccase-mediated biotransformation. All novel compounds exhibited strong antimicrobial activity, inhibiting the growth of several Gram-positive bacteria, among them various MRSAs and VREs. The compounds also protected mice against an infection with *Staphylococcus aureus*, and revealed negligible cytotoxicity and acute toxicity. All these data demonstrate the usefulness of the novel beta-lactam antibiotics for fight-

ing of – especially – multi-resistant germs. Currently, the already tested compounds are further optimized and tested against a large panel of Gram-positive and Gram-negative bacteria, in order to assess the compounds' full spectrum of activities as well as their possible areas of applications. Subsequently, preclinical studies will be carried out with the two most promising drug candidates.

In a second aspect, innovative compositions of beta-lactams and biguanides of the general formula 2 have been prepared and characterized with regard to synergistic effects in their fight against pathogenic germs. In fact, both compounds individually possess antimicrobial activity. Interestingly, however, it was observed that the combination of both agents shows improved activity against various Gram-positive and Gram-negative bacteria compared to the individual compounds, and even revealed activity in cases where none of the starting compounds alone was active. Beta lactams and biguanide form poorly soluble salts that provide particular benefits when being used in wound dressings, wound irrigations etc, due to their surfactant properties and their negligible diffusion into wounds. The composition's highly efficient prevention of germ proliferation and germ spreading has been already demonstrated *in vitro* and *ex vivo*.

Both, the innovative beta-lactam derivatives and the compositions of beta-lactam and biguanide, provide advantages in human and veterinary health care, and are available for sale, licensing and/or co-development.



## Advantages at a glance

- Innovative beta-lactam antibiotic derivatives for the treatment of bacterial (Gram-positive and Gram-negative) infectious diseases.
- Broad-spectrum of activity against even multi-resistant pathogens (e.g. MRSA, VRE).
- Current stage of development: API optimization and determination of the antimicrobial spectrum of activity.
- Innovative compositions of beta-lactam and biguanide for the utilization in wound dressings and wound irrigations.
- Low diffusion rates combined with highly efficient prevention of germ proliferation and spreading.

## Areas of application

- Human and veterinary health care
- Treatment of bacterial (Gram-positive and Gram-negative) infectious diseases
- Wound healing and wound irrigation

## Keywords

- Beta-lactam antibiotics
- Cephalosporin
- MRSA
- VRE
- Multi-resistance

## Patent status

The innovation is covered by a patent family that has been internationally filed and is owned by Dritte Patentportfolio Beteiligungsgesellschaft mbH & Co. KG (D). The first application was filed in January 2007.

**To acquire a licence for this new technology, please don't hesitate to contact us!**



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