

# Beta-lactamase inhibitors

This article has been translated from WikiSkripta; ready for the **editor's review**.

**$\beta$ -lactamases** are enzymes that cleave antibiotics with a beta-lactam structure, which form one of the mechanisms of resistance. Due to the increasing occurrence of bacterial strains resistant to broad-spectrum penicillins (and cephalosporins), inhibitors have been developed<sup>[1]</sup> of these enzymes. Inhibitors are used in combination with antibiotics, which leads to **broadening the antimicrobial spectrum** by strains that are resistant to the antibiotic itself. Inhibitors are mostly ineffective on their own.

## Mechanism of action

These substances are *structurally similar to beta-lactams*, but they either do not have antibiotic activity by themselves (clavulanic acid) or have it, but very limited (sulbactam, tazobactam). They are therefore not used by themselves, only *'in combination with antibiotics'*. Beta-lactamases have a higher affinity for them, so the antibiotic is not split and can act against pathogens.

## Clavulanic acid

Significantly **broadens the antimicrobial spectrum'**. ***it is most often combined with amoxicillin' and ticarcillin***. It binds to serine residues of  $\beta$ -lactamases. It acts mainly on plasmid-bound penicillinases. It does not affect chromosomal cephalosporinases.

File:Clavulanic acid.png  
Clavulanic acid

Poor penetration into body fluids, does not penetrate cerebrospinal fluid. Absorption is not affected by food. It is excreted by the kidneys (nephrotoxic effects).

### Co-amoxicillin (Amoksiklav®, Augmentin®)

Combination of **clavulanic acid and amoxicillin'**. Extends the spectrum of amoxicillin to staphylococcus, *H. influenzae*, *Moraxella catarrhalis*, *Neisseria gonorrhoeae*, *Bacteroides fragilis*, *Enterobacter*, etc. ,

The specific indication is the treatment of animal or human bites.

### Co-ticarcillin (Timentin®)

Combination of **clavulanic acid and ticarcillin'**. Effective against strains resistant to ticarcillin – *Escherichia coli*, *H. influenzae*, *Moraxella catarrhalis*, *Klebsiella pneumoniae*, *Yersinia enterocolitica*, *Proteus vulgaris*, *Proteus mirabilis* etc.

## Sulbactam

As the only inhibitor, it has an antibacterial effect on some acinetobacter and bacteroids. It is combined with ampicillin, cefoperazone (3rd generation cephalosporin).

File:Sulbactam.png  
Sulbactam

### Co-ampicillin (Unasyn®)

Combination of **sulbactam and ampicillin**. Effective against strains resistant to ampicillin - staphylococci, *H. influenzae*, *N. gonorrhoeae*, *Moraxella catarrhalis* etc.

## Tazobactam

Minimal antibacterial action. A very effective inhibitor. It is combined with piperacillin. Efficacy comparable to clavulanic acid.

File:Tazobactam.png  
Tazobactam

### Co-piperacillin (Tazocin®)

Combination of **tazobactam and piperacillin'**. It is administered i.v. Renal excretion. It has a very broad antimicrobial spectrum, effective even against strains resistant to piperacillin - aerobic G+ and G–, most anaerobes. Indications for severe polymicrobial infections.

## Links

## Related Articles

- Antibiotics

- Betalactam antibiotics
- Penicillins
- Cephalosporins

References

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|book =

*Incomplete publication citation.* LINCovÁ, Dagmar and Hassan FARGHALI, et alPrague : Galen, 2002. 978-80-7262-438-6.

|collection =

*Incomplete citation of contribution in proceedings.* LINCovÁ, Dagmar and Hassan FARGHALI, et al. Prague : Galen, 2002. {{#if: 80-7262-168-8 |978-80-7262-438-6} }  
|article =  
*Incomplete article citation.* LINCovÁ, Dagmar and Hassan FARGHALI, et al. 2002, year 2002,

|web =

*Incomplete site citation.* LINCovÁ, Dagmar and Hassan FARGHALI, et al. Galen, ©2002.

|cd =

*Incomplete carrier citation.* LINCovÁ, Dagmar and Hassan FARGHALI, et al. Galen, ©2002.

|db =

*Incomplete database citation.* Galen, ©2002.

|corporate\_literature =

*Incomplete citation of company literature.* LINCovÁ, Dagmar and Hassan FARGHALI, et al. Prague : Galen, 2002. 978-80-7262-438-6} }

- {{#switch: book

|book =

*Incomplete publication citation.* MARTÍNKOVÁ, Dahlia, et alPrague : Grada, 2018. 978-80-7262-438-6.

|collection =

*Incomplete citation of contribution in proceedings.* MARTÍNKOVÁ, Dahlia, et al. Prague : Grada, 2018. {{#if: 978-80-271-0929-6 |978-80-7262-438-6} }  
|article =  
*Incomplete article citation.* MARTÍNKOVÁ, Dahlia, et al. 2018, year 2018,

|web =

*Incomplete site citation.* MARTÍNKOVÁ, Dahlia, et al. Grada, ©2018.

|cd =

*Incomplete carrier citation.* MARTÍNKOVÁ, Dahlia, et al. Grada, ©2018.

|db =

*Incomplete database citation.* Grada, ©2018.

|corporate\_literature =

*Incomplete citation of company literature.* MARTÍNKOVÁ, Dahlia, et al. Prague : Grada, 2018. 978-80-7262-438-6} }

- {{#switch: book

|book =

Incomplete publication citation. ŠVIHOVEC, Jan, et al. *Pharmacology*. Prague : Grada, 2018. 978-80-7262-438-6.

|collection =

Incomplete citation of contribution in proceedings. ŠVIHOVEC, Jan, et al. *Pharmacology*. Prague : Grada, 2018. {{ #if: 978-80-271-2150-2 |978-80-7262-438-6} }  
|article =  
Incomplete article citation. ŠVIHOVEC, Jan, et al. 2018, year 2018,

|web =

Incomplete site citation. ŠVIHOVEC, Jan, et al. Grada, ©2018.

|cd =

Incomplete carrier citation. ŠVIHOVEC, Jan, et al. Grada, ©2018.

|db =

Incomplete database citation. Grada, ©2018.

|corporate\_literature =

ŠVIHOVEC, Jan, et al. *Pharmacology*. Prague : Grada, 2018. 978-80-7262-438-6} }

References

1. {{#switch: book |book = *Incomplete publication citation*. LINCOVÁ, Dagmar, et al. *Basic and Applied Pharmacology*. Prague : Galen, 2007. 978-80-7262-438-6. |collection = *Incomplete citation of contribution in proceedings*. LINCOVÁ, Dagmar, et al. *Basic and Applied Pharmacology*. Prague : Galen, 2007. {{ #if: 978-80-7262-373-0 |978-80-7262-438-6} } |article = *Incomplete article citation*. LINCOVÁ, Dagmar, et al. 2007, year 2007, |web = *Incomplete site citation*. LINCOVÁ, Dagmar, et al. Galen, ©2007. |cd = *Incomplete carrier citation*. LINCOVÁ, Dagmar, et al. Galen, ©2007. |db = *Incomplete database citation*. Galen, ©2007. |corporate\_literature = LINCOVÁ, Dagmar, et al. *Basic and Applied Pharmacology*. Prague : Galen, 2007. 978-80-7262-438-6} }