

Amoxicillin / Clavulanate

BRAND NAMES: AUGMENTIN, CLAVACILLIN, CLAVAMOX

AVAILABLE IN SUSPENSION &
62.5 mg, 125 mg, 250 mg, 375 mg
TABLETS

HISTORY AND BACKGROUND

Thanks to work by Alexander Fleming (1881-1955), Howard Florey (1898-1968) and Ernst Chain (1906-1979), penicillin was first produced on a large scale for human use in 1943. At this time, the development of a pill that could reliably kill bacteria was a remarkable development and many lives were saved during World War II because this medication was available.

But quickly, it became obvious that this new "wonder drug" could bear improvement. For example:

- Penicillin is not well absorbed from the intestinal tract meaning that at least 70% of an oral dose is wasted.
- Penicillin is also a short-acting medication, with half of the amount circulating being removed from the body every half hour.
- Not all bacteria have the type of cell wall which is susceptible to destruction by Penicillin. (Bacteria are classified as Gram negative or Gram positive, depending on the cell wall characteristics. Penicillin is able to punch holes through the Gram positive cell wall but is not very effective against the Gram negative cell wall.)
- *Staphylococci* (an important group of bacteria) have developed an enzyme (called "penicillinase") to break the penicillin molecule apart and are thus rarely susceptible to penicillin.

Amoxicillin represents a synthetic improvement upon the original penicillin molecule. Amoxicillin is better able to resist damage from stomach acid so less of an oral dose is wasted. While it is still susceptible to destruction by staphylococcal enzymes, it does have a much broader spectrum against the Gram negative cell wall and is able to last a bit longer.

Clavamox represents the answer to the *Staphylococcus* problem. By adding Clavulanic acid, the penicillin structure was protected and the antibiotic could be used effectively against Staph. infections. By adding "Clavulanic acid," the penicillin structure was protected and the antibiotic could be used effectively against *Staph.* infections.

USES OF THIS MEDICATION

Amoxicillin is regarded as having a fairly broad spectrum against many bacteria thus it is used both on organisms known to be sensitive to it plus it is a good selection when the sensitivity of bacteria is unknown. It is especially helpful in anaerobic infections (those which grow without the benefit of oxygen). Typical uses might include:

- Infected bite wounds
- Upper respiratory infections
- Infected teeth
- Bladder infections
- Skin infections (which are almost always caused by *Staphylococci*)

In short, anything amoxicillin can do, the combination drug will also do PLUS the combination can kill *Staphylococci*, provided they are not of the "methicillin-resistant" type (see below).

Amoxicillin-clavulanic acid is usually given twice daily. Nausea, if any, can be mitigated by giving with food. If a dose is accidentally skipped, do not double up on the next dose. Simply give the next dose as scheduled.

INTERACTIONS WITH OTHER DRUGS

When the organism in a serious infection cannot be isolated, a common strategy is to attempt to "cover" for all possible bacteria. The amoxicillin-clavulanate combination is frequently used concurrently with other antibiotics for this purpose. A synergistic combination is believed to occur between amoxicillin and members of the quinolone class of antibiotic (enrofloxacin, marbofloxacin, orbifloxacin etc.) What this means is that these antibiotics act together to create a greater effect than expected.

Methotrexate, a common chemotherapy agent, can build up to toxic levels when used at the same time as amoxicillin.

SIDE EFFECTS

Some individuals experience nausea with this medication. Giving the medication with food seems to reduce this effect.

SPECIAL CAUTIONS

The oral suspension should be refrigerated; if the bottle is left out of the refrigerator for more than one night, it should be replaced, as the flavoring agents will spoil. The oral suspension should be discarded after 10 days.

Clavamox may be given with or without food.

Clavamox will cross the placenta in a pregnant patient but is felt to be safe for use during pregnancy.

In recent years, *Staphylococci* have developed genes of resistance beyond simply producing penicillinase. These new *Staphylococci* are called methicillin-resistant *Staphylococci* and they are simply resistant to the penicillin antibiotic group (and usually also to the cephalosporin antibiotic group) and no amount of clavulanic acid can change that. If resistance is suspected (or even if *Staphylococci* are suspected) it may be prudent to culture the organism and obtain a profile of appropriate antibiotics so as not to waste time using something ineffective. Methicillin-resistant *Staphylococci* are resistant to the combination of amoxicillin and clavulanic acid so something else will need to be selected.

Human formulations have differing amounts of amoxicillin and clavulanic acid and strengths are usually expressed only in the amounts of amoxicillin present. It may be challenging to find a human product that is truly comparable to the veterinary product.

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