

# ANTIBIOTIC USE IN VETERINARY DENTISTRY

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The management of bacterial infections and the use of antibiotics are complex subjects. This will be a brief discussion of some of the issues involved. The clinical decision to use or not use antibiotics in a particular case always resides with the attending veterinarian.

## **What follows is my opinion. There are others with differing opinions.**

My observation is that antibiotics are vastly over used in veterinary dentistry, often to the detriment of the patient. For example, I have seen many cases in which oral tumors have been given time to grow larger and more difficult to manage because antibiotics were dispensed to see if they would resolve the problem. Antibiotics are often used in an attempt to treat undiagnosed dental and oral diseases and this simply cannot not work. There are virtually no oral or dental conditions that can be effectively managed with antibiotics alone.

Consider how antibiotics work. If the drug is in high enough concentration around the bacteria, the drug either prevents bacterial reproduction (bacteriostatic) or actually kills the bacteria (bacteriocidal). In order for this to happen, the drug must come into contact with the offending bacteria for a sufficiently long time.

Now consider where the bacteria involved in dental disease are residing.

In the case of endodontic disease, the bacteria are living inside the hollow pulp chamber – an area once occupied by living pulp tissue, but now simply a hollow chamber full of necrotic pulp, food debris and bacteria. Since there is no blood flowing into the pulp chamber of a dead tooth, there is no way for the antibiotics to reach and affect the bacteria. If the bacteria have managed to propagate through the apical delta into the periapical periodontal ligament space to cause infection there and in the surrounding bone, antibiotics can reach these organisms. However, the source of the infection is the pool of bacteria inside the tooth and they remain unaffected by even high chronic doses of antibiotics. Antibiotics may be indicated as an adjunctive treatment to combat periapical infection, but the most important thing is to remove the source of the infection either through extraction of the tooth or root canal treatment.

In the case of periodontal disease, the cause of the problem is bacteria living in the dental plaque and within the porous calculus on the crown and root surfaces. Antibiotics can reduce the bacteria count in the surrounding soft tissues and may even have an effect in reducing the bacteria count within the plaque film, but antibiotics cannot remove the calculus or the plaque film and so the infection recurs as soon as antibiotic treatment stops. Again, by far the most important step is to remove the source of the infection by doing a thorough oral hygiene procedure to remove all plaque and calculus. While it is important to clean the crowns, it is far more important that the subgingival areas (gingival sulcus and periodontal pockets) are cleaned thoroughly.

From my perspective as a referral service, I see cases that are complex and have often been ongoing for some time. The history often includes several spins of the Antibiotic Wheel of Misfortune. The primary-care practitioner saw an oral problem and without a proper assessment and diagnosis, decided to try Drug A. When that did not work they tried Drug B (still no diagnosis!) and finally Drug C and D together. After weeks of ineffective drug therapy (with potential side-effects and the attendant cost), the animal is referred for assessment, diagnosis and treatment. This is backwards. It should be diagnosis first, then treatment.

As the oral cavity may be home to over a thousand species of micro-organisms, culture and sensitivity testing has virtually no value. The results will tell which, of all those hundreds of species of bacteria, grow most happily under artificial laboratory conditions and what antibiotics they are sensitive to (again, in an artificial environment). The bacteria that grow in the lab may not be the ones causing disease in the mouth and *in vitro* sensitivity is not a reliable predictor of response to therapy. For the vast majority of cases, the time and money spent on culture and sensitivity would be better spent doing a proper dental and radiographic examination followed by surgical/mechanical removal of the source of infection.

Certainly, some animals have rampant oral infection (periodontal or endodontic) and require antibiotic therapy as part of the treatment plan, but the most important thing to do is to remove the source of the problem through any or all of root canal therapy, periodontal therapy or extraction.

Some clinics like to have a pre-operative antibiotic protocol. I feel this is bad medicine. The routine or reflex use of antibiotics is the reason we have so many resistant bacteria and why antibiotics are becoming more and more expensive as the pharmaceutical industry struggles to keep up with the evolution of the pathogens. My preference would be to do a proper pre-operative assessment on each patient and decide, based on the specifics of each case, if pre-operative antibiotics are appropriate. Even then, I would not start the antibiotics until the day of surgery.

The American Heart Association and American Dental Association have had recommendations for antibiotic use for many years. When this paper was first written (in 2004), the recommendation was that if a patient has a heart murmur or any prosthetic device (artificial heart valve, knee, hip...) then a dose of penicillin the morning of treatment and for 24 hours post treatment may be prescribed. Since then even that recommendation has been tightened as not all murmurs are clinically relevant. A statement a few years ago indicated that there were more negative outcomes from using antibiotics than from not using them.

Personally, I dispense antibiotics only rarely. If I see an animal with a seriously infected mouth and the animals ability to fight infection is compromised by some other illness (diabetic, FIV positive status..), I will give a pre-induction injection IV of ampicillin Na+. If after surgery I feel there is still deep-seated infection of soft tissues or bone, I will dispense seven to fourteen days of antibiotic, but more than 95% of my patients are sent home without antibiotics.

When antibiotics are indicated, there are some that have better effect on oral disease than others. As always, familiarize yourself with the product monographs regarding side-effects, drug interactions and contra-indications.

#### Tetracyclines:

The tetracycline group tends to have good activity against periodontal pathogens. They are excreted in saliva and gingival fluid at concentrations higher than serum levels. They also have anticollagenase effect at levels far below the antibacterial level and bind to calcified tissues such as bone and cementum.

Periostat™ is a product prescribed to humans for the control of periodontal disease. Very simply, it is low dose tetracycline. The dose is well below the antibacterial dose and it is used specifically for its anticollagenase effect. Since all collagen needs to be broken down and replaced with fresh collagen over time, there is some concern that blocking this physiologic remodeling may cause problems with chronic use.

Doxirobe™ is a doxycycline product in an absorbable polymer gel. This product is to be placed into properly prepared periodontal pockets. This local delivery of antibiotic right at the site of infection allows for excellent antibacterial levels at the target with virtually no systemic effect. Also, as the drug binds to the bone and cementum, there is anticollagenase effect long after the product has been absorbed and levels have fallen below the MIC. While this can increase the effectiveness of proper periodontal debridement, it does not replace any of the steps required to treat periodontal disease. Simply placing this gel in a poorly prepared pocket will result in failure.

#### Clindamycin:

Clindamycin has long been established as a drug of choice for oral infections. It has a spectrum against many of the anaerobic periodontal pathogens and an ability to penetrate into bone, walled-off abscesses and white blood cells. As periodontal and endodontic diseases typically involve at least some degree of osteomyelitis this feature makes clindamycin a good choice for many oral infections.

There have been studies that indicate that clindamycin can have some effect in reducing the bacterial plaque load when given pre-operatively. This led to the suggestion that animals with periodontal disease might benefit from "Pulse-dose therapy" The protocol involves giving 5.5 mg/kg every 12 hours for the first five days of each month. Theoretically, the repeated short-term treatment helps keep periodontal pathogens under control while avoiding the development of resistance. In fact, there is no published research to demonstrate any measurable benefit or to confirm the safety of this protocol. It is now widely felt to be inappropriate.

If a patient has had proper (and thorough) periodontal treatment and is on an effective plaque control program including VOHC-accepted products and daily tooth brushing and still has chronic oral

inflammation, then pulse therapy may be of some value. However, it should never be used in a “let’s see what this does” manner or as an excuse to avoid proper periodontal treatment. And really, if the animal is so intolerant of its teeth and the bacteria that reside on them, everyone is going to be happier if the animal has whole-mouth extraction to put a final and definite end to the problem.

#### Metronidazole:

With excellent activity against anaerobic bacteria, good oral absorption and levels in bone, metronidazole can also be an effective adjunct to the treatment of periodontitis.

#### Amoxicillin/Clavulanate:

Some studies published in the Journal of Veterinary Dentistry indicated that amoxicillin/clavulanate was more effective (*in vitro*) than clindamycin against many oral pathogens. What happens on the culture plate may have little relationship to what happens in the mouth. However, amoxicillin/clavulanate is generally regarded as a reasonable choice for oral soft-tissue infection.

#### Conclusion:

Antibiotics are for the treatment of clinical infection. They are not a vaccine against infection. In fact, giving pre-operative or “preventative” antibiotics may do far more harm than good, in that the drug will reduce the numbers of sensitive bacteria, reducing the competition for the resistant ones. The net result is an increased risk of infection with a resistant organism.

When dealing with a confirmed or suspected oral/dental infection the protocols should be:

1. Get an accurate assessment of the problem.
2. Remove the source of the problem (root canal treatment, periodontal surgery, extraction...).
3. Only in select cases of residual infection following thorough assessment and appropriate mechanical/surgical treatment to remove the source of the infection should antibiotics be considered.
4. I see absolutely no medical justification for routinely putting a patient on antibiotics days before a dental procedure or for keeping them on antibiotics for days after the procedure. Only in rare and specific cases is there need for any antibiotic therapy at all for dental patients. It is not possible to prevent an infection with antibiotics. All you can do with "prophylactic antibiotics" is increase the risk of the patient developing a resistant infection.
5. Exception to the rule. If a patient presents with an acute facial swelling due to dental infection and it is not possible to get the patient to surgery that day, starting antibiotic therapy to bring symptomatic relief until the day of surgery is acceptable. However, the owner must be made aware that even if the facial swelling resolves with medication, the source of the problem is still there and so the owners must proceed with a proper evaluation and surgery and this should be done absolutely as soon as possible.