

Improving Pig Welfare Through Appropriate Antibiotic Use

Veterinarians have been asked why they sometimes need to administer antibiotics to pigs that appear to be healthy. Some pigs may appear healthy, but they can be very effective at hiding signs of disease even when they are infected with bacteria. These infected animals can then spread disease to the rest of the herd. To fully understand this issue one must understand how bacteria cause disease and how antibiotics interact with the bacteria.

Disease Prevention Toolbox

Antibiotics are not the first choice for preventing disease. Pig farmers and veterinarians use a variety of strategies to prevent disease including:

Biosecurity to prevent the introduction of pathogens into the herd.



Vaccination to increase herd immunity and provide maternal protection for newborn piglets.



Controlled animal flows to decrease exposure of new bacteria to naïve animals.



Facility design and management to provide optimal environmental conditions to promote animal health.



Despite all these efforts, however, animals still become exposed to pathogenic organisms, including bacteria, and these management efforts alone are sometimes inadequate to prevent disease. In these cases, the properly timed application of appropriate antibiotics can minimize or prevent disease and thus improve animal health and welfare.

Introduction

Bacteria are microscopic living organisms, some of which make animals sick. Antibiotics may inhibit growth, destroy, or have no impact on bacteria depending on the specific bacteria and antimicrobial characteristics. The use of antibiotics to treat disease can result in the selection of bacteria resistant to specific antibiotics or classes of antibiotics.

Treatment, Control, Prevention, and Growth Promotion

Antibiotics are approved for use in swine for four purposes as defined by the U.S. Food and Drug Administration (FDA): Treatment, Control, Prevention, and Growth Promotion. The label approvals for growth promotion of antibiotic classes considered “important” for human use have been withdrawn by the FDA (Guidance for Industry #209¹ and #213²).

Definitions³

Prevention of disease/prophylaxis: Administration or application of antimicrobial agents to an individual or a group of plants/crops or animals at risk of acquiring a specific infection or in a specific situation where infectious disease is likely to occur if the antimicrobial agent is not administered or applied.

Control of disease/metaphylaxis: Administration or application of antimicrobial agents to a group of plants/crops or animals containing sick and healthy individuals (presumed to be infected), to minimize or resolve clinical signs and to prevent further spread of the disease.

Treatment of disease: Administration or application of antimicrobial agents to an individual or group of plants/crops or animals showing clinical signs of infectious disease.

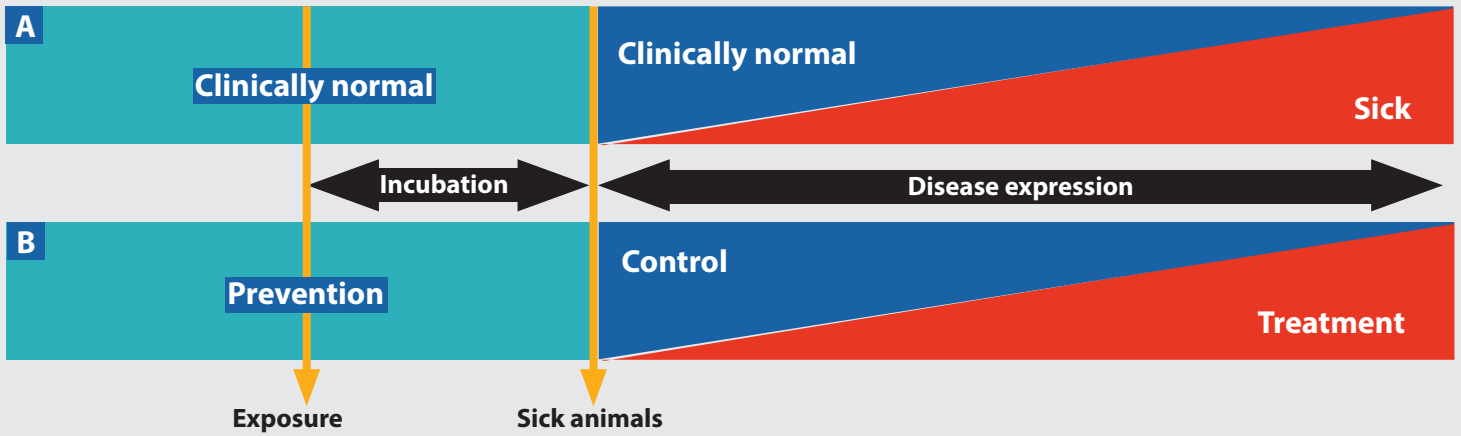
Growth promotion: Administration of antimicrobial agents to only increase the rate of weight gain and/or the efficiency of feed utilization in animals. The term does not apply to the use of antimicrobials for the specific purpose of treating, controlling, or preventing infectious diseases.



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Figure 1: Diagram of disease progress and spread in a population and opportunities for antibiotic intervention



This figure is broken into two sections. Figure 1.A illustrates disease progression in a population while Figure 1.B illustrates how antibiotics can be used to address disease. The gold arrows indicate important disease events including the initial disease exposure and the identification of the first sick animal(s). The period between these two arrows is called the incubation period. The light blue bands represent a period where individuals are infected and possibly sick but disease remains below the population threshold. Following the identification of sick animals, a disease outbreak or expression occurs until the condition is eliminated. During a disease outbreak, two populations emerge as indicated by the blue and red banners.

As shown in Figure 1, antibiotics applied prior to the appearance of clinical signs is referred to as prevention. Whereas, application following the appearance of clinical signs in the herd is either to control or treat disease.

The timing of antibiotic administration relative to pathogen exposure can dramatically impact the outcome, as outlined in Table 1. Preventing rather than controlling or treating clinical disease results in the least adverse impact on animal health and welfare. The use of antibiotics to prevent disease may be appropriate in swine medicine under conditions such as the following:

- Illness can be prevented by administering an appropriately-timed antibiotic when swine are at risk.
- Administering antibiotics prior to the onset of clinical signs can prevent illness and reduce the need for treatment later.
- Swine are infected with an immuno-suppressive virus and exposure to disease-causing bacteria is likely.
- Swine are undergoing a stressful event likely to cause increased susceptibility to bacteria.

Veterinary considerations when using FDA-defined medically important⁴ antibiotics for prevention of disease:

1. Animals are deemed to be at risk of becoming sick through medically appropriate veterinary assessment and a Veterinarian-Client-Patient Relationship exists.
2. Potential pathogen(s) are identified based on the veterinarian's clinical and laboratory diagnosis.
3. Alternative prevention strategies such as immunization should be considered as part of an overall control strategy.
4. The veterinarian should consider the medical importance of a given drug when making a selection.

5. The veterinarian is responsible for discontinuing medically important prevention antibiotics when animals are no longer at risk.

In conclusion, the use of antibiotics to prevent, control or treat disease should be considered after all other efforts have been ineffective. The use of appropriately selected antibiotics early in the disease process can be most effective at improving animal health, well-being and production performance. Antibiotic therapy should be re-evaluated with the goal of minimizing its use.

References:

1. US Food and Drug Administration. Guidance for Industry #209 The Judicious Use of Medically Important Antimicrobial Drugs in Food -Producing Animals. Available at: <https://www.fda.gov/downloads/AnimalVeterinary/GuidanceComplianceEnforcement/GuidanceforIndustry/UCM216936.pdf>. Accessed 15 September 2017.
2. US Food and Drug Administration. Guidance for Industry #213 New Animal Drugs and New Animal Drug Combination Products Administered in or on Medicated Feed or Drinking Water of Food-Producing Animals: Recommendations for Drug Sponsors for Voluntarily Aligning Product Use Conditions with GFI #209. Available at: <https://www.fda.gov/downloads/AnimalVeterinary/GuidanceComplianceEnforcement/GuidanceforIndustry/UCM216936.pdf>. Accessed 15 September 2017.
3. Codex Commission—Intergovernmental Task Force on AMR 9-13 December 2019 Korea. COP to minimize and contain foodborne AMR (CXC 61-2005) http://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FMeetings%252FCX-804-07%252FFREPORT%252FReport%252FFREP20_AMRe.pdf
4. FDA guidance for Industry #152 Appendix A <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/cvm-gfi-152-evaluating-safety-antimicrobial-new-animal-drugs-regard-their-microbiological-effects>

Key points about antibiotic use in swine

Treatment

- Veterinary oversight required
- Antibiotics used to treat animals when they become sick
- Rapid spread of disease leads to increased losses to producers and poor animal welfare
- Prolonged and repeat dosing may be required
- Treatment is targeted at a specific bacteria

Control

- Veterinary oversight required
- Antibiotics used to slow/stop spread of disease
- Improving welfare
- Prolonged and repeat dosing may be required
- Control is targeted at a specific set of bacteria

Prevention

- Veterinary oversight required
- Antibiotics used to prevent disease
- Animals receive targeted antibiotics before they become sick
- Prevention is targeted at a specific set of bacteria

Growth promotion

- Antibiotics used to reduce the amount of feed required to gain weight
- FDA has eliminated the use of medically important antibiotics for this purpose
- Antibiotics not targeted at a specific bacteria

