Feed Additive Guidelines for Swine

Table of Contents

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

Feed Additive Types

What types of feed additives are available?

Feed additives have been used extensively in swine diets. Most swine producers use them because of their demonstrated ability to increase growth rate, improve feed utilization, and reduce mortality and morbidity from clinical and subclinical infections. Because of concern for the development of antibiotic resistance in food borne pathogens, feed additives should not be used indiscriminately.

In general, additives available for swine producers fall into five classifications: (1) animal drugs which include: antibiotics, chemotherapeutics, and anthelmintics or dewormers, (2) growth-promoting minerals, (3) enzymes, (4) organic acids and, (5) probiotics.

An antibiotic is a compound synthesized by living organisms, such as bacteria or molds, which inhibits the growth of another. Chembiotics are compounds similar to antibiotics but they are produced chemically rather than microbiologically. Anthelmintics or dewormers are compounds added to swine diets generally for short intervals to help control worm accumulation. Two growth promoting minerals are copper sulfate and zinc oxide which have growth-stimulating value similar to antibiotics. Enzymes and organic acids are products added to diets to improve the digestibility of the diet. Probiotics, which means “in favor of life,” have an opposite effect to antibiotics on the microorganisms of the digestive tract. It has been theorized that probiotics increase the population of desirable microorganisms instead of directly killing or inhibiting undesirable organisms.

How do I choose a feed additive?

There are many feed additives on the market, and they differ widely in chemical composition and mode of action. Selection of a specific feed additive and the level for optimal response will vary with the existing farm environment, management conditions, and the stage of the production cycle.

Producers planning to use a feed additive for treatment or prevention of a disease should consult their veterinarian or other professional who has training in the efficacy of feed additives. Some drugs are not as effective as others. For example, chlortetracycline is approved for the treatment of bacterial scours. When the scours are caused by Salmonella organisms; however, many times the strain of Salmonella organisms will be resistant to chlortetracycline. Certain drugs will appear to be a good treatment based upon a sensitivity test, but will be unsatisfactory because the drug has limited absorption from the intestine. Penicillin and neomycin often appear to be good drugs against organisms causing pneumonia in sensitivity tests, but neither is absorbed to any degree from the intestine. If the response to a feed additive appears to be diminishing, rotation of antibiotics, evaluation of different antibiotics, or use with approved mixtures may be advisable.

It is highly recommended that an accurate diagnosis and an antibiotic sensitivity test be performed to determine which compounds will be effective. In the long run, the initial expense of a sensitivity test will be of great value because unnecessary drugs and inadequate levels will be avoided.

Because animal drugs are expensive and their usage is coming under greater scrutiny by health authorities and the public, their indiscriminate use should be avoided. Animal drugs should not be used to replace good management.

Veterinary Feed Directive

What is a Veterinary Feed Directive (VFD) medicated feed?

Any feed product that contains an approved animal drug is a medicated feed. Historically, all commercially available animal drugs intended for use in medicated feed were available on an over-the-counter (OTC) basis whether under the direction of a veterinarian or not. Congress recently established a new category, Veterinary Feed Directive (VFD) medicated feeds. VFD medicated feeds will offer an alternative to prescription status for medicated feeds, requiring veterinary diagnosis for the use of these types of medicated feeds while enabling the feed industry to maintain current sound practices in the manufacturing and distribution of feed.

How do I go about using a VFD medicated feed?

A producer contacts the veterinarian to diagnose and treat a health problem. Under a valid veterinarian-client-patient relationship, it is determined that the use of a VFD medicated feed is necessary. The VFD is then issued by filling out a preprinted form. The format of each VFD form will be approved by the FDA-CVM in much the same manner as the label is approved. As with other medicated feeds, the VFD feed can only be lawfully fed to animals in a manner consistent with FDA conditions of approval. Extra-label use is strictly prohibited.

What information is needed on the VFD form?

Information that the veterinarian supplies on the VFD form normally includes:

- Producer name, address and phone number.
- Identification of species, location, and number of animals to be treated.

- Condition or disease being diagnosed or treated.
- Name of the animal drug.
- Level of the animal drug in the feed and the amount of feed.
- Date of treatment and, if different, date of issuing the VFD form.
- Feeding instructions with withdrawal time.
- Any special limitations and precautionary statements.
- Number of refills if permitted by the approval.
- Expiration date.
- Veterinarian's name, address, phone number and signature.
- Veterinarian's license number and name of issuing state.

What records of VFD medicated feed must be retained?

The veterinarian that issued the VFD, the producer, and the feed supplier must retain a copy for at least two years. The VFD copies must be available for review and copying by the FDA.

What are the recommended levels of feed additives?

Level of usage of feed additives depends upon the type of additive and the purpose of the compounds. In Table 1, some of the common feed additives are listed. It should be noted that many additives have two levels—one for growth promotion and one for treatment. Always consult manufacturer's direction before mixing. In addition, the Food and Drug Administration has proposed that the subtherapeutic use of certain antibacterial compounds in feed be restricted and certain withdrawal periods must be observed. Thus, it is important to recognize that approved usage of any feed additive and withdrawal periods are subject to change, and it is imperative to keep updated on any changes. A good source of information on available drugs, indications for their usage, dosages, withdrawal times, and labeling requirements is the current issue of the Feed Additive Compendium.

Certain feed additives must be withdrawn from the feed prior to slaughter at varying intervals to ensure residue-free carcasses. Some withdrawal periods for commonly used feed additives are listed in Table 1. Be sure to read the feed tags to determine withdrawal time.

Can animal drugs be used in an extra-label manner in medicated feeds?

No persons (including veterinarians, feed manufacturers, or producers) have "extra-label" drug use provisions for adding drugs to medicated feeds.

Why has a 14-day voluntary withdrawal time been established for medicated feeds containing tetracycline class antibiotics?

Animal health products that contain tetracycline class antibiotics (tetracycline, oxytetracycline or chlortetracycline) have been approved by the Food and Drug Administration for use in swine. Depending on formulation or dose, there may or may not be a labeled withdrawal to market. When used according to labeled directions, they are safe and efficacious and can be included in cost-effective pork production programs to supply a safe, quality pork product to consumers.

In the global marketplace, individual countries may hold their meat supplies to their unique specifications for tissue residue limits. Not all countries agree with the maximum tissue residue limits set by the United States government, even though U.S limits are based on scientifically sound food safety data.

Some countries have used the fact that specifications are not standardized throughout the world to impose restrictive meat import standards which effectively act as non-tariff trade barriers.

Based on currently available information, when using feed or water forms of tetracycline class antibiotics, a minimum withdrawal of 14 days should meet the residue limits of our international markets. The National Pork Producers Council calls on pork producers to voluntarily observe this withdrawal effective immediately, when supplying packers shipping pork to international markets.

The 14-day length of the voluntary withdrawal is an important interim measure until more tests, providing further data, are completed by product manufacturers. It applies when tetracycline products are given only from a single source, either the feed or water. It does not apply to injectable tetracycline products. Based on current information, pork producers should continue to follow the labeled directions and withdrawal times for these injectable products.

At what stages of the production cycle are additives most effective?

The response to feed additives is greatest in starter (10 to 50 pounds) diets. The response to feed additives is less during the finishing period (125 pounds to market weight) than it is at younger ages. Therefore, because of the expense of antibiotics and the expected improvement in performance, their use in finishing diets many times lack economic justification.

Herds that have experienced problems with conception rates and litter size have often been helped by the addition of antibiotics to sow diets. However, the routine feeding of antibiotics to the breeding herd is discouraged unless there is a history of reproductive problems.

Growth-promoting Minerals

Are zinc oxide and copper sulfate considered growth promoting?

The use of copper sulfate and zinc oxide are considered growth promoting when used at much higher levels than supplied by the trace mineral premix. Use of the growth promoting levels of trace minerals is recommended for additions to starter pig diets but is not recommended for use in the finishing phase.

The use of copper sulfate as a growth promotant in swine has become widespread. Research has shown that when 125 to 250 ppm of actual copper (1 to 2 pounds of copper sulfate per ton) is added to starter pig diets, an improvement in growth and feed efficiency and a reduction in mortality is observed. When a combination of supplemental copper and antibiotics is fed in starter diets, improved performance is observed compared with the addition of antimicrobial agents alone.

Copper sulfate increases corrosion, thereby reducing the longevity of galvanized woven wire floors and feeders. It also has been shown to decrease the bacterial degradation of manure in lagoons. Copper, when fed in excess of 300 to 500 ppm (2.5 to 5.5 pounds of copper sulfate per ton), may be toxic, particularly if the diets are low in zinc and iron.

High levels of zinc oxide have been shown to exhibit a growth promoting effect in nursery diets. However, this effect has been shown to be an interactive effect with the use of growth promoting copper sulfate. The effect of using zinc oxide alone has been shown to have a greater effect than a combination of zinc oxide and copper sulfate. Further research has indicated that the optimum level of zinc oxide is 3,000 ppm for pigs less than 15 pounds and 2,000 ppm for pigs from 15 to 25 pounds. Therefore, current recommendations are to use either zinc oxide or copper sulfate alone and not in combination in nursery diets as trace mineral growth promoting agents.

Enzymes and Organic Acids

Should I add supplemental enzymes or organic acids to my starter diets?

Supplemental enzymes and organic acids added to the diet may help the young pig's digestive system in breaking down nutrients in starter diets. Research evaluating diets containing added enzymes have shown that if complex diets are fed (i.e., diets containing milk products, plasma protein, etc.), supplemental enzymes are not necessary. However, some research supports addition of organic acids to diets for early weaned pigs, even when complex diets are fed. If pigs are weaned on to grain-soybean meal diets, supplemental enzymes or organic acids may improve digestibility of the diet.

One enzyme, phytase, has been shown to greatly enhance the digestibility of phytate phosphorus in grains and plant protein sources. This reduces the amount of inorganic phosphorus needed for supplementation. See the factsheet, *General Nutrition Principles for Swine,* MF2298 for further information on phytase.

Probiotics

What are probiotics?

Probiotics are organisms that, rather than killing pathogenic bacteria like antibiotics, help stimulate proliferation of desirable organisms. Probiotics can be classified into two types—live microbial cultures and nonviable fermentation products of microbes. The most common in probiotic products contain Lactobacillus, Streptococcus, and Bacillus organisms, bacteria that normally inhabit the digestive tract of healthy animals. It has been theorized that these bacteria remove waste products and inhibit the growth of certain undesirable bacteria. Numerous research reports have indicated little if any benefit of probiotics on pig performance. Therefore, their use in swine diets is neither recommended nor economically justified.

Is it too good to be true?

Producers are bombarded with products and additives that promise improvements in growth performance, sow production, etc. Claims are often too good to be true. When evaluating new products, use common sense, and ask to see the results of scientific testing. Products are often promoted based on testimonials. If you have any questions concerning the use of a product, contact your county agent, extension specialist, veterinarian, or swine consultant for an objective evaluation.

Table 1. Claims and Withdrawal Time for Additives in Swine Feeds[a].

Feed Additive	Level (g/ton)	Indications for Use	Withdrawal Period
Antimicrobials and Growth Promotants			
Apralan (Apramycin)	150	Feed continuously as the only ration for 14 days	28 days
Bacitracin[b]	10–30	Growth and feed efficiency	none
	250	Control of swine dysentery	none
Chlortetracycline	(10 mg/lb BW Daily)	Growth and feed efficiency	none
(Aureomycin, CTC, Phi-Chlor)		Bacterial enteritis and rhinitis	none
		Bacterial enteritis (scours)	none
		Reduce leptospirosis shedding	none
CSP 250 100 g CTC 100 g sulfathiazole 50 g penicillin	250 (total)	Reduce abscesses; growth promotion; aids in rhinitis control; treatment of salmonellosis	7 days
Denagard (Tiamulin)	10	Growth performance and feed efficiency	none
	35	Control swine dysentery	none
	200	Treatment of swine dysentery	2 days
Flavomycin (Bambermycin)	2–4	Growth and feed efficiency	none
Lincomycin	20	Growth performance	none
	40	Control of dysentery	none
	100	Treatment of bacterial enteritis (scours)	6 days
	200	Reduce severity of mycoplasmal pneumonia	6 days
Mecadox (Carbadox)	10–25	Growth and feed efficiency	70 days
	50	Control of dysentery and enteritis; growth promotion in pigs up to 75 lbs.	70 days
Neo-Terramycin	120–290 (total)	Control of bacterial enteritis (scours) and the maintenance of gains in the presence of rhinitis.	
70–140 g Neomycin base		Neomycin at 140 g	10 days
50–150 g Oxytetracycline		Neomycin < 140 g	5 days
Penicillin	10–50	Growth and feed efficiency	none
Pulmotil (Tilmicosin)	181–363	Control of respiratory disease associated with *Actinobacillus pleuropneumoniae and Pasturella multocida*	7 days
Terramycin (Oxytetracyline; OTC)	(10 mg/lb BW) Daily)	Treatment or control of bacterial scours or pneumonia due to oxytetracycline susceptible organisms	none
	(10 mg/lb BW Daily)	Treatment and control of leptospirosis	5 days

Tylan (Tylosin)	10–20	Growth and feed efficiency in finishing pigs	none
	20–40	Growth and feed efficiency in growing pigs	none
	20–100	Growth and feed efficiency in starter pigs	none
	40–100	Control of bacterial enteritis (scours)	none
	100	Aids in ileitis and rhinitis control	none
Stafac (Virginiamycin)	5–10	Growth and feed efficiency	none
	25	Control of bacterial enteritis (scours) up to 120 lb.	none
	100	Treatment and control of bacterial enteritis (scours)	none
Anthelmintics			
Atgard (Dichlorous)	348	Control internal parasites (pigs)	none
	479	Control internal parasites bred and open sows and boars	none
	334–500	Aid in improving litter production	none
Banminth (Pyrantel tartrate)	96	Internal parasite control	1 day
Hygromycin B	12	Control ascarids, nodular, and whipworms	15 days
Ivomec (Ivermectin)	2 ppm for 7 days	Internal and external parasites	5 days
Safegard (Fenbendazole)	9 mg/kg body weight over 3–12 day's time	Internal parasite control	none
Feed Additives That May Be Used in Combination			
Denegard/CTC			
Denegard	35	Growth and feed efficiency	none
CTC	(10 mg/lb BW Daily)	Growth and feed efficiency	none
BMD/CTC (can be fed for no more than 14 days)			
BMD	10–30	Growth and feed efficiency	none
CTC	(10 mg/lb BW Daily)	Growth and feed efficiency	none

[a] This is only a partial list of feed additives and combinations. Information was adapted from 1997 Feed Additive Compendium. Feed additives and their combinations may not be used in any way other than specified on the label.

[b] Bacitracin is available in several forms including the zinc, and methylene disalicylate (MD form) derivatives.

Notes

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