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Calf Note #41 - Antibiotics in milk replacers

Introduction

Salmonella typhimurium DT104. This organism is an increasing concern to the U.S. medical and agricultural community. Recent reports of increasing prevalence of a multiple antibiotic resistant strain of Salmonella typhimurium DT104 in humans and animals, especially cattle, have posed an emerging public health issue of international concern. Most occurrences were originally reported in the UK, but other European countries such as Germany, France, Austria and Denmark have reported outbreaks. In the U.S., this strain has been isolated from cows, pigs, sheep, chickens, turkeys, horses, goats, and other animals, including emu, cat, dog, elk, mouse, coyote, ground squirrel, raccoon, chipmunk, and several species of birds.

The *New England Journal of Medicine* (May, 1998) published an article by Glynn and others from the Centers for Disease Control and Prevention in Atlanta, Georgia. The authors wrote an article related to the prevalence of antibiotic resistant strains of Salmonella typhimurium DT104 and the health ramifications of this increase in prevalence. The authors reported that the proportion of this bacterium in the U.S. that was resistant to five different antibiotics (ampicillin, chloramphenicol, streptomycin, sulfonamides, and tetracycline) increased from 0.6% in 1979-1980 to 34% in 1996. The authors concluded *"More prudent use of antimicrobial agents in farm animals and more effective disease prevention on farms are necessary to reduce the dissemination of multidrug-resistant typhimurium DT104 and to slow the emergence of resistance to additional agents in this and other strains of salmonella"*.

This article is something of a bellwether in animal agriculture. For many years, concerns about antibiotic resistance have been focused on the use of antibiotics by medical professionals and in hospitals. Few (at least publicly) have expressed concern about the use of antibiotics in animal agriculture. For years we have utilized antibiotics for therapeutic (for treatment of disease) and subtherapeutic (as feed additives to increase growth and efficiency) uses in animals. The tide appears to be turning, however. This new paper suggests that in this one organism, at least, the link between antibiotic use in animals and antibiotic resistance in human pathogens is more compelling.

The Centers for Disease Control and Prevention appear to support the World Health Organization's recommendation that the use of all growth promoters be terminated. This, of course, includes the use of antibiotics fed subtherapeutically as growth promoters. Recently, the British Parliament issued a statement expressing concern regarding the transfer of antibiotic resistant microorganisms from animals to humans through food and called for a ban on the use of antibiotics in farming as growth promoters. Further, members called for tighter restrictions on use of antibiotics as subtherapeutic purposes.

Research data has to date indicated little impact of the use of antibiotics in animal agriculture on antibiotic resistance in human pathogens (see links below for discussions related to use of antibiotics

in animal agriculture). However, research directed to minimize the *need* for using antibiotics should have a very high priority.

Are antibiotics necessary in calf milk replacers? This is an interesting question. Producers in certain geographic regions of the U.S. rarely feed medicated calf milk replacers (e.g., West coast). Conversely, other regions (e.g., Midwest) have such a demand for medicated milk replacers that there are no nonmedicated replacers available.

Research indicates that antibiotics are still effective in reducing the incidence and severity of diarrhea in young calves (Quigley et al., 1997). These data support older data showing improved performance of calves, particularly when they are exposed to stress. Conversely, when animals are not exposed to significant stress, the potential benefits of antibiotic use are not as likely.
Seeking alternatives to antibiotics in milk replacers is a goal for many research organizations. Some alternatives might include:

- Low stress environments. This may be the lowest cost and most effective method of reducing reliance on antibiotics. By reducing the pathogen exposure in the environment, there is less of a need for "killing off" the pathogens.
- Probiotic bacteria and yeasts. The idea here is to provide viable organisms that can effectively compete with pathogens. By "outgrowing" the pathogenic bacteria, the probiotic bacteria are able to improve animal health.
- Oligosaccharides. These molecules provide a site for pathogens to bind. Upon binding to the oligosaccharide, the pathogen is unable to "unbind" and it carried out of the animal's digestive tract.
- Dietary IgG. Dietary IgG, whether included in milk replacers as colostrum or animal plasma, may provide some intestinal immunity by actively binding to pathogens. An increasing body of data in many species indicates that immunoglobulins maintain biological activity in the gut and provide a level of local immunity.

Discussions related to the risks and benefits of antibiotic use in animal agriculture (and in calf milk replacers) will continue. It is important that universities, feed companies, and other research entities attempt to identify viable alternatives to the subtherapeutic use of antibiotics. The risks of inaction are too great and the rewards for proactive research and product development are substantial.
Some interesting web sites related to the use of antibiotics in animals are:

- An excellent review of use of antibiotics by the Animal Health Institute: http://www.ahi.org/info/general/E7c1.htm
- University of Nebraska, Lincoln Cooperative Extension Service guide to the use of antibiotics in cattle: http://www.ianr.unl.edu/PUBS/animaldisease/g795.htm
- University of Guelph http guide to "Mastering Mastitis": http://www.uoguelph.ca/Research/spark/dairy/hymast.html
- IFC "Backgrounder": A nice overview of U.S. agriculture (including use of antibiotics in cattle) by the International Food Information Council: http://ificinfo.health.org/backgrnd/bkgr12.htm
- A dense, technical review of antibiotic resistance by Glaxo Wellcome scientists: http://www.health.fgov.be/WHI3/periodical/months/wwhv1n5tekst/9714497b4.htm

- Antibiotic resistance web site, run by the E. coli Reference Center at Penn State University: http://www.ecoli.cas.psu.edu/resistan.htm
- U.S. Animal Health Association 1997 review of Salmonella typhimurium DT104: http://www.usaha.org/speeches/sal10497.html

References:

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Quigley, J. D., III, J. J. Drewry, L. M. Murray, and S. J. Ivey. 1997. Body weight gain, feed efficiency, and fecal scores of dairy calves in response to galactosyl-lactose or antibiotics in milk replacers. J. Dairy Sci.80:1751-1754.