Can Tylosin Use be Reduced?

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Project Title:
Investigation of an antimicrobial use (AMU) reduction in tylosin on the severity of liver abscesses and antimicrobial resistant (AMR) in Enterococci in feedlot cattle

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Background:
Liver abscesses in cattle have been extensively studied for the last 70 years, and yet, are still one of the leading causes of beef quality defects and economic losses in beef cattle. Condensed or discounted livers due to abscesses cost the Canadian beef industry over $60 million per year.

Tylosin, a member of the macrolide family of antimicrobials, is widely used in feedlot cattle and is administered through the diet to reduce the incidence of liver abscesses. Antimicrobials that belong to this same family are also used in humans to e.g. sepsis. According to Health Canada’s categorisation of antimicrobial drugs based on importance in human medicine, this antimicrobial family is considered to be of high importance for treating and preventing bacterial infections in humans, the second-highest category.

Tylosin is usually fed continuously throughout the feeding period at a concentration of 1 ppm in the diet and there is no withdrawal period required prior to sending cattle to the abattoir.

It has been one year since Health Canada fully implemented new regulations involving medically important antimicrobials in livestock feed. This new directive motivates the effects in the United States, as well as similar initiatives in the European Union, aimed at enhancing the stewardship of antimicrobials. In Canada, as in the United States, new regulations require the total annual use of medically important antimicrobials across all categories, including those for livestock production must decrease by 20% over a three-year period. Antimicrobials can’t be prescribed to livestock unless the producer is approved and registered with a livestock practitioner, and is in the process of a consultation. Antimicrobials are approved and registered through the College of Veterinarians of Alberta, the regulatory body that oversees all aspects of veterinary medicine in the province.

The objectives of this project were to:
1) Determine the effects of reducing in-feed tylosin administration by 25% on liver abscess incidence and severity.
2) Determine the effects of the reduced tylosin use on the development of AMR in Enterococcus species.
3) Identify the diversity and AMR profiles of the microbiota associated with liver abscesses in both conventionally fed cattle and cattle administered 25% less tylosin during the feeding period.

The incidence of liver abscesses did not differ with duration of tylosin administration, but while there was a tendency for cattle administered tylosin for a shorter duration, this did not affect the growth performance of feedlot cattle. There was also no difference in finishing weight, average daily gain or feed efficiency associated with the duration of tylosin administration. The overall incidence of liver abscess was over 60%, regardless duration of tylosin administration, with about 20% of the abscesses considered to be severe. Although some of the bacteria that cause liver abscesses are known, there may also be some contributing bacteria that have yet to be identified. While high incidences of liver abscesses have been attributed to the use of high doses of tylosin during finishing, little is known about when liver abscesses develop during the feeding period or why some cattle develop liver abscesses while others do not. Advancements in genomics could provide some light on these unknowns, as it may allow for the full characterization of all the bacteria that contribute to liver abscesses and may help define why some cattle are susceptible and others are not. Regardless, it is clear that the high prevalence of this disease in feedlot cattle, finding alternative strategies to reduce the prevalence of liver abscesses in cattle has considerable merits.

One possible approach may be to reduce the duration that in-feed antimicrobials are administered during the feeding period. With this possibility in mind, a collaboration between Agriculture and Agri-Food Canada and Feedlot Health Management Services was formed to determine if reducing the duration of tylosin in the diet for only 15% of the feeding period (as opposed to the entire feeding period) would reduce antimicrobial resistant bacteria, without decreasing the prevalence or severity of liver abscesses, other health issues, or compromising the growth performance of feedlot cattle.

What They Learned:
Reducing the duration that tylosin is administered during the feeding period did not lower the antimicrobial resistance in Enterococcus species. The overall prevalence and severity of liver abscesses did not differ with the duration of tylosin administration. The overall incidence of liver abscess was over 60%, regardless duration of tylosin administration, with about 20% of the abscesses considered to be severe. Although some of the bacteria that cause liver abscesses are known, there may also be some contributing bacteria that have yet to be identified. While high incidences of liver abscesses have been attributed to the use of high doses of tylosin during finishing, little is known about when liver abscesses develop during the feeding period or why some cattle develop liver abscesses while others do not. Advancements in genomics could provide some light on these unknowns, as it may allow for the full characterization of all the bacteria that contribute to liver abscesses and may help define why some cattle are susceptible and others are not. Regardless, it is clear that the high prevalence of this disease in feedlot cattle, finding alternative strategies to reduce the prevalence of liver abscesses in cattle has considerable merits.

Example of a healthy liver with progression from mild (A-) to severe (A+) liver abscesses. Severely abscessed livers may possess one large abscess (> 2.5 cm) as above or more than 4 abscesses of < 2.5 cm.

What It Means:
Reducing the duration that tylosin is administered during the feeding period did not lower the antimicrobial resistance in Enterococcus species. The overall prevalence and severity of liver abscesses did not differ with the duration of tylosin administration. The overall incidence of liver abscess was over 60%, regardless duration of tylosin administration, with about 20% of the abscesses considered to be severe. Although some of the bacteria that cause liver abscesses are known, there may also be some contributing bacteria that have yet to be identified. While high incidences of liver abscesses have been attributed to the use of high doses of tylosin during finishing, little is known about when liver abscesses develop during the feeding period or why some cattle develop liver abscesses while others do not. Advancements in genomics could provide some light on these unknowns, as it may allow for the full characterization of all the bacteria that contribute to liver abscesses and may help define why some cattle are susceptible and others are not. Regardless, it is clear that the high prevalence of this disease in feedlot cattle, finding alternative strategies to reduce the prevalence of liver abscesses in cattle has considerable merits.

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