(+0.08 liter/cow/day). However, herds feeding monensin and having high nonfiber carbohydrates (NFC) level in diet (>41.0%) had an increase of PROD (+0.7 liter/cow/day). Monensin significantly decreased MFP (-0.16%). Some dietary factors had a significant influence on monensin effect on MFP. The decrease in MFP was smaller for herds that had a diet low in NFC (≤39.7%); had a high proportion of physically effective fibre in the total mixed ration (as determined by adding the results of the two top sieves of Penn State Particle Separator) (>45%); and who fed dry hay as first meal in the morning.

Significance

The results of this trial are consistent with previous studies and confirm that monensin lowers herd milk fat percentage at a dose of 16 ppm (15g per ton) in lactating dairy cows. No effect on PROD for monensin, as measured using bulk tank data, was found. Dietary factors influencing the impact of monensin on PROD and MFP were mostly related to carbohydrate and fibre levels in the diet. Those factors could be used for predicting potential effects of monensin in herds.

A Meta-analysis of the Metabolic Impacts of Monensin in Lactating Dairy Cattle.

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Introduction

Monensin shifts the microbial population in the rumen towards more gram negative bacteria, consequently changing rumen volatile fatty acid concentrations towards propionate and away from acetate and butyrate. Since the late 1980's there have been many papers published on the effects of monensin in lactating dairy cattle. Recently, approvals for use on monensin have been obtained in Canada and the United States, while the product has been available for dairy cattle in countries such as Mexico, Australia and New Zealand for many years. The impacts of monensin on energy metabolism, including effects on serum ketones, NEFA, glucose, and urea have not always been consistent. Meta-analysis is a useful tool that can be employed to both summarize effects across studies and to investigate factors explaining potential heterogeneity of response.

Materials and Methods

An intensive literature search and screening process yielded a total of 59 papers, abstracts, and trial reports containing useable data on monensin in dairy cows. Of these, 30 papers contained metabolic data. All trials included were randomized designs but were not necessarily blinded. Data from each trial contained in the papers was extracted to a database including the number of animals, mean, and standard error for each of the monensin and control groups. Other relevant data that were common to most studies such as dose, stage of lactation, dose delivery method, and diet type (pasture, forage, component-fed) were also extracted. Meta-analysis was conducted in STATA for monensin effects on blood/serum beta-hydroxybutyrate (BHB), acetoacetate, non-esterified fatty acids (NEFA), glucose, urea, cholesterol, insulin, and calcium.

Results

There was a total of 30 papers containing 45 trials with monensin and metabolic outcomes. Some studies contained a summary of one trial conducted on multiple trial sites whereas other studies reported multiple trials conducted at a single trial site. Over all the trials analyzed, monensin decreased serum or blood BHB (P=0.001), NEFA (P=0.006), and acetoacetate (P=0.003). In addition monensin increased blood glucose

(P=0.0001), urea (P=0.0001), and cholesterol (P=0.08). Monensin had no effect on serum calcium or insulin. The effect size estimates for monensin on BHB, acetoacetate, and cholesterol were heterogenous; thus random effects models were utilized for these analytes. Effect size estimates of monensin for BHB and NEFA were positively correlated, but were negatively correlated to glucose. A consistent delivery of monensin via topdress or in a controlled release capsule gave a slightly smaller but more consistent reduction in BHB. Topdress delivery and increasing dose increased glucose response. NEFA, BHB and glucose effects were modified by stage of lactation. Larger effects for BHB and NEFA were observed in the transition period than later in lactation. Glucose response was greater in cows after calving than before calving.

Significance

Monensin clearly has profound effects on energy metabolism which are marked by decreases in NEFA , BHB and acetoacetate and increases in glucose and cholesterol. The effect on increasing urea is likely a reflection of reduced protein degradation in the rumen and subsequent deamination of absorbed amino acids. Maximum benefit from monensin for improved energy metabolism will be obtained by ensuring a consistent daily dose and targeting the transition dairy cow.

A Meta-analysis of the Production Impacts of Monensin in Lactating Dairy Cattle.

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Introduction

Monensin increases propionic acid production through effects on rumen microbial populations. Recently, approvals for use on monensin have been obtained in Canada and the United States, while the product has been available for dairy cattle in many other countries such as Mexico, Australia and New Zealand for many years. The impact of monensin on production, especially on milk fat content have been inconsistent. Meta-analysis is a useful tool that can be employed to both summarize effects across studies and to investigate factors explaining potential heterogeneity of response.

Materials and Methods

An intensive literature search and screening process yielded a total of 59 papers, abstracts, and trial reports containing useable data on monensin in dairy cows. Of these, there were 37 papers that contained production data. All trials included were randomized controlled designs but were not necessarily blinded. Data from each trial contained in the papers were extracted to a database including the number of animals, mean, and standard error for each of the monensin and control groups. Other relevant data that was common to most studies such as dose, stage of lactation, dose delivery method, and diet type (pasture, forage, component-fed) were also extracted. Meta-analysis was conducted in STATA for monensin effects on milk yield, dry matter intake, milk production efficiency, milk components (percent and yield), body condition score, and body weight change. A subset of trials contained dietary information. This information was used to estimate ration parameters in CPM and then these parameters were screened in meta-regression to evaluate impact on monensin treatment on milk components.

Results

There were a total of 37 papers containing 70 trials with monensin and production outcomes. Some stud-