The Effect of Anthelmintic Treatment in Adult Dairy Cows on Milk Production

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A Scientific Review

The Bottom Line

- Virtually all cattle on pasture are infected with parasites, usually *Ostertagia ostertagi* and *Cooperia* spp.

- Cattle infected with parasites produce less milk.

- When cows or heifers infected with parasites were treated with an effective anthelmintic, milk production increased by an average of 1.39 lb liquid milk per day ($P<0.01$).

Introduction

The presence of parasites in grazing calves and adult beef cattle is well established and recognized among the agriculture community. But what about adult dairy cows?

As cattle mature and are exposed to parasite challenge while grazing, the effect of infection is reduced.(1,2) Thus, calves are more susceptible to the adverse effects of parasitism than are yearlings, and yearlings are more susceptible than adults. Adult dairy cattle on a good nutritional program usually have some degree of immunity to parasites.(1) However, research has shown that the immunity of adult dairy cows to parasites can be lowered during periods of stress, including sickness, poor nutrition, pregnancy and lactation.(1,2) This interference with host defenses can lead to clinical disease or productivity losses related to subclinical infection.(3)

The impact of gastrointestinal parasitism and anthelmintic treatment on milk production in dairy cattle has been extensively reported.

Cows on Pasture and in Confinement Have Parasites

Published reports of slaughter house surveys of culled dairy cows, fecal egg counts in lactating cows, serological tests, and worm counts in cull cows...
from milk production studies have demonstrated that grazing dairy cattle are usually infected with *Ostertagia ostertagi* and *Cooperia* spp, with worm burdens often up into the thousands—up to 225,500.(4-12) The seasonal fluctuations in populations of inhibited *O ostertagi* in these adult dairy cows are similar to those seen in young cattle.(4,7,11,13)

Recently, a survey was conducted in New York, Pennsylvania, Wisconsin, and Minnesota to determine the prevalence of nematode eggs in their feces. (14) At least one animal on 108 of the 141 farms in the survey (77%) was positive for nematode eggs in the feces. The most common parasites found were *Ostertagia*, *Cooperia*, and *Haemonchus*. Cows and heifers in this survey were kept on pasture or in confinement. Of the cows on pasture, 46% had nematode eggs in the feces; 37% of the cows maintained in confinement had nematode eggs present in their feces.

**Keys to Productivity Losses**

The effect of gastrointestinal parasitism on dairy cattle can include appetite suppression, reduced feed digestibility, disruption of protein metabolism, interference with water and electrolyte balance, intestinal stasis, and a local hypersensitivity response at the site of infection.(3,15)

**Appetite Suppression**

Appetite suppression may be the single most important factor related to productivity losses in both dairy and beef cattle. In one study, anorexia caused by *O ostertagi* accounted for a weight gain difference of 73% between parasitized and non-parasitized calves.(15) In sheep, inappetence accounted for over 60% of the reduced weight gain in infected lambs, relative to parasite-free controls.(15) The reduction in appetite may result from increased gastrin levels associated with the elevated abomasal pH, consequent to parietal cells damage.(15,16) Thus, it appears the indirect effect of lower feed intake is far more important than the direct effect of physical damage on poor growth rate in parasitized animals.

**Feed Digestibility Reduction**

The digestibility of feed is expected to decrease in cattle infected with gastrointestinal parasites due to the damage caused by these parasites in the gut. Heinemann reported that a yearling steer infected with parasites demonstrated significantly (*P*<0.01) lower forage dry matter digestion than an uninfected animal.(17) The dry matter digestibility of high quality forage declined from 48.3% to 31.2% (a 35% reduction) when the steer was infected with nematodes. In lower quality forages, the decline in digestibility was even greater, from 25.9% to 12.2% — a 53% reduction (*P*<0.01). The digestibility of protein followed the same pattern, with both high and low quality forages when cattle were infected with nematodes.

Regardless of parasite status, cows in early lactation have total energy expenditure that is greater than energy intake.(18) Milk yield in post-calving dairy cows is closely correlated with energy balance.(1) Any reduction in appetite and/or forage digestibility in lactating dairy cows...
would likely have an impact on milk production because nutrients are first used for maintenance. It seems that the effects of parasite treatment are greatest during the peri-parturient period.(1) The body condition of cows at calving may also have an impact on subsequent milk production because body fat reserves are a source of energy for the lactating cow.(1)

**The Effect of Parasites on Milk Production**

In reviewing the literature, 6 of 9 studies — all utilizing experimental nematode infections — demonstrated a negative impact of parasite infection on milk production.(19) In four separate trials conducted by Bliss, et al, cows averaging 39, 33, 73, or 134 days of lactation were each given 200,000 infective larvae of mixed nematode species, for up to three days. (20)

> In these four trials, uninfected cattle produced 2.2 to 6.5 lb more milk per day than did infected cows for the 30 days following infection. These results are similar to those reported by Barger and Gibbs, in which cows in week 4 of lactation were infected with a mixture of 5,000 infective larvae three times weekly for nine weeks.(21) These cows produced 4.75 lb less milk per day than did non-infected cows. Kloosterman and others reported cows infected with 200,000 infective larvae of *O ostertagi* produced 0.09 lb less milk per day, on average, than did non-infected controls.(22) The trend from these studies suggests that parasite infection has a detrimental effect on milk production.

**Parasite Treatment Can Increase Milk Production**

The literature contains several citations which support the premise that antiparasitic treatment of lactating adult dairy cows can increase milk production.(19) These studies utilized a variety of anthelmintics, including coumaphos, benzimidazoles (BZs), imidazothiazoles (IMZs), and avermectins.

**Mid-lactation Treatment**

In 19 studies, where cows were treated for parasites mid-lactation and followed for 60 days or less, milk production responses ranged from –2.86 lb/day to +4.64 lb/day, with a median increase of 1.76 lb/day (Figure 1). (19) Increases in milk production were noted in 15 of the 19 studies. Increases in five of the 15 studies were statistically significant (P<0.05); in the remaining four studies there were either minor (not statistically significant) decreases in milk production, or no change at all (Table 1).

**Pre-calving or Early-lactation Treatment**

There were 43 studies reported, where cows were treated one to three times during the dry period, or just before, or immediately after, calving.(19) Both seasonal and year-round calving systems were included.

Increased milk production was demonstrated in 34 of the 43 studies (79%) when cows were treated between drying-off and week 2 of lactation (Table 1).(19) The increase was statistically significant (P<0.05) in 13 of the 34
studies that demonstrated an improvement. In these 43 studies, milk production was increased up to 4.55 lb/day, and the median change in milk production was approximately +0.92 lb/day (Figure 1).

**Strategic Treatment**
An increase in milk production was observed in 15 of 16 studies (94%) in which cows were treated multiple times over extended periods, or were treated strategically over a one-year period (Table 1).(19) The increase was significant ($P<0.05$) in two of the 15 studies that demonstrated an improvement. For all 16 studies, treatment of cows resulted in a median increase in production of 1.65 lb/day, ranging from -0.79 lb/day to +6.95 lb/day, comparing treated groups to control groups (Figure 1).

**Combined Data from All Treatment Programs**
When data from all 87 published studies are combined, 70 (80%) of the studies resulted in a positive response ($P<0.001$) to parasite treatment of adult dairy cows on milk production; with the median increase in milk yield being +1.39 lb/day (Table 1, Figure 1).(19)

Using a milk price of $17.80/cwt, the average "mailbox" price paid for milk in December of 1998, over a full 300-day lactation, this additional 1.39 lb of milk per cow per day could amount to an average of 417 lb additional milk per cow treated — a $74.23 value (Figure 2).(23)

**Table 1. Milk-production responses following anthelmintic treatment of dairy cattle (19)**

<table>
<thead>
<tr>
<th>Type of study</th>
<th>Results</th>
<th>Results (multi-herd studies)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number positive/ Number studies</td>
<td>Herds positive/ Herds in study</td>
</tr>
<tr>
<td>Infective larvae</td>
<td>6/9(a)</td>
<td>---</td>
</tr>
<tr>
<td>Mid-lactation</td>
<td>15/19(b)</td>
<td>8/10</td>
</tr>
<tr>
<td>Single treatment near calving</td>
<td>34/43(b)</td>
<td>236/342</td>
</tr>
<tr>
<td>Multiple or strategic treatments</td>
<td>15/16</td>
<td>24/30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>70/87 (80%)</strong></td>
<td><strong>268/382 (70%)</strong></td>
</tr>
</tbody>
</table>

*a* Two studies did not report numeric results;  
*b* One study did not report numeric result
On this basis, average projected additional earnings in milk production per cow per lactation for the different treatment programs could range from $49.13 for the single treatment near calving to $93.98 for the mid-lactation treatment (Figure 2).

**Anthelmintic Consistency**

Older anthelmintics such as coumaphos, thiabendazole and IMZs are less effective than later BZs, which in turn are less effective than avermectins, especially against immature parasites, including inhibited larvae of *O ostertagi*. Comparing studies using the older anthelmintics (coumaphos, thiabendazole, IMZs) with those using more modern products such as albendazole, fenbendazole, oxfendazole, and ivermectin suggests that as efficacy improves, so does reliability (97% positive response for modern products vs. 74% for older products) and consistency of response (-1.1 to +3.81 lb/day for modern products; -5.13 lb to +7.92 lb/day for older products).
products).(19) It should be noted that in the United States, ivermectin is not approved for use in female cattle of breeding age.

**IVOMEC® EPRINEX® (eprinomectin) Pour-On for Parasite Control in Dairy Cattle**

IVOMEC EPRINEX is the newest generation of the macrocyclic lactone family. This product resulted from an exhaustive research and development program designed to deliver a product superior to other endectocides. The active compound, eprinomectin, was selected after an initial screening of more than 500 avermectins and milbemycins.

IVOMEC EPRINEX is more than 99% effective against eleven damaging internal parasites of cattle, including inhibited larvae of *O ostertagi*. IVOMEC EPRINEX is the only avermectin currently approved for use in dairy cattle of all ages – even those in lactation.

**Conclusion**

Overall, the studies reviewed here demonstrated a positive response in milk production when adult dairy cows were treated for parasites. There was a median change of +1.39 lb milk per cow per day for cows that were given antiparasitic treatment. Over a full lactation, this could amount to as much as 417 lb of additional milk per cow treated, with a potential value of $74.23 (assumed milk price of $17.80/cwt).

IVOMEC EPRINEX Pour-On for Beef and Dairy Cattle is a revolutionary design in parasite control providing more power, flexibility, convenience and confidence than ever before. IVOMEC EPRINEX has claims for 39 stages of internal and external parasites, including *Chorioptes* mite, which is the main culprit in "tail itch" or "barn itch." Being the only product of its class that requires **no milk withholding**, IVOMEC EPRINEX should be the product of choice for veterinarians and dairy producers who seek to improve overall herd efficiency, productivity, and profits.

**REFERENCES**


