Efficacy of Cydectin 0.5% Pour-On and Renegade 1.5% Pour-On to control lice infestation in naturally infested fattening beef

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SUMMARY

Typical Italian beef production in feedlot is based on an intensive 6-months fattening period of imported bulls, which are generally treated at their arrival with endectocides. However, emergence of mange and pediculosis are usually reported. In the present study we assessed the efficacy of the administration of Cydectin 0.5% Pour-On at the arrival of the animals, followed by Renegade 1.5% Pour-On after 8 weeks, in controlling lice infestation.

One treatment group (T), and one control group (C), composed of 8 animals each, were kept in two different boxes and monitored through clinical observation and lice sampling after one, two, four, six, eight and 13 weeks. Lice were collected from three standard sheared areas (shoulders, back and rump), on the right side of the animals, and observed at the stereo-microscope in laboratory for specimens counts and identification. Differences in counts between C and T groups were evaluated using a non-parametric statistic.

Among the four bovine lice species, only *Bovicola bovis* and *Linognathus vituli* were found in both groups at pre-treatment sampling and throughout the whole trial. Both species were kept at very low burden in the T group up to the 13th week, whereas their number started to increase exponentially in the C group after the fourth week. It was impossible to compare the trends of the two groups after the sixth week, since the C group was treated due to a mange outbreak. The combination of an initial treatment using a macrocyclic lactone with a second treatment using an insecticide at 2 months after arrival showed to effectively control lice infestation and to prevent clinical signs of pediculosis.

KEY WORDS

Lice, bovine, Italy, moxidectin, cypermethrin.

INTRODUCTION

In Italy, beef production in feedlots is typically based on young bulls that are imported from other European countries at 350-450 kg of body weight (bw), before being fattened over a period of 6-7 months until slaughter at 590-700 kg bw[1]. These cattle frequently harbour both endo- and ecto-parasites, including several species of helminths[2], mites and lice[3]. As a consequence, animals are routinely treated on arrival with endectocides (e.g., macro-cyclic lactones, MLs), to keep under control all parasites potentially present. However, emergence of clinical signs due to ecto-parasites during the fattening period are commonly reported, and infestation of both mites and lice can spread rapidly in the entire herd[4,5]. At present, the control programs to fight lice rely mostly on synthetic insecticides[5,6].

One species of biting louse, namely *Bovicola bovis* (L.), and three species of sucking lice, *Haematopinus eurysternus* (Nitzsch), *Linognathus vituli* (L.), and *Solenopotes capillatus* (Enderlein), are reported to infest cattle in Europe[5,7]. Given this basic knowledge, there is a paucity of information on prevalence and intensity of lice infestation in fattening bulls in Italy. This is probably due to their short productive life and to the availability of effective drugs, which allow a satisfactory control of infestations, also in the absence of a detailed knowledge of the magnitude of the problem. However, some products frequently used for the control of external parasites on cattle have been withdrawn from the Italian market in the last years (e.g. amitraz-based spraying formulations). Besides, outbreaks of lice infestation were recently reported in beef herds in Italy[8], suggesting the emergence of the problem and consequently the need for adequate tools for their control.

The aim of this study was to evaluate the efficacy of a pharmaceutical protocol for the prevention and control of pediculosis in naturally infested fattening bulls, which consisted in the administration of a ML at the arrival of the animals (i.e. Cydectin 0.5% Pour-On, Zoetis, Parsippany, NJ, USA), followed by a pyrethroid insecticide after 8 weeks (i.e. Renegade 1.5% Pour-On, Zoetis, Parsippany, NJ, USA).

MATERIALS AND METHODS

Experimental plan

A total of 16 animals were selected to be included in the trial, out of a group of about 120 animals (Charolais breed, about

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420 kg bw each) arrived at the beginning of October 2019 in a fattening farm located in Veneto Region. Animals were divided in two homogeneous groups of 8 individuals each and kept in two different boxes, not directly contiguous, but in the same barn.

According to the established experimental protocol, one group was acting as control group (C), and was excluded by any kind of treatment. Due to ethical issue, it was defined that this group was admissible to treatment, if requested by the health conditions. The second group was acting as treatment group (T) and received an initial treatment with moxidectin (Cydectin 0.5% Pour-On) the day after the first sampling (day0) and a second treatment with alpha-cypermethrin (Renegade 1.5% Pour-On) 8 weeks after the initial treatment. All other animals kept in the same barn were solely treated at the day0 with Cydectin 0.5% Pour-On. At day0, an individual faecal sample was retrieved through rectal inspection from 4 animals in each group, to evaluate the endoparasite burden, as general indicator of the health status.

Both groups were monitored through clinical observation and lice sampling after one (day7), two (day14), four (day28), six (day42), eight (day56) and 13 (day90) weeks. A monthly sampling was planned for the remaining 3 months of the fattening period.

Lice sampling and counting

Although international guidelines[9] suggested that lice can be counted on the body surface by direct examination with the naked eye or using magnifying lens, after parting the hair coat (coat opening), we considered this approach unfeasible in the specific context of feedlots. In fact, the size of the animals and their continuous movement make it difficult to properly observe the area for a sufficient time and to avoid potential risks for the operator. Besides, the sole opening of the coat may be insufficient to detect lice when the burden is very low.

Therefore, the following protocol was established for collecting and counting lice from animals. Each animal was constrained in a narrow corridor and observed on the whole visible parts of the body to detect macroscopically the presence of lice, using a front light to improve visibility. After this preliminary observation, a squared area of approximately 50 cm^2 (7cmx7cm) was sheared using an electric clipper Aesculap© GT 474 Econom II - (B. Brown, Melsungen, Germany) and, if necessary, also a razor blade, in three different areas of the dorsal lateral surface of the animal (shoulders, back and rump), on the right side of the animals (Figure 1). After cutting, hairs were collected and the area was thoroughly examined and all lice present in it were kept, jointly with the hair, in a transparent plastic box with hermetic closure. Each box was identified by animal tag, sampled area and sampling date.

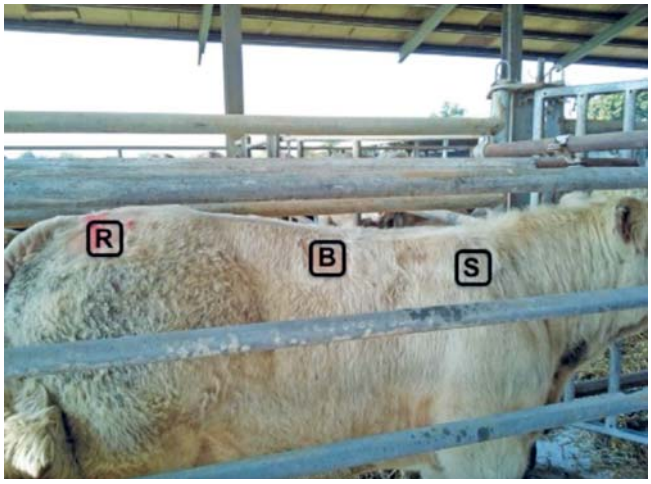

Figure 1 - Sampling sites on animal skin (S = shoulders; B = back; R = rump).

All plastic boxes were transported to the Laboratory of Parasitology and Parasitic Diseases of the University of Padova and carefully examined under the stereo-microscope SZX12 (Olympus, Tokyo, Japan) to count and identify all lice contained in them. Live and dead individuals were counted separately. Lice were identified according to the morphological features[5].

Faecal samples were analysed by means of a quali-quantitative copro-microscopic analysis, as previously described[10], using 5 gr for each sample, to estimate the burden in helminth eggs (EPG=eggs per gram) and coccidian oocysts (OPG=oocysts per gram).

Data analysis

Lice showing active movements (live lice) were counted separately from the ones that did not show any kind of movement (dead lice). Only live (motile) lice were included in data display and analysis. If single counts were outside the interval Avg ± 2*St. Dev., calculated among all eight animals of each group for each sampling date, were considered outlier and excluded from the analysis. The average among the remaining animals was calculated and used for displaying data in tables and graphs.

Table 1 - Average counts of biting and sucking lice in Control (C) and Treatment (T) groups at different times. Significant differences ($p<0.05$) between C and T groups at the Mann Whitney U test are highlighted by different superscript letters.

Activity	week	*Bovicola bovis* (avg count)		*Linognathus vituli* (avg count)	
		C	T	C	T
day0 - Sampling pre-Treatment	0	0,14	0,25	0,00	0,29
day0 - Treatment with Cydectin (Group T)					
Day7 - Sampling	1	0,29	0,00	0,00	0,14
day14 - Sampling	2	0,00	0,00	0,29	0,14
day28 - Sampling	4	0,43	0,13	1,00	1,38
day42 - Sampling	6	13,86[a]	0,13[b]	7,25	3,25
day50 - Emergency treatment with Cydectin (Group C)					
day56 - Sampling	8		1,50		7,14
day57 - Treatment with Renegade (Group T)					
day90 - Sampling	13		3,29		3,75

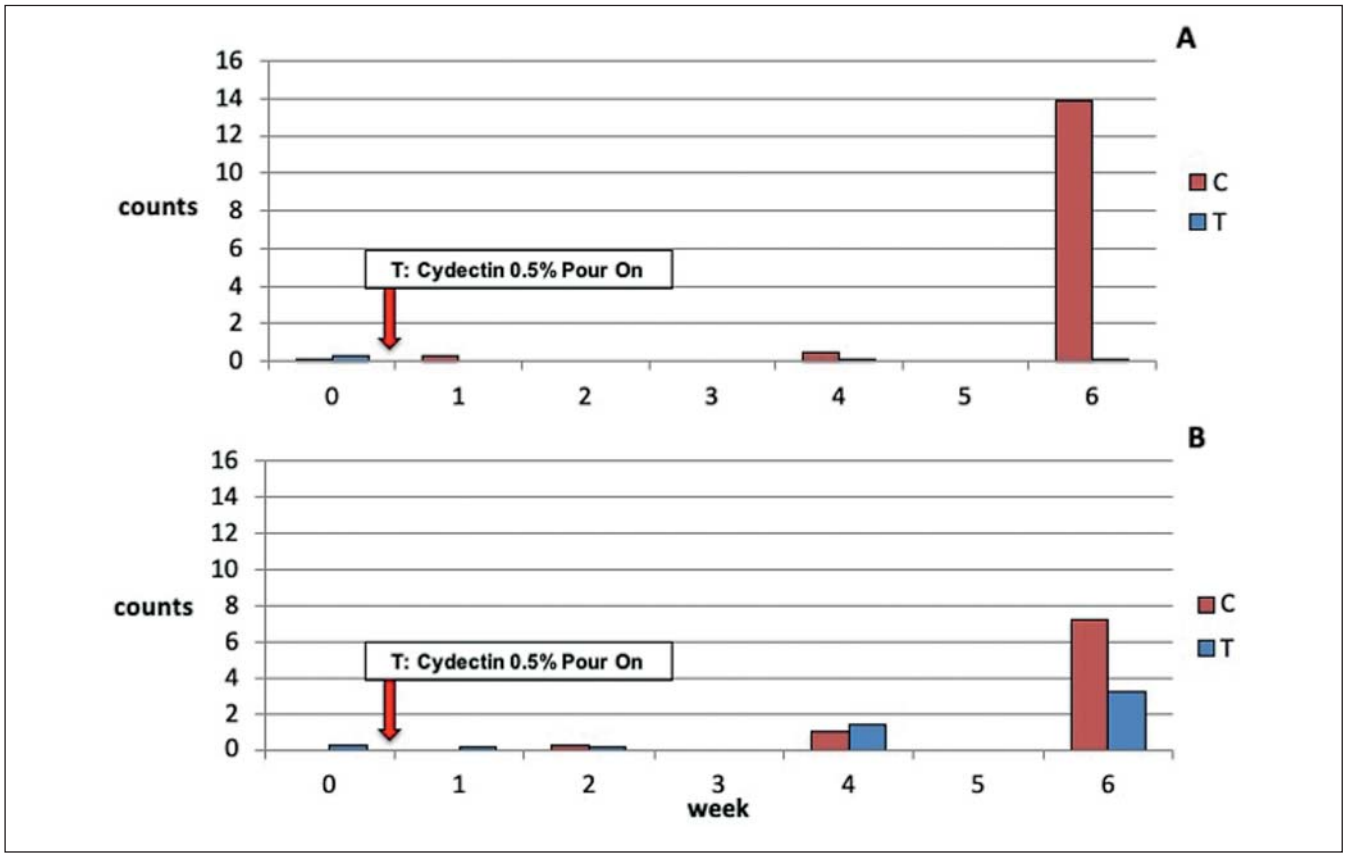

Figure 2 - Comparison between C and T groups' trends in lice average counts (weeks 1-6) of *Bovicola bovis* (upper; A) and *Linognathus vituli* (bottom; B).

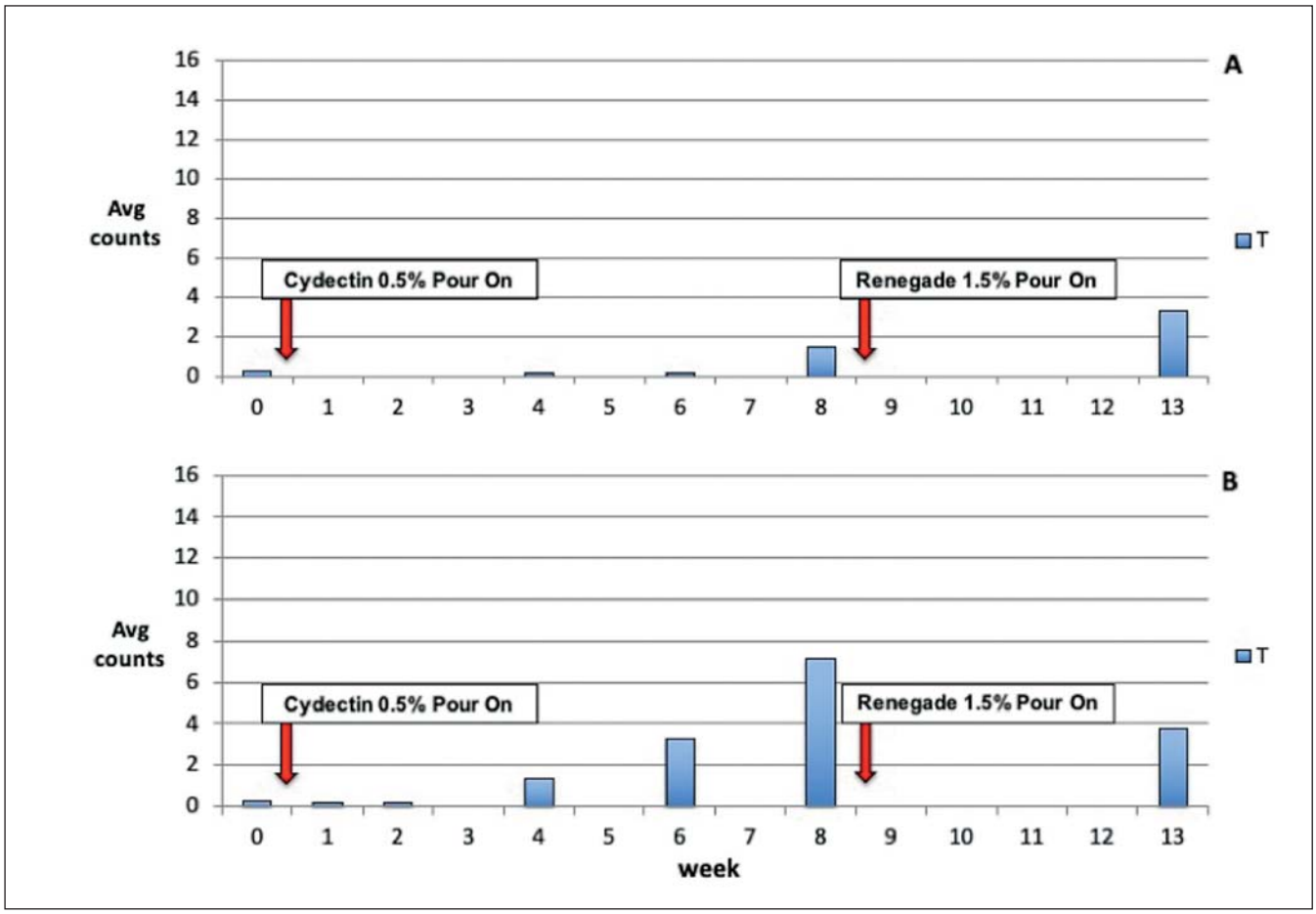

Figure 3 - Lice average counts in T group (weeks 1-13) of *Bovicola bovis* (upper; A) and *Linognathus vituli* (bottom; B).

Differences in counts between C and T groups were evaluated through the Mann Whitney U test, for each sampling date.

RESULTS

Animals were clinically healthy at arrival, and 75% (3/4) animals resulted positive for eggs of gastro-intestinal strongyles and coccidian oocysts at coproscopic analysis, in both groups. However, all positive animals showed very limited burden (maximum values of 160 EPG and 200 OPG). Notwithstanding clinical signs referrable to pediculosis were totally absent in the first days after arrival, at the first sampling (pre-treatment) 37.5% (3/8) of the animals resulted naturally infested with two different species of lice (*Bovicola bovis* and *Linognathus vituli*), in both groups. The numbers of lice found in the two groups at pre-treatment sampling were not significantly different. The sole presence of these two species was confirmed throughout the whole trial.

At the sampling of the sixth week of the trial, three bulls of the C group showed clinical signs of mange, which was confirmed as a mixed *Psoroptes-Chorioptes* infection by laboratory examination of skin scarification from dorsal lesions. As a consequence, it was necessary to modify the experimental protocol and to treat all animals of the control group at the beginning of the seventh week with a principle active against mange mites (Cydectin 0.5% Pour-On). The comparison between T and C was therefore possible only for the first six weeks, whereas the efficacy in keeping lice burdens at low levels in the T group was investigated up to the end of the trial (13th week).

The average lice counts of the eight animals of C and T groups are reported in Table 1 and shown in Figure 2 for both lice species. Burdens of *B. bovis* were very low up to the 4th week in both groups, but it started increasing sharply in the C group immediately after. At the 6th week sampling the group C showed a burden significantly higher than T (Figure 2A), and parallelly most animals started showing typical clinical symptoms (i.e. scratching, irritability). The numbers of the sucking lice *L. vituli* were also low up to the 6th week, when the C group showed a sharp increase and recorded a value double than the T group, although the difference was not statistically significant (Figure 2B).

The overall trends of average count for both lice species in T group are shown in Figure 3, and their values reported in Table 1. *B. bovis* burdens were kept constantly low throughout the whole trial (Figure 3A), whereas *L. vituli* was moderately increasing in numbers at the 8th week sampling. The treatment with Renegade 1.5% Pour-On achieved a reduction in the burden, as demonstrated by the sampling at the 13th week, when the lice were lower than at the 8th week (Figure 3B).

DISCUSSION

Notwithstanding they appeared to be in perfect health conditions, the animals enrolled in the trial were found to be naturally infested at arrival with two species of lice, the biting louse *B. bovis*, and one of the sucking lice, *L. vituli*. This finding confirmed that imported cattle are usually asymptomatic carriers of ectoparasites at their arrival in Italy and highlighted the consequential risk for an uncontrolled spread of ectoparasites infestation in feedlots, if animals are left untreated. Both pediculosis and mange outbreaks were in fact taking place in the control group, when it was decided to treat it at the seventh week. The other two species of sucking lice reported in Italy (i.e. *S. capillatus* and *H. eurysternus*) were not detected in this group of animals. It should be noted that the sampling approach was focused on investigating the body of the animals, whereas these species are mostly found in the head[11] However, during samplings, all parts of the animals were observed (including the head) suggesting that the two species were really absent or, if present, were constantly found at very low burden during the whole observation period.

The aim of the study was only partially affected by the mange outbreak in the control group at the seventh week, which didn't allow to compare treated and control groups up to the end of the trial. In fact, our findings demonstrate the efficacy of the proposed protocol in keeping under control the lice infestation. Both *B. bovis* and *L. vituli* were found in less number in the treated group at the end of the first six-weeks period. Moreover, the two species were kept at very low burden in the treated group up to the 13th week. In particular, the inclusion of a second treatment with an insecticide (i.e. Renegade 1.5% Pour-On) seemed to be particularly important for *L. vituli*, which was starting an ascending curve at the end of the second month, exactly when the insecticide treatment was planned in the protocol. Finally, the newly developed approach for lice detection and counts seems to be particularly sensitive, since few animals were found positive (at low burden) also at the pre-treatment sampling, when they didn't show any signs of pediculosis. This finding suggests the potential use of this new diagnostic approach, which may allow for an early detection of lice presence, when the burden is still low.

CONCLUSION

The tested protocol that combines two different products (Cydectin 0,5% Pour-On at arrival + Renegade 1,5% Pour-On at 2 months after arrival) showed to be effective in controlling lice infestation in a group of fattening beef naturally infested with both biting and sucking lice. During the trial a new and more sensitive system for lice detection was developed, based on the shearing of a limited area (about 50 cm^2) of hair on the back of the animals. This approach allowed us to detect lice also at low burdens, and can be used during the clinical activity of practitioners for an early detection of lice infestations. Further studies in different geographical regions is recommended[9] to confirm and potentially strengthen the soundness of the results of the present study.

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