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Comparative evaluation of efficiency of traditional McMaster chamber and newly designed chamber for the enumeration of nematode eggs

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Summary

The objective of this study was to perform the comparative evaluation of efficiency of traditional McMaster chamber and the newly designed chamber for the enumeration of nematode eggs in different agriculture animals. Thirteen pig, two horse and two sheep farms were randomly selected, and 815 of pig faecal samples, 264 of horse and 264 of sheep faecal samples were examined. The positive samples were identified by Henriksen and Aagaard (1976) [1] modification of McMaster method. Furthermore, experimental horse faeces were examined by [1] and Urquhart et al., 1996) [2] modifications, whereas pig and sheep faeces were examined by [1] and Kassai, 1999 [3] modifications, respectively. All samples were evaluated in two replicates: using traditional McMaster 0.3 ml chamber – I and newly designed 1.5 ml chamber – II [4]. In pig farms, 11.5% and 18.2% (chambers I and II, $P<0.05$) of pigs were found infected with *Ascaris suum.* Furthermore, 14.6% and 17.8% (chambers I and II, $P<0.05$) of pigs were found infected with *Oesophagostomum dentatum* and 3.7% and 8.2% (chambers I and II, $P<0.05$) with *Trichuris suis,* respectively. In horse farms, 65.5% and 83.7% horses infected with strongyles were identified (chambers I and II, $P<0.05$. In sheep farms, the number animals of positive to strongyle infection was 81.4% and 96.2% (I and II chambers, $P<0.05$). The new modification of chamber [4] demonstrated statistically higher sensitivity for enumeration of nematode eggs and for evaluation of farms with infected animals compared to McMaster modifications described in [1-3].

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Introduction

Faecal examination is an important tool for monitoring worm infections in farm animals and an important adjunct to maintaining effective worm control programmes. Described faecal examination methods are either qualitative or quantitative. Qualitative methods provide information on the species present, whereas quantitative methods provide an indication of the levels of infections. Both have their own importance in determining the health status of a herd and determining appropriate treatments and control measures. Quantitative examinations are performed by different modifications of the McMaster method, which is the most widely used and standard quantitative technique with sensitivity from 10 to 100 eggs per 1 g of faeces [5-15]. Furthermore, the following chambers are used for egg count: traditional McMaster chamber with two chambers (2 x 0.15 ml), Gordon-Whitlock chamber (3 x 0.15), Whitlock McMaster chamber (3 x 0.3 ml), Whitlock universal chamber (4 x 0.5 ml), FECPAK 1 ml chamber (2 x 0.5 ml), and modified MAFF 1 ml chamber (2 x 0.5 ml) [5,7,16-19].

We produced a new type of chamber and tested it by the high performance modification of McMaster method using the highest possible amount of faeces and reducing the sensitivity coefficient. The new chamber was compared with the traditional McMaster chamber in both cases using the McMaster method modifications [1-3]. The traditional (I) and the new chambers (II) were used for comparative analysis to evaluate the performance and stability of faecal examination results.

Materials and methods

Thirteen pig, two horse and two sheep farms were randomly selected, and 815 of pig faecal samples, 264 of

horse and 264 of sheep faecal samples were examined. The positive samples were identified by [1] modification of McMaster method. Experimental horse faeces were examined by [1] and [2] modifications, whereas pig and sheep faeces were examined by [1] and [3] modifications, respectively. All samples were evaluated in two replicates: using traditional McMaster 0.3 ml chamber – I, and newly designed 1.5 ml chamber - II [4]. The new egg count chamber (II) has a bead, which prevents the faeces suspension from seeping out and protects the optics of microscope from adverse effect. Comparisons were made as to the number of samples found to be positive by each of the chamber.

Results

Ascaris suum infection was identified in all investigated pig farms, but the number of infected pigs estimated with the two chambers was significantly different – 11.5% (94/815) of pigs positive (chamber I) and 18.2% (148/815) of pigs positive (chamber II). Whipworm infection was identified only in 8 farms (chamber I) and in 11 farms (chamber II) – 3.7% (30/815) and 8.2% (67/815) of samples were positive to *T. suis* infection. Nodular worm infection was identified in 5 and 7 farms (chambers I and II) – 14.6% (119/815) and 17.8% (145/815) of positive pigs, respectively. The number of positive samples (chamber II) to *Ascaris suum* was on 1.6, *Oesophagostomum dentatum* on 1.2, and *Trichuris suis* on 2.2 times higher compared results with chamber I. In farms where up to 10% of samples were identified as infected with chamber I, the difference coefficient was highest (1.8). However, in the farms where >50% of infected pigs were identified with chamber I, the difference coefficient was lowest (1.02).

In horse farms, 65.5% (173/264) and 83.7% (221/264) of horses were identified infected with strongyles (chambers I and II, $P<0.05$). The number of samples positive to *Strongylus spp.* was on 1.2 times and to *Parascaris equorum* on 3.4 times higher with chamber II compared to chamber I. In sheep farms, the number of animals positive to strongyle infection was 81.4% (215/264) and 96.2% (254/264) (I and II chambers, $P<0.05$). The number of samples identified as infected with *Trichostrongylus* spp. was 1.3 times higher for chamber II compared to chamber I, 3.1 times higher for *Toxocara vitulorum*, 2.5 times higher for *Nematodirus filicollis*, and 1.9 times higher for *Trichuris ovis*, respectively.

Conclusion

The experimental examination of pig, horse and sheep faeces using the new 1.5 ml chamber (II) helped to identify a higher percentage of infected animals compared to the traditional McMaster 0.3 ml chamber (I). The new modification of chamber [4] demonstrated statistically higher sensitivity for enumeration of nematode eggs and for evaluation of farms with infected animals compared to McMaster modifications desribed in [1-3].

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