Current aspects of detection treatment and control of worm infections in cattle

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As pasture grazing animals cattle are permanently and ubiquitously exposed to helminth infections. The most highly prevalent group of cattle helminths are the gastro-intestinale nematodes (GIN) with various species of the genera *Ostertagia*, *Cooperia* and *Trichostrongylus* plus the more regionally occurring *Nematodirus* and *Haemonchus*. Also belonging to the GIN are the hookworms (*Bunostomum* and *Chabertia*) and the cattle ascarid species *Toxocara vitulorum*, which occur only rarely. The lungworm *Dictyocaulus viviparus* is another important nematode species with considerable prevalence and pathogenicity. Also trematodes are serious health threats for grazing cattle. Namely the liver fluke *Fasciola hepatica* which is the most prevalent trematode species particularly occurring in regions with high precipitation and humidity. In contrast the small liver fluke *Dicrocoelium dendriticum* more often occurrs in dryer regions. Also a regional occurrence is seen for the rumen flukes *Paramphistomum* spp. or *Calicophoron* spp.. In the following current data on means of detection, on the prevalence, the clinical and economic relevance as well as on therapeutic and control options for the above listed cattle helminths will be discussed.

To date the detection of GIN infections in cattle in the field is still mostly based on the coproscopic analysis of faecal samples. However, increasingly also serological examination of blood or milk is being employed. Patent infections are much more frequent in calves and young stock compared with adult cows. There are only few current data on the occurrence of GIN eggs in faecal samples, for example showing for German cattle herds a prevalence of above 60% in young animals (Jäger et al. 2005; Kemper und Henze 2009). Liver fluke eggs were only detected in 0.4% of the samples (Kemper und Henze 2009). However, using bulk-tank-milk (BTM) ELISA a much higher *F. hepatica* prevalence of 23.6% amongst the more than 20,000 examined German dairy farms was encountered (Kuerpick et al. 2013) while the *D. viviparus* prevalence was 17.1% (Schunn et al. 2013).

Clinical symptoms caused by helminths are predominantly seen in first-season grazers with respect to GIN infections. Heavy infections are particularly causing diarrhoea but nowadays on most farms lower infection intensities occur which are associated with subclinical effects such as reduced weight gain. Comparatively low infection intensities with the much more pathogenic lungworm *D. viviparus* can result in sever courses of pneumonia, often accompanied with secondary bacterial infections and frequently with fatal outcome if not effectively treated. Liver fluke infections in cattle result generally in chronic diseases and are mostly relevant in dairy cattle due to the negative effect on milk production. The economic relevance of helminth infections in cattle is documented by two recent studies. Using an online-calculation software (PARACALC) in addition to BTM analysis in German dairy herds mean annual losses of milk yield per cow of €13 and €8 for GIN and liver fluke, respectively, were obtained. In addition to this treatment costs and losses due to increased intercalving times contributed to mean farm losses of €721 and €566 for GIN and liver fluke infections per year (Fanke et al. 2017). Another study revealed that an anthelmintic treatment of heifers was associated with a significant increase of 2.3 kg milk production per day and cow (Geurden et al. 2017).

Not only in the Netherlands but world wide the drug classes available for the treatment of helminth infections in cattle did not change during the last three decades. However, several new drug combinations or long acting formulations have been registered. While for the Netherlands there are no current data available on the occurrence of anthelmintic resistance in cattle GIN, studies from other European countries such as Belgium, France, Germany, Sweden or the UK indicate that populations with resistance against macrocylic lactones exist and appear to increase in occurrence (Demeler et al. 2009; Geurden et al. 2015). With respect to resistance in liver fluke, following an early report on tricalbendazole resistance in sheep and cattle on one farm (Moll et al. 2000), no further studies on this issue were published since then in the Netherlands. However, an interesting publication reported on a *F. hepatica* infection in a Dutch farmer, with persistent shedding of liver fluke eggs despite several successive treatments with triclabendazole (Winkelhagen et al. 2012). The authors considered tricalbendazole-resistance as the most likely reason for the treatment failure. The apparent increasing spread of AR urges for the development of new, i.e. more sustainable, approaches for worm control also in cattle. As already well established for small ruminants, also for cattle targeted-treatment (TT) and targeted-selective-treatment (TST) are be considered the most promising strategy in this respect (Charlier et al. 2014, Jackson et al. 2017). While in young animals weight gain, faecal worm egg counts or body condition are possible indicators for treatment decision within the TST approach, in dairy cattle BTM data have been shown to be meaningful and field applicable parameters to employ TT. These approaches still require further propagation and with respect to the development of low-cost TST treatment indicators there is also room for further improvement. It is important to point out that to date it seems not realistic that new anthelmintic drug classes for cattle will be introduced in the forseeable future. Thus, it is very urgent to prevent the ongoing development and spread of AR, since otherwise effective worm control in cattle may not be feasible the way it is currently but become a major challenge again, as it is already the case in a number of regions world wide in sheep and goats.

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