Veterinary Parasitology 212 (2015) 308–317

Contents lists available at ScienceDirect

Veterinary Parasitology

journal homepage: www.elsevier.com/locate/vetpar

Diagnosis before treatment: Identifying dairy farmers' determinants for the adoption of sustainable practices in gastrointestinal nematode control

F. Vande Velde[a,b,*], E. Claerebout[a], V. Cauberghe[b], L. Hudders[b], H. Van Loo[c], J. Vercruysse[a], J. Charlier[a]

[a] Department of Virology, Parasitology and Immunology, Faculty of Veterinary Medicine, Ghent University, Salisburylaan 133, 9820 Merelbeke, Belgium
[b] Department of Communication Studies, Faculty of Political and Social Sciences, Ghent University, Korte Meer 7–11, 9000 Gent, Belgium
[c] Veepeiler Rund, Animal Health Care Flanders (Dierengezondheidszorg Vlaanderen), Deinse Horsweg 1, 9031 Drongen, Belgium

ARTICLE INFO

Article history:
Received 3 March 2015
Received in revised form 10 June 2015
Accepted 14 July 2015

Keywords:
Dairy farms
GIN control
Anthelmintic resistance
Diagnostics
Farmers' behaviour
Adoption intention
Structural equation modelling

ABSTRACT

Anthelmintic resistance is emerging in dairy cattle and this can result in a lack of effective control and production losses. Therefore, sustainable control strategies, such as targeted treatments (TT) and targeted selected treatments (TST), should be adopted by the industry. TT and TST approaches require the use of diagnostic methods to take informed treatment decisions. To understand the factors affecting the farmers' intention to adopt diagnostic methods before implementing anthelmintic drugs ('adoption intention'), a cross-sectional survey was carried out in dairy farms in Belgium (Flanders). A framework was constructed to predict adoption intentions based on two fundamental theories in the field of behavioural psychology and health psychology: the Theory of Planned Behaviour and the Health Belief Model. In the tested model, adoption intentions were predicted based on attitudes towards anthelminthics, attitudes towards diagnostic methods, subjective norms, behavioural control and perceived risk. Structural equation modelling was used for analyses. The model fitted the data well and explained 46% of the variance in adoption intention of diagnostics. The factors 'attitude towards diagnostic methods' and 'subjective norm'; i.e. the influence of significant others, had the strongest, positive influence on adoption intention of diagnostic methods. 'Perceived behavioural control' had a weak, positive effect on intention. Further, 'attitude towards the use of anthelmintic drugs' had a negative effect on adoption intention of the diagnostic methods. This implicates an effect of current behaviour on future adoption, which should be considered in future research. Factors measuring risk perception of anthelmintic resistance; perceived severity and perceived susceptibility, had no effect on the adoption intention of diagnostic methods. The threat of anthelmintic resistance is perceived to be low for dairy herds. The study further did not find any differences in the effects of the predictors for young stock and adult dairy cows. The results of this study can be used to develop communication strategies to advertise sustainable nematode control on dairy farms.

1. Introduction

Gastrointestinal nematode (GIN) infections are a major threat for animal health, productivity, and profitability of pasture-based dairy herds (Charlier et al., 2012; Perri et al., 2011). Highly efficacious and relatively inexpensive drugs were developed to prevent GIN infections and concomitant production losses (Woods and Knauer, 2010). Hence, worm control in livestock now largely depends on the use of anthelmintic drugs (Kaplan, 2004). Unfortunately, the intensive use of anthelmintics in cattle has led to the development of anthelmintic resistance (Edmonds et al., 2010; Gasbarre, 2014; Jackson et al., 2006; Mejía et al., 2003; Sutherland and Leathwick, 2011; Torres-Acosta et al., 2012; Waghorn et al., 2006). The emerging resistance in cattle emphasizes the need for sustainable control approaches with less intensive use of anthelmintics (Charlier et al., 2014a).

Examples of sustainable worm control practices are the targeted treatments (TT) strategy, i.e. group treatment based on a marker of infection, and targeted selective treatments (TST), i.e. treatment of identified individual animals (Kenyon and Jackson, 2012). Sustainable worm control practices require the use of diagnostic methods to enable informed treatment decisions (Charlier et al., 2014b). However, adoption of diagnostic methods for sustainable parasite control by the farmers is hampered by the lack of tangible effects

* Corresponding author. Fax: +32 9264 7496.
E-mail address: fiona.vandevelde@ugent.be (F. Vande Velde).

http://dx.doi.org/10.1016/j.vetpar.2015.07.013
0304-4017/

of anthelmintic resistance on animal health and production on the one hand and the low price of anthelmintics on the other hand (Kahn and Woodgate, 2012; Knox et al., 2012). In order to successfully translate recommendations in such a way that adoption of diagnostics will be facilitated, socio-psychological research is essential. Attempts were made in the past for the translation of new approaches in applicable control programs, e.g. Wormkill and WormBoss, reviewed by Woodgate and Love (2012), and SCOPS and COWS, reviewed by Taylor (2012). However, recent research showed a limited uptake of the presented advice (McArthur, 2014). This emphasizes the need to understand the factors affecting the farmers' behaviour, in order to optimise communication and to improve compliance with specialists' advice. However, to our knowledge, little research has been conducted yet on the understanding of farmers' decision making in GIN control and adoption of diagnostic methods.

In this study two grounded theories from behavioural and health psychology were used to build a theoretical framework identifying farmers' adoption of diagnostic methods for GIN control on their farms: the Theory of Planned Behaviour (Ajzen, 1991) and the Health Belief Model (Rosenstock, 1974). The former is a model to predict and explain behavioural intention as an immediate determinant of actual behaviour, while the latter was specifically developed for the understanding of health-related behaviour. From a historical perspective, researchers and veterinarians assumed that farmers' management decisions were based primarily on rational, technical and economic considerations (Burton, 2004). Although these rational choices play an important role, farmers' decision making is a complex process which involves many factors like social environment, attitude, risk perception, etc. (Derks et al., 2013). Cattle-farming is an industry intertwined with lifestyle and often associated with family, therefore decisions cannot always be explained by external, economic factors alone (Ellis-Iversen et al., 2010). The incorporation of socio-psychological theories and methodologies with traditional epidemiologic approaches has already proven to be a useful tool for the exploration of cattle farmers' behaviour or decision-making in animal disease interventions. Most studies focused on identifying important motivations or beliefs to comply with a certain behaviour using a qualitative approach such as in-depth interviews (e.g., Delgado et al., 2012; Ellis-Iversen et al., 2010), others used quantitative methods like cross-sectional surveys (e.g., Jansen et al., 2009; Laanen et al., 2014; Leach et al., 2010). Few studies focussed on assessing the effect of specific factors on behaviour using quantitative modelling methods (e.g., Garforth et al., 2006; Toma et al., 2013). This study is one of the first in using modelling techniques to measure a theoretical framework built from socio-psychological models.

The objective of this study is to: (1) provide a better understanding of the underlying factors that influence dairy farmers' adoption intention of parasitic diagnostic methods before implementing anthelmintic drugs, and (2) validate a theoretical framework that provides insight in the interactions of these underlying factors.

2. Materials and methods

2.1. Theoretical framework

Numerous socio-psychological theories have been designed to understand and predict human behaviour. For the purpose of this study, the Theory of Planned Behaviour (TPB) (Ajzen, 1991) was chosen to serve as the foundation for the development of a theoretical framework for understanding dairy farmers' adoption of diagnostic methods in GIN control. The TPB is one of the most widely used theories in research of human behaviour. Among many different types of behaviour it has proven useful in modelling a wide range of public health behaviours (Zemore and Ajzen, 2014) and was also recently used to examine animal health related behaviours (Delgado et al., 2012; Ellis-Iversen et al., 2010). Despite its widespread use, the TPB could be improved through the incorporation of additional variables (Armitage and Conner, 2001). Therefore, we added certain factors of the Health Belief Model (HBM) (Rosenstock, 1974) as additional predictors of intention to behave, since the HBM is specifically developed for the explanation and prediction of health-related behaviour. The HBM has proven to be useful in explaining motivations and barriers for mastitis management (Jansen and Lam, 2012). We propose the same for GIN control; hence the incorporation of certain factors of the HBM in the TPB.

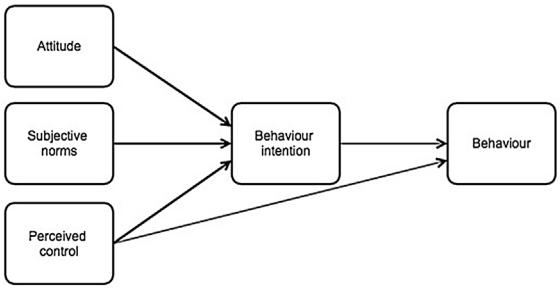

Fig. 1. The theory of Planned Behaviour (Ajzen, 1991).

The TPB, shown in Fig. 1, is a general model of human behaviour suggesting a bridge between beliefs and behaviour. Behaviour is determined by 'behavioural intention', which is determined by 'attitude towards the behaviour', 'subjective norm' and 'perceived behavioural control' of a person. 'Behavioural intention' is regarded as the proximal determinant of behaviour and captures the motivation to perform this behaviour (Ajzen, 1991). 'Attitude towards the behaviour' is an individual's positive or negative evaluation of the particular behaviour based on the expected outcomes. Within the context of this study it represents the positive or negative evaluation of using diagnostic methods before implementing anthelmintic drugs. 'Subjective norm' refers to a person's perception of the expectation of significant others in performing that behaviour, the perceived social pressure founded in normative expectations of important referents such as family or friends. 'Perceived behavioural control' represents one's perceived ability to perform a specific behaviour, i.e. the farmer's perception of his/her ability to implement a diagnostic test on the farm, and is based on beliefs whether factors are present that may facilitate or impede its performance (e.g. cost, expertise).

The HBM, shown in Fig. 2, was specifically developed for the prediction of behavioural change in health-related topics. The HBM suggests that people's beliefs about health problems and related treatment programs explain the engagement in health-promoting behaviour (Janz and Becker, 1984). The mechanisms behind the HBM are similar to the behavioural determinants of the TPB such as 'attitude' and 'perceived behavioural control'. In the TPB, 'attitude towards the behaviour' measures the beliefs about the expected outcomes, which are measured by the items 'perceived benefits and barriers' in the HBM. In addition to 'attitude towards the adoption of diagnostic methods', we added 'attitude towards the use of anthelmintic drugs' to our model as a perceived barrier. Farmers appear to have a positive attitude towards these highly effective and relatively inexpensive drugs (Kaplan, 2004), hence a barrier for the adoption of diagnostic methods before implementing anthelmintic drugs. Similar barriers were suggested by Jansen and Lam (2012) in mastitis management. The variable 'self-efficacy' was incorporated at a later stage in the HBM (Rosenstock et al., 1988) and is similar to 'perceived behavioural control' of the TPB. It is a person's self-confidence to perform a particular behaviour. The 'cues-to-action' factor was not included in our framework because