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ABSTRACT

# Gastrointestinal strongyle Faecal Egg Count in goats: circadian rhythm and relationship with worm burden

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## Introduction

The population of goats in the world has increased considerably over the past few years, also in Europe-in particular in the Mediterranean Basin-where 18 % of the world's goats milk is produced, nearly exclusively for cheeses (Boyazoglu et al. 2005).

The quality and quantity of dairy goat production, however, is negatively affected by several factors, including parasitic diseases. Among these, gastrointestinal (GI) strongyle infection remains one of the main constraints to goat production throughout the world.

The contemporaneous presence of different genera/species of these nematodes often causes inflammatory/traumatic problems, as well as a diversion of nutrients from production sites towards the repair of tissue-damage provoked by the parasites, with negative repercussions on the growth, fecundity and productivity of the animals (Hoste et al. 2005).

For the above reasons, the diagnosis of these parasitic infections is of importance, with the final goal of a targeted treatment.

Although some physiopathological indicators of GI strongyle infections (e.g. anaemia index, diarrhoea index and body condition score) have been proposed in recent years, Faecal Egg Count (FEC) techniques remain the most common approach for the diagnosis of

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these parasites (Cringoli et al. 2004). However, the response of FEC is dependent on several laboratory and animal-related factors.

The aim of the present paper was to evaluate the effect of the time of day of sampling on GI strongyle egg excretion and the relationship between FEC and worm burden in goats naturally infected by GI strongyles.

## Materials and methods

The study was conducted every 3 weeks (total=21 weeks) on a total of 63 female Siriana goats, about 1.5 years old, during their second pasturing season at the experimental farm of the "C.R.A., Unità di Ricerca Zootecnia Estensiva, Bella Scalo, Muro Lucano, Potenza". These goats were naturally infected by the following species of GI strongyles: *Teladorsagia circumcincta*, *Haemonchus contortus*, *Trichostrongylus colubriformis* and *Oesophagostomum venulosum*.

In order to evaluate the effect of time of day of sampling on FEC, at each date, 3 goats were individually housed for 24 hours in cages containing a sieve for separating faeces. Faecal samples were collected from each cage every 2 h, for a total of 12 samples a day. Once in the laboratory, each faecal sample was analyzed by the FLOTAC technique (Cringoli 2006), having an analytic sensitivity of 1 egg per gram of faeces (EPG), utilizing a sucrose-based flotation solution (density=1.250). In addition, coprocultures were performed and third-stage larvae were identified and counted.

In order to evaluate the relationship between FEC and worm burden, the same 3 goats were then slaughtered and necropsied. The viscera were processed for sample collection, further worm counts and identification of GI strongyles present in the abomasum and small and large intestines, following the procedures described in the WAAVP guidelines for evaluating the efficacy of anthelmintics in ruminants (Coles et al. 2006).

All data were transformed into natural logarithms and statistically analyzed (software SPSS 13) using: 1) a Generalized Linear Model (GLM) to evaluate the effect of time of day of sampling on FEC; 2) the Pearson correlation, to evaluate the relationship between FEC and worm burden.

## Results

Both GI strongyle EPG and adults were *positively skewed*, thus suggesting an aggregate (not Normal) distribution of the parasites in the animals. The GLM results (taking into account the effect of the individual by considering it as a random effect) did not reveal any significant effect of the time of day of sampling on FEC ($F_{11,\ 63}$=0.99; P=0.449), whereas a significant effect of the sampling period (seasonality) on FEC was found ($F_{20,\ 63}$=27.5; P=0.000).

The Pearson correlation results showed a positive relationship between FEC and total GI strongyle worm burden (r=0.619; P=0.000). At the species level, the highest positive relationship was found for *H. contortus* (r=0.915; P=0.000), followed by *O. venulosum* (r=0.728; P=0.000), *T. colubriformis* (r=0.501; P=0.000) and *T. circumcincta* (r=0.404; P=0.000).

## Discussion

The findings of the present study have added data on the validity of FEC for the *in vivo* diagnosis of GI strongyles in dairy goats. They evidenced the absence of a circadian rhythm

in the FEC of GI strongyles, thus indicating that faecal sampling for GI strongyle detection can be performed at any time of the day on a goat farm.

However, as is widely known, GI strongyle FEC was influenced by the period of sampling (seasonality), thus underlying that the variable "time" is fundamental for the diagnosis and control of these infections (Veneziano et al. 2004).

In addition, in agreement with studies performed on small ruminants from other climatic regions (Cabaret et al. 1998), a significant positive correlation was found between FEC and adult GI strongyles. These findings showed that FEC, provided the use of standardized, sensitive and reliable techniques, is representative of worm burden in goats. The good relationship between FEC and worm burden justifies the fact that FEC techniques are widely used to measure the prevalence and intensity of GI strongyle infections for epidemiological surveys, to quantify the efficacy of chemotherapies, and to detect anthelmintic resistance, as reported by the WAAVP guidelines.

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