Veterinary Parasitology 163 (2009) 293–297

Contents lists available at ScienceDirect

Veterinary Parasitology

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

Sheep helminth parasitic disease in south eastern Scotland arising as a possible consequence of climate change

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ARTICLE INFO

Keywords:
Climate change
Helminth parasites
Sheep
Haemonchus contortus
Teladorsagia circumcincta
Fasciola hepatica
Nematodirus battus

ABSTRACT

The climate in the UK is changing, with a trend towards increased rainfall in the autumn and winter and warmer average temperatures throughout the year. There has also been a 4-week extension of the herbage growing season over the past 40 years. These changes may have implications for the epidemiology of sheep helminth parasites. Here, we describe production-limiting disease outbreaks caused by *Haemonchus contortus*, *Nematodirus battus*, *Teladorsagia circumcincta* and *Fasciola hepatica* in sheep flocks in south eastern Scotland. The occurrence and timing of these disease outbreaks could not have been predicted in this region highlighting changes in the epidemiology of helminth infections from the patterns historically described. These cases are used to introduce discussion regarding the potential effects of climate change on the epidemiology of helminth parasites and the implications for sheep farming in the UK.

1. Introduction

There is now a consensus that the UK climate is changing, with a trend towards shorter, warmer and wetter winters and warmer summers. In south eastern Scotland, the average rainfall has increased in spring, autumn and winter (resulting in an increase of around 20% in annual rainfall) and monthly mean temperatures have increased by 1 °C between 1961 and 2004 (Barnett et al., 2006). Some predictions suggest that there could be a further 4 °C increase by 2080 (Barnett et al., 2006). Consequently, the herbage growing season has been extended during the spring and autumn periods. For example, in the 1960s, the length of the growing season in eastern Scotland was 213 days, whereas in 2004 it was 241 days (Barnett et al., 2006). There has also been a significant reduction in the number of days when ground frost occurred between 1961 (147 days) and 2004 (127 days). Thus, south eastern Scotland has experienced shorter, warmer winters, with higher rainfall and fewer ground frosts. If these changes in climate are sustained, as predicted, various consequential effects on sheep production could be seen. Fig. 1 shows some ways in which climate change may affect different parasites species and therefore the risk of disease.

The consequences of climate change are, therefore, particularly important in helminth parasites because of its potential to impact upon their free-living stages and/or their intermediate or paratenic hosts. The main economically important helminth parasites in sheep in the UK are the nematodes, *Nematodirus battus*, *Teladorsagia circumcincta*, and *Haemonchus contortus* and the trematode *Fasciola hepatica*. Recent surveillance data suggest that the pattern of these infections may be changing in Scotland (Veterinary Investigation Surveillance Report (VIDA) data http://www.defra.gov.uk/vla/reports/rep_surv.htm). Since there is an obvious risk of bias in surveillance data that derives from material submitted to the investigative

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doi:10.1016/j.vetpar.2009.03.027

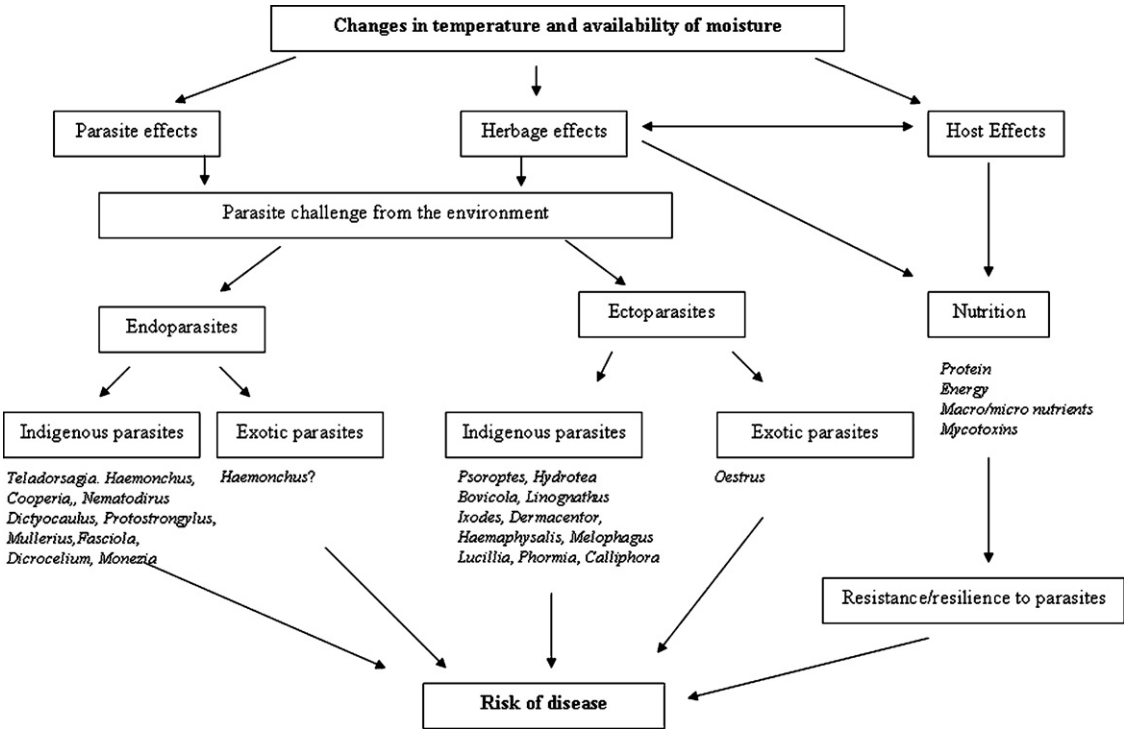

Fig. 1. A simplified scheme of how climate change may affect different parasites and the risk of disease.

services this paper has used an alternative approach, describing changes in clinical disease patterns that have occurred in the south east of Scotland; an area where the patterns of infection and disease were traditionally considered to be well understood. The aim of this paper is to use recent cases of helminthoses in south eastern Scotland to stimulate discussion on the possible role of climate change in the current patterns of parasitic disease.

2. Example cases

2.1. Haemonchosis

An outbreak of haemonchosis was investigated in a traditionally managed flock of 570 Texel cross ewes on a mixed sheep and arable farm in central Scotland. The flock was closed with the exception of 3 or 4 rams that were purchased annually at ram sales in the south of Scotland, and could have originated from northern England. The flock was outwintered on forage and cereal crop aftermaths, supplemented by hay and cereals. Anthelmintics were used on an *ad hoc* basis throughout the year in all classes of sheep. Introduced rams were not treated with an anthelmintic on arrival, but were dosed on an *ad hoc* basis thereafter.

After lambing in April 2007, 120 ewes and about 190 newborn lambs were drawn at random and turned onto a 10 hectares (ha) field of grass that had been sewn under a cereal crop during the previous year. This young grass was notably lush and would not have harboured any significant nematode parasite burden when the sheep were turned onto it, because it had not been grazed by livestock. All of the ewes and lambs were dosed with an anthelmintic (assumed to be ivermectin) at the beginning of May and all of the lambs were dosed with ivermectin at four weekly intervals thereafter, regardless of their grazing management.

Severe weight loss was first noted at the beginning of August 2007 in ewes and lambs grazing on the 10 ha field of new grass, despite adequate pasture growth. Twelve lambs died over a period of 7 days. The mean faecal worm egg counts (FWECs) of lambs and ewes were estimated to be 6100 and 250 eggs per gram of faeces (epg), respectively, based on pooled samples. Post-mortem examination of a lamb showed the presence of about 28,000 adult *H. contortus* in its abomasum. Following the diagnosis of haemonchosis, all of the sheep on the farm were dosed with ivermectin. A post-treatment drench check indicated that this treatment was effective.

2.2. Nematodirosis and teladorsagiosis

Signs of scour and weight loss were observed during mid-May 2003 in a group of 1200 April-born lambs on an upland, mixed sheep and beef cattle farm in the south east of Scotland. Most of the 1200 lambs had been turned onto pastures that had been grazed by sheep during the previous year, and their dams had been treated with moxidectin shortly after lambing to control the periparturient rise in FWECs.

All of the lambs were treated with mebendazole on 22nd May, but concern was raised when they continued to scour, lose weight and die. The mean FWEC of 12 lambs, 8 days after treatment was 945 (range 200–1850) *T.*