

## A LONG-TERM STUDY ON THE PREVALENCE OF GASTROINTESTINAL, HEPATIC AND PULMONARY PARASITISM IN ADULT CATTLE FROM SALAMANCA PROVINCE, WESTERN SPAIN

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**ABSTRACT:** The prevalence of some protozoa and helminths of cattle in Salamanca (Spain) was studied from 1986-1994. Analysis of 2202 faecal samples showed that 1190 (54%) were infected, 411 (18.7%) of them with mixed infections. These prevalences were: 12.7% for *Eimeria* sp.; 43.7% for Strongylida of the gastrointestinal tract; 2.7% *Capillaria bovis*; 2.1% *Dictyocaulus viviparus*; 4% *Moniezia* sp. and *Thysanietzia giardi*; 8.5% *Fasciola hepatica*; 2.6% *Schistosoma bovis*; and *Dicrocoelium dendriticum* was only present in one case. Similar data were found in other countries of the Mediterranean area. The prevalence of hepatic and sanguineous trematodes was decreased and the prevalence of gastrointestinal nematodes and cestodes was maintained. The results, obtained by observations during nine years, yield information which reflects the prevalence of these parasitic infections in the cattle of our area.

**KEY WORDS:** Prevalence, protozoa, helminths, cattle, Salamanca, Spain.

### INTRODUCTION

The province of Salamanca is a Spanish region where beef cattle are bred in an extensive system on range-lands. Because of the high number of animals in this area, it constitutes one of the most important nuclei of bovine production in Spain.

The negative economic impact which parasitic infections of cattle cause in the productive sectors has been widely recognized by numerous authors throughout the world (HERLICH, 1978; COOP, 1982; RAYNAUD, MAGE & LE STANG, 1983; CAWDERY, 1984; DARGIE, 1987; GENICOT, MOULIGNEAU & LIKEUX, 1991). The particular influence on Spanish cattle production has been evaluated, in recent years, principally by FLORES (1981) and COMPAIRÉ & TARAZONA (1985).

The control of these parasitic infections yields variable benefits (EUZEBY, 1977; NANSEN, 1987; HAWKINS, 1993) and the control measures in systems linked to grazing must be based on local epidemiological data (DORCHES, 1979; BRUNSDON, 1980; ANDERSON, DONALD & WALLER, 1983; ROJO VAZQUEZ, 1993).

The objective of this work was to know the prevalence of gastrointestinal, pulmonary and hepatic parasitic infection in beef cattle in this region of Spain and the trends in these infections during the last nine years.

### MATERIAL AND METHODS

**The study area:** This study was carried out in the province of Salamanca, situated in the western part of Spain at some 800 m above

sea level (Fig. 1A). The climate is characterized by being hot and dry in summer, temperate in spring and autumn and cold in winter. The average maximum temperature is 20-24° C in July-August and the average minimum is 2-6° C in December-January. The average annual rainfall varies between 300-1200 mm per year, with a dry period in the summer which lasts from one to four months. It is considered to be a temperate Mediterranean climate (DE LEON LLAMAZARES, 1990).

**Animals:** All of the animals included in these observations were farmed in an extensive system. A total of 2202 adult cattle were examined by individual sampling. This sampling was uniformly distributed throughout the study area and carried out at all times of the year, from January 1986 to December 1994 (Fig. 1B).

**Parasitological techniques:** A modification of PARFITT'S technique (1958) was employed. Briefly, this consists of the homogenization and suspension of 3 g of faeces in 42 ml of water, filtering through a 350 µm mesh and centrifuging in tubes of 15 ml at 1500 rpm for 3 min. The pellet is resuspended in a 33% zinc sulphate solution, adapting slide covers to the meniscus of the tube. After further centrifuging, to accelerate the process of flotation, the slide cover is removed and observed through a light microscope for the identification of parasite eggs and larvae.

### RESULTS

The analysis of the 2202 samples of faeces showed a wide spectrum of parasitic infections in the course of the 9 years of the study. The parasites belonged to various groups and included: A) intestinal protozoa: *Eimeria* sp.; B) trematodes: *Fasciola hepatica*, *Dicrocoelium dendriticum* and *Schistosoma bovis*; C) adult digestive cesto-

Zoological groups	Parasites	positive samples	prevalence (%)
Protozoa	<i>Eimeria</i> sp.	279	12.7
Digenea	<i>Fasciola hepatica</i>	188	8.5
	<i>Dicrocoelium dendriticum</i>	1	0.1
	<i>Schistosoma bovis</i>	58	2.6
Nematoda	Strongylida	962	43.7
	<i>Capillaria bovis</i>	60	2.7
	<i>Dictyocaulus viviparus</i>	46	2.1
Cestoda	<i>Moniezia</i> sp.		
	<i>Thysaniezia giardi</i>	89	4.0

Table 1.— Prevalence of the different groups of parasites from 1986-1994.

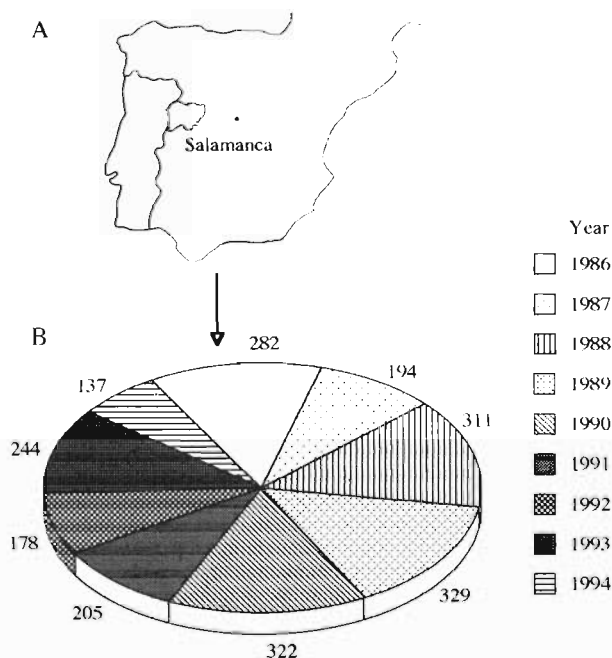


Fig. 1.— A) Geographical localization of the study area (Salamanca province) in the Iberian Peninsula. B) Annual distribution of the sampling.

des: *Moniezia* sp. and *Thysaniezia giardi*; D) gastrointestinal nematodes: Strongylida and *Capillaria bovis*; E) pulmonary nematodes: *Dictyocaulus viviparus*.

A total of 1190 samples (54%) were positive for some types of parasites: 779 (35.4%) for only one, 338 (15.4%) for two and 73 (3.3%) for three or more parasites. The trend of multiple infections showed that the proportion of individual carriers of at least one type of parasites varied between 48.5 and 72%, except in the years 1988 and 1992, in which the proportions were 36 and 38.2%, respectively.

The prevalences of each of the species or groups of parasites present were very variable, the digestive strongylids reaching the highest level (Table 1).

The prevalence of the intestinal protozoa is presented in Figure 2A. The prevalence of *Eimeria* infection was low during almost all the study period (1.6-13.1%), except in 1989 and 1990 in which its values reached 38.6% and 24.8%, respectively.

Figure 2B shows the profile of prevalences of *Fasciola hepatica*, *Schistosoma bovis* and *Dicrocoelium dendriticum*. These infections tended to diminish gradually during the course of the study: *Fasciola hepatica* decreased from 25.2 to 1.5%; *Schistosoma bovis* decreased from 9.9 to 1.5% and *Dicrocoelium dendriticum* was only present in one case.

The group of Strongylida of the gastrointestinal tract was the most prevalent, varying between 20.9 and 61.1%, with highest figures recorded in the period 1989-91 (Fig. 2C). This group included various common species, among which the Trichostrongylidae predominated. *Capillaria bovis*, also an intestinal nematode, had a low prevalence which varied between 0.4 and 6.2%, and the pulmonary nematode *Dictyocaulus viviparus* remained throughout the study period between limits of 0.3 to 5.2% (Fig. 2C).

The prevalences of cestodes (*Moniezia* and *Thysaniezia*) varied between 1 and 7.8%, with lowest values in 1987 and 1994 (Fig. 2D).

## DISCUSSION

The beef cattle of the province of Salamanca (Spain) have been cited as natural hosts of a wide range of parasites (RAMAJO MARTIN, 1992; CORDERO DEL CAMPILLO, CASTAÑON & REGUERA, 1994) in which all those found in the present study are included. The general characteristics of these infections in our cattle are very similar to those mentioned recently by AMBROSINI, BARCACCIA & MONDINI (1994) for the cattle of central Italy. In regions of Spain more humid than Salamanca, especially in the north of the Iberian Peninsula, higher prevalences have been found for all these parasites (URIARTE, 1985; NOGAREDA *et al.*, 1987).

The presence of *Eimeria* was considerably lower than that found in subtropical areas, where prevalences of up to 67.2% have been reported (MUNYUA & NGOTO, 1990). The rise in prevalence registered in the study area in the years 1989-90 corresponded to times with higher levels of rainfall than usual.

The gastrointestinal nematodes, with a practically cosmopolitan distribution and prevalences which are generally very high in all the humid and temperate regions of the world, present a relatively moderate, although persistent, prevalence here, due to the limitation which the scarcity of rainfall signifies for its exogenous development (RAMAJO MARTIN, 1988). Equally, the habitually dry climate of our region proves to be little favourable for the development of *Dictyocaulus viviparus*, which could explain the reduced presence of this parasite here, in comparison with other more humid zones of Spain

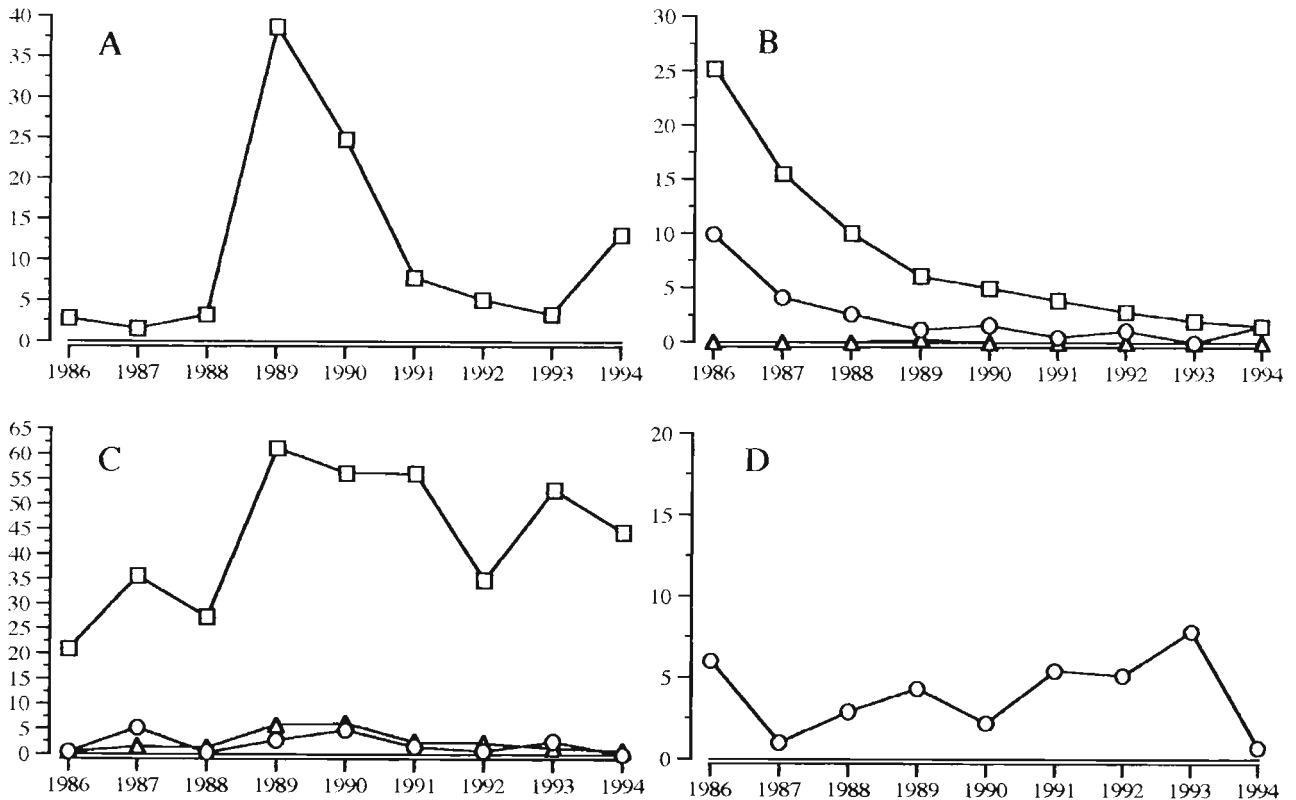


Fig. 2.— Evolution of prevalences: A) intestinal protozoa (*Eimeria* sp.); B) trematodes ( $\square$  *Fasciola hepatica*,  $\Delta$  *Dicrocoelium dendriticum*,  $\circ$  *Schistosoma bovis*); C) gastrointestinal nematodes ( $\square$  Strongylida,  $\Delta$  *Capillaria bovis*) and pulmonary nematodes ( $\circ$  *Dictyocaulus viviparus*); D) tapeworms (*Moniezia*, *Thysanotria*).

(NOGAREDA *et al.*, 1987) and also with the rainy countries of the north of Europe, where notably higher prevalences are registered (SCHNIEDER, BELLMER & TENTER, 1993; EYSKER *et al.*, 1994).

The hepatic trematodes *Fasciola hepatica* and *Dicrocoelium dendriticum* are less prevalent than in areas of the north-east of Spain (GONZALEZ LANZA *et al.*, 1989; GONZALEZ LANZA, MANGA GONZALEZ & DEL POZO CARNERO, 1993) and than in other countries of central and southern Europe: France (CASSET, 1989), Switzerland (DUCOMMUN & PISTIER, 1991), Belgium (GENICOT, MOULIGNEAU & LEKEUX, 1991) and Italy (FASANELLA, GIANGASPERO & PUCCINI, 1993). The significant decline in the prevalences of these helminths during recent years has also been observed in different areas of Europe: Germany (GRÄFNER, 1989), Poland (MICHALSKY, LAGODZINSKA & BRZEJSKA, 1991) and France (XIMENES *et al.*, 1993). This can be attributed, in our area, to the progressive desiccation of many natural habitats of their intermediaries and to the strategic-preventive treatments which have been carried out systematically. Identical measures do not, however, achieve the same result in the gastrointestinal nematodes and cestodes, whose prevalences seem to persist both in our region and in other regions of Spain and Europe. A gradual descent can also be appreciated in *Schistosoma bovis*

over the last twenty years (RAMAJO MARTIN, 1972; SIMON VICENTE & RAMAJO MARTIN, 1982), attributable to the fact that many of the natural habitats of the intermediate host (*Planorbium metidjensis*) have disappeared as a consequence of the prolonged periods of drought which have occurred recently in the area of our observations.

Our results on prevalence, obtained through observations during a period of nine consecutive years, present reliable epidemiological data on the presence of the diverse parasites of beef cattle in our area.

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