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Authors: Lavín, Santiago, Marco, Ignacio, Rossi, Luca, Meneguz, Pier Giuseppe, and Viñas, Luis

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Haemonchosis in Spanish Ibex

Santiago Lavín,[1] Ignacio Marco,[1] Luca Rossi,[2] Pier Giuseppe Meneguz,[2] and Luis Viñas,[1] [1] Patología General y Médica. Facultad de Veterinaria, Universidad Autónoma de Barcelona, 08193-Bellaterra, Barcelona, Spain; and [2] Parassitologia, Facoltà di Medicina Veterinaria, Università degli Studi di Torino, 10126 Torino, Italy

ABSTRACT: Two cases of haemonchosis occurred in the Spanish ibex (*Capra pyrenaica*) population of the National Hunting Reserve of Tortosa and Beseit, northeastern Spain, in July 1992 and May 1993. The animals were cachectic and recumbent and had an acute hemorrhagic, macrocytic and hypochromic anemia; which was related to a high infection of 2,016 and 1,863 *Haemonchus contortus*, respectively, in the abomasum of the animals.

Key words: Spanish ibex, *Capra pyrenaica*, nematode, *Haemonchus contortus*, anemia.

The Spanish ibex (*Capra pyrenaica*) is a wild artiodactyle from the Iberian Peninsula that has been confined to mountain regions, mainly in the Mediterranean area. Populations have increased considerably during the last 30 yr due to the establishment of intense protective measures (Fandos, 1991). There is little knowledge about the diseases affecting this wild ungulate and tracking health programs are lacking. To date, just a few studies have been performed in some populations.

We evaluated the health status and established a tracking program for the diseases of the Spanish ibex in the National Hunting Reserve of the Tortosa and Beseit (40°45′N, 0°15′E) in 1992 at the request of the Catalonian Government. This National Reserve is an area of 30,418 ha; the ibex population increased from 732 animals in January 1970 to 6,291 animals in January 1992. To reduce animal density, an intensive hunting program was initiated in 1992 which reduced the population to 4,786 animals in January 1994 and 4,660 animals in January 1996.

A 3-mo-old, 9 kg male Spanish ibex (CP-1), that had been easily captured was brought to the School of Veterinary Medicine on 7 July 1992. The animal was cachectic and recumbent. A second animal, an 8 yr old, 24 kg female Spanish ibex (CP-2), was referred on 3 May 1993. Besides these two animals, 20 more Spanish ibex in 1991, 10 in 1992, and four in 1993 were found dead in the same area. The study of these animals was not possible due to their advanced state of decomposition. Fifteen of the dead animals were 1 yr old.

On physical examination, the two animals had pale mucous membranes on the conjunctiva and oral mucosa, and their general condition was extremely poor. Recumbency due to generalized weakness was present. Rectal temperatures were 37 C and 36 C, respectively. Feces were normal in the first animal, but they were liquid, dark-brown colored in the second. Hematological analysis (semiautomatic haematological analyser Sysmex F-800, TOA Instruments, Kobe, Japan), total serum protein level (Biuret method), albumin and globulins (electrophoresis on cellulose acetate strips) and serum iron levels (Multichannel automatic analaser, Mascott-plus, Biomerieux, France) were determined (Table 1). A quantitative coprologic study was also performed using a modified McMaster technique (Ministry of Agriculture, Fisheries and Food, 1986).

Red blood cell count, hematocrit, and hemoglobin concentrations were very low compared to reference values for the species normals (Peinado et al., 1993, 1995). Mean corpuscular volume (MCV) was increased and mean corpuscular hemoglobin concentration (MCHC) was decreased (macrocytic-hypochromic anemia). Anisocytosis, poikilocytosis, polychromasia and occasional Howell-Jolly bodies were observed on blood smears. Hypoproteinemia with a marked decrease in albumin levels was also detected. To determine the cause of anemia, serum iron levels and total and unbound iron-binding capacity were mea-

TABLE 1. Hematology, total serum protein, protein electrophoretic fractions and serum iron values of two Spanish ibex (*Capra pyrenaica*) with clinical haemonchosis.

Parameters	CP-1	CP-2
Red blood cells ($\times 10^{12}$/l)	1.83	4.77
Hematocrit (%)	7.6	15.0
Hemoglobin (g/dl)	2.5	4.7
Mean corpuscular volume (fl)	41.5	31.4
Mean corpuscular hemoglobin (pg)	13.6	9.9
Mean corpuscular hemoglobin concentration (g/dl)	32.8	31.3
White blood cells ($\times 10^9$/l)	32.6	22.6
Differential leukocyte count		
Lymphocytes ($\times 10^9$/l)	13.36 (41%)	4.74 (21%)
Monocytes ($\times 10^9$/l)	<0.3	0.45 (2%)
Band neutrophils ($\times 10^9$/l)	2.28 (7%)	1.13 (5%)
Segmented neutrophils ($\times 10^9$/l)	16.95 (52%)	16.27 (72%)
Eosinophils ($\times 10^9$/l)	<0.3	<0.3
Basophils ($\times 10^9$/l)	<0.3	<0.3
Platelets ($\times 10^9$/l)	494	568
Total protein (g/dl)	6.30	4.90
Albumin (g/dl)	0.85	1.11
Globulins (g/dl)	5.45	3.79
α_1 (g/dl)	0.40	0.48
α_2 (g/dl)	0.50	0.59
β (g/dl)	0.30	0.42
γ (g/dl)	4.25	2.30
Albumin/globulin ratio	0.16	0.29
Iron (μm/dl)	50	43
Total iron-binding capacity (TIBC) (μm/dl)	270	198
Unbound iron-binding capacity (UBIC) (μm/dl)	220	155

sured and compared with data from sheep and cattle (Smith, 1989), and data from healthy Spanish ibexes (S. Lavin, L. Viñas, and I. Marco, unpubl.). In the anemic animals, serum iron was decreased and total and unbound iron-binding capacity were increased. Thus, there was evidence that anemia was due to acute hemorrhage (Jain, 1993).

With the modified McMaster technique, we estimated 22,400 (CP-1) or 7,200 (CP-2) gastrointestinal nematode eggs/g, respectively in the feces. The number of nematode eggs was much higher than observed in eight ibexes from the same area (100 to 200 eggs/g) that were hunted during the same period and which had an overall parasite burden of less than 500 nematodes in the digestive system (S. Lavin, L. Viñas, and I. Marco, unpubl.).

Due to the poor condition of the animals, euthanasia was performed in both cases with 1 g of intravenous sodium thiopental (Pentothal sodico, Abbott, Madrid, Spain). On necropsy both animals lacked abdominal fat (epiplon and perirenal). We observed verminous pneumonia nodules that were confirmed with routine histopathological examination (hematoxylin-eosin stain). In the CP-2 animal, petechial hemorrhages were found in the abomasum that were histopathologically associated with a mild inflammatory infiltrate in the base of the abomasal mucosa. Parasitological evaluations of the digestive tract was also performed (Table 2). *Haemonchus contortus* was identified using characteristics of the synlophe (Lichtenfels et al., 1994). Other nematodes were identified using the keys of Durette-Desset (1989) and Skrjabin (1954). The nematodes were deposited in the Natural Science Museum

TABLE 2. Nematodes of the digestive tract of two Spanish ibex (*Capra pyrenaica*) in Spain with clinical haemonchosis, 1992 and 1993. The voucher specimen numbers are in parentheses.

	CP-1	CP-2
Abomasum		
Haemonchus contortus (11.02–12)	2,016	1,863
Ostertagia circumcincta (11.02–13)	3,259	3,624
Ostertagia trifurcata/pinnata (11.02–14)	148	349
Small intestine		
Nematodirus abnormalis (11.02–15)	996	2,115
Nematodirus davtiani alpinus (11.02–16)	395	0
Nematodirus spathiger (11.02–17)	99	0
Trichostrongylus capricola (11.02–18)	4,027	600
Trichostrongylus colubriformis (11.02–19)	100	72
Trichostrongylus vitrinus (11.02–20)	0	277
Large intestine		
Skrjabinema sp.	37	0

of Madrid and the voucher specimen numbers are included (Table 2).

We found a high parasite burden of *Haemonchus contortus* in the abomasum of both animals, identified using the most recent characteristics of the synlophe (Lichtenfels et al., 1994). The pathogenicity of this parasite is extremely high: a burden over 1000 parasites can produce acute anemias in domestic ruminants (Roberts and Swan, 1987; Soulsby, 1987). In white tailed deer (*Odocoileus virginianus*), a burden over 70 worms/kg body weight was associated with decreased packed cell volume, hemoglobin, and total serum protein values (McGhee et al., 1981). Thus, we concluded that the acute hemorrhagic anemia diagnosed in the two animals was due to *Haemonchus contortus* parasitism. The prevalence of the nematode in the Reserve is high (64%) (Rossi et al., 1992). High amounts of other nematodes (over 1000) were also present in the abomasum and small intestine (Table 2), but their pathogenicity was considered relatively low, with higher parasite intensities needed to produce clinical signs. However, infections are usually mixed in nature and clinical signs are due to the combined effects of all species, with the effects caused by the most pathogenic parasites usually predominating (Tarazona, 1980). Meterological data of the area (pluviometry, mean temperature and relative humidity) from 1991 to 1993 were not significantly different from those of previous or later years.

Two conditions occurred in the study area that may be related to the haemonchosis epizootic. First, the Spanish ibex lives in close contact with domestic sheep and goats during part of the year, and these animals could be responsible for the increase in the parasitism in the area (McGhee et al., 1981). However, the same condition occurs in other areas of the Reserve where no diseased or dead animals have been found. *Haemonchus contortus* is a common parasite of sheep in Spain (Cordero et al., 1994).

Second, the epizootics occurred in coastal areas, where the Spanish ibex density was very high; usually more than 30 animals/100 ha were present but density even increased up to 60 animals/100 ha in some regions (Ruiz-Olmo and Aguilar, 1995). Weather conditions (18 to 26 C) in these coastal zones favor the development of the parasite (Mage, 1991) from May to October. The acute development of the process could be responsible for the fact that no more diseased animals were found. After the ibex population density was reduced to less than 20 animals/100 ha, no more diseased or dead animals were found in the area.

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