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Pulmonary Protostrongyliasis in a Mountain Hare from Italy

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ABSTRACT: An adult male mountain hare (*Lepus timidus*), shot during the hunting season on the slopes of Mt. Civetta (eastern Alps, Veneto, northeastern Italy), was eviscerated and diffuse nodular lesions of verminous pneumonia were observed. Adult helminths were collected and male specimens were identified as *Protostrongylus pulmonalis.* Histologically, a non-purulent interstitial pneumonia and a desquamative bronchiolitis and alveolitis, along with thickening of alveolar septa, were apparent in the nodules. In several enlarged alveoli, a large number of eggs and larvae of nematodes were found. This is the first recorded case of *protostrongyliasis* in mountain hares from Italy and from an alpine population.

Key words: Case report, helminths, *Lepus timidus,* mountain hare, *Protostrongylus pulmonalis,* verminous pneumonia.

The mountain hare (*Lepus timidus*) is widespread in Ireland, Scotland, northern Europe, Faeroes, Scandinavia, and northeast Europe. This species, in some areas, shares habitat with brown hares (*L. europaeus*). There is an isolated population, which is declining in numbers, in the Alps where it is mainly present between 1,200 to 3,000 m., or lower during the winter season. This form, also called Alpine hare (*L. timidus varronis*), has evolved through geographical isolation; it is smaller, has longer ears, and is regarded as a separate subspecies (Toschi, 1965; Bjarvall and Ullstrom, 1986).

In October 1996, during the hunting season, an apparently healthy adult male mountain hare was shot by a hunter on the Valle Agordina side of Mt. Civetta in the eastern Alps (province of Belluno, Veneto, northeastern Italy; 46°23′N, 12°02′E). The animal was not considered to be a juvenile individual, due to the absence of the Stroh's tubercle (Broekhuizen and Maaskamp, 1979; Habermehl, 1985), but its age was still not possible to determine. It was immediately eviscerated and no gross pathological findings were observed other than pneumothorax, hemothorax and hemoperitoneum caused by gunshots, and a diffuse, bilateral bronchopneumonia suspected to be of parasitic origin. Macroscopically, several gray, subpleural nodules were present, scattered throughout the lungs and affecting approximately 20% of the parenchyma. Numerous nematodes were detected in the bronchial tree. There was thickening of bronchial walls and catarrhal exudate in their lumen. Several lung tissue specimens were immediately fixed in 10% neutral buffered formalin and subsequently embedded in paraffin, 5 μm sections were cut and stained with haematoxylin and eosin (H&E) for light microscopy. Adult parasites were collected from the bronchial tree and preserved, along with portions of the pulmonary parenchyma, in 70% ethanol to which 5% glycerol had been added.

Histologically, a subacute to chronic, non-purulent interstitial pneumonia was observed. In the nodules described above, desquamative bronchiolitis and alveolitis were apparent, along with thickening of alveolar septa, which were diffusely infiltrated by inflammatory mononuclear cells. In addition, proliferative changes of bronchiolar epithelia and type II pneumocytes were seen. Several alveoli, which were also markedly enlarged, contained a large number of eggs and larvae of nematodes. Another frequent microscopic feature of such nodules was represented by prominent hyperplastic lymphoid nodules, in both perivascular and interalveolar location. These contained predominantly lymphoid cells with scattered or few eosinophils. Alveoli adjacent to the nodular lesions were often affected by a more or less pronounced emphysema.

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FIGURE 1. Posterior extremity of an adult male of *Protostostrongylus pulmonalis* showing the telamon. Bar = 52 μm.

Many lungworms were collected and several adult male nematodes were examined by clearing in lactophenol and observed with a light microscope. On the basis of morphological features (Fig. 1) all the specimens were identified as *Protostrongylus pulmonalis* according to Boev (1975), and to the description provided by Costantini et al. (1990) for lungworms collected in brown hares from Val Gardena (eastern Alps, Italy). Specimens were filed in the permanent collection of the Istituto Zooprofilattico Sperimentale delle Regioni Lazio e Toscana (Rome, Italy) as number 2696/D/96.

Apparently, this is the first recorded case of protostrongyliasis in mountain hares from Italy and from alpine mountain hare populations. It seems likely that this parasite had been present in mountain hares from Italy in the past and never described because of the lack of biological studies in this population. An alternative is that *P. pulmonalis* spread from brown hares to mountain hares, although the distributions of the two species in the Alps have a limited overlap. The occurrence of *P. pulmonalis* in a brown hare population from Alto Adige in northeastern Italy was recorded for the first time in 1990 (Costantini et al., 1990).

In northern Europe, *P. pulmonalis* commonly is found both in mountain hare and in brown hare, either in separated or in sympatric populations (Soveri and Valtonen, 1983). The prevalence and intensity of *P. pulmonalis* infections seem to be higher in adult subjects, probably because the development and the extension of lung lesions are relatively slow processes (Soveri and Valtonen, 1983). Heavy infections can compromise pulmonary function, thus creating disadvantage especially during winter, when malnutrition and adverse effects of the weather are more likely to affect the survival of heavily infected individuals. However, no association between *P. pulmonalis* or other helminths and mountain hare population dynamics has ever been demonstrated (Soveri and Valtonen, 1983; Iason and Boag, 1988).

Further studies to estimate prevalence, as well as to evaluate both the intensity and the extension of lesions in the cases observed, could usefully contribute in assessing the health status of the declining alpine mountain hare populations. The total number of mountain hares that can be hunted every year from this area is limited, so hunters should be asked to submit biological samples and viscera from every individual for pathological, parasitological, and microbiological investigations.

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