

A CASE OF MULTIPLE MIXED INVASION WITH ECTOPARASITES IN GOATS

Petyo Prelezov, Nikola Nizamov

Trakia University, Faculty of Veterinary Medicine, Stara Zagora, Bulgaria

E-mail: nikola_nizamov@abv.bg

ABSTRACT

The current study involves 15 goats from a local breed, naturally infested with ectoparasitic insects. The goats come from a farm in the village of Yazdach, Stara Zagora County, property of a private owner. Our visit to the farm occurred after a signal given by the owner who informed us that the goats were scratching themselves and had exhibited strong discomfort. 15 animals were examined and 14 of them were found to be infested with one or more species of insects. 6 of them (40 %) were infested with sucking lice from the species *Linognathus stenopsis* Burmeister (1838), family Linognathidae, suborder Anoplura of order Phthiraptera; 7 (46.6 %) – with biting lice from species *Bovicola caprae* Gurlt (1843), family Bovicolidae, suborder Ischnocera of order Phthiraptera; 9 (60%) – with fleas from the species *Pulex irritans*, Linnaeus (1758) belonging to the Pulicidae family, order Siphonaptera and 2 (13,3 %) – with hippoboscids from the species *Hippobosca equina* Linnaeus (1758) from Hippoboscidae family of order Diptera.

In 5 of the examined animals was found a monoinfestation and a mixed one in the rest of goats: in 6 of them with two species and in 3 of them with 3 species of insects.

The average Intensity of Infestation (II) with *Linognathus stenopsis* was 750, with *Bovicola caprae* – 328. With *Pulex irritans* II was 11,3 and with *Hippobosca equina* – 1.

A part of the ectoparasites (178) were collected and conserved in 70° ethanol with the purpose of laboratory identification, morphological examination and preparing the photographic material.

Key words: goats, ectoparasites, lice, fleas, *Linognathus stenopsis*, *Bovicola caprae*, *Pulex irritans*, *Hippobosca equina*.

Introduction

The ectoparasitic entomoses cause serious economical losses to the small agricultural owners. The causing agents have a direct and indirect impact on the hosts. The direct impact could be a result of blood loss, inflammation and skin irritation, toxic effect and an allergic reaction. The indirect impact could cause restlessness, disruption of the normal feeding and rest of the animals, as well as self mutilation brought by the itch they cause (Taylor et al. 2007).

The goats are often being infested by ectoparasites. The species of insects that pester goats most often are from the orders: *Siphonaptera* (fleas), *Phthiraptera* (lice) and *Diptera* (dipterous).

The species of lice found in goats around the world are: sucking louse – *Linognathus stenopsis*, African louse – *Linognathus africanus*, biting louse – *Bovicola (Damalinia) caprae*, biting lice of the Angora goat – *Bovicola crassipest* and *Bovicola limbata* (Talley, 2015), sheep foot louse – *Linognathus pedalis*, long nosed cattle louse – *Linognathus vituli* (Ortis, 2010), short nosed cattle louse, found on goats in Ethiopia (Tesfaheywet et al. 2016).

The following species of fleas are found on goats: *Ctenocephalides canis* – dog flea, *Pulex irritans* – human flea and *Ctenocephalides felis* – cat flea, which according to Soulsby (1982) has 4 subspecies: *Ctenocephalides felis felis* – cosmopolite in spread, found in dogs, cats, rats and primates, *C. felis strongylus* – found only in Africa, *C. felis damarensis* – restricted in southeastern Africa and *C. felis orientis* – found in India, Sri Lanka and southeastern Asia. *C. felis orientis* more

commonly infests cattle and less commonly domestic pets (Ortis et al.2010). In new studies *C. orientis* and *C. damarensis* are divided as separate species and not as subspecies to the cat flea (Ashiwini et al. 2017). *Xenopsylla cheopis* – southern rat flea is also found on goats in Iraq (Zangana et al. 2013). In Greece (Christodouloupoulos et al. 2003) the full cycle of development of the human flea *Pulex irritans* in goats has been proven. The so called horse fly (*Hippobosca equina*) which pesters a lot of different species of domestic and wild animals is sometimes found in goats as well (Maa, 1962).

Materials and methods

Animals

15 goats from a local breed were included in the study (8 female, 1 male and 6 kids). It was conducted in a private farm in Iazdach village, Stara Zagora county on 05.07.2018. From the anamnesis it becomes clear that the animals manifest strong discomfort and scratch themselves in nearby objects. The goats have not been treated for ectoparasites for over a year. During the pasture season the animals use common pastures with other cattle herds bred in the region.

Examination

Before the parasitological examination the goats included in the study were inspected with a magnifying glass for signs of skin changes such as alopecia, squamas, crusts, nodules, as well as eggs and adult ectoparasites. The lice that were found (preimaginal and imaginal stages) were collected individually with tweezers and kept in containers filled with 70 ° ethanol. The material was gathered from 7 fields with a square shape and size of 10 cm² measured with a pre-prepared paper template. The areas were chosen on the following regions: (1) shoulder, (2) chest, (3) neck, (4) flank, (5) thigh, (6) groin and (7) abdomen on one side of the body. During the calculation of the intensity of invasion (I.I.) we multiplied the sum of all parasites found on the 7 areas by 100 (Brown, 2005). We then put the animal on its back and the areas with less fur: abdomen, udder, perianal region and the inside surface of the thighs were treated with 0,05 % water solution of amitraz with the purpose of killing the fleas that were eventually there (Christodouloupoulos et al. 2006). The dead insects were collected with a flea comb. All insects that we found were transported to the laboratory in plastic containers with 70° ethanol. The fleas and lice were submerged in xylene for 5 minutes with the purpose of enlightening and dehydration, after which they were fixed on slides with Canadian balm and covered with cover slides in order to make permanent microscopic material. After they were identified the hippoboscids were fixed with entomological pins and were kept in entomological boxes. The species differentiation was conducted by the morphological traits described by Neveu Lemaire (1938). For microscopic examination and photographic material, we used a Leica[®], microscope equipped with a photo camera.

Results

From the 15 animals that were examined 14 turned out to be infested with one or a few species of ectoparasites. All infested animals were exhibiting signs of restlessness and itching.

The morphological and microscopic identification proved that 6 (40%) were infested with sucking lice from the *Linognathus stenopsis* species, Burmeister (1838), belonging to the Linognathidae family, Anoplura suborder, Phthiraptera order (Fig. 1&2), 7 (46.6 %) with biting lice

from the *Bovicola caprae* species, Gurlt (1843), belonging to the Bovicolidae family, Ischnocera suborder, Phthiraptera order (Fig. 3&4), 9 (60 %) with fleas from the *Pulex irritans* species, Linnaeus (1758), belonging to the Pulicidae family of Siphonaptera order (Fig. 5&6), and 2 (13.3%) with hippoboscas from the *Hippobosca equina* species, Linnaeus (1758) from the Hippoboscidae family of Diptera order (Fig. 7).



Figure 1: *Linognathus stenopsis* Burmeister (1838), male, magn. 40X (dorsal view).



Figure 2: *Linognathus stenopsis* Burmeister (1838), female, magn. 40X (dorsal view).



Figure 3: *Bovicola caprae*, Gurlt (1843) female, magn. 40X (dorsal view).



Figure 4: *Bovicola caprae*, Gurlt (1843) male, magn. 40X (dorsal view).



Figure 5: *Pulex irritans*, Linnaeus (1758) male, magn. 40X.



Figure 6: *Pulex irritans*, Linnaeus (1758) female, magn. 40X.



Figure 7: *Hippobosca equina*, Linnaeus (1758)

178 insects total were collected from all infested animals. The number of both the types of lice collected from the 7 areas on the body of the goats that were examined, their sex, as well as the number and sex of the fleas and hippoboscids found are shown in Table 1. The average I.I. with *Linognathus stenopsis* is 750 (Brown, 2005), and with *Bovicola caprae* it is 328, with *Pulex irritans* I.I. is 11,3 and for *Hippobosca equina* it is 1.

Table 1: Number of insects found and population structure of ectoparasites on goats

Animal №	<i>L. stenopsis</i>		<i>B. caprae</i>		<i>P. irritans</i>		<i>H. equina</i>	
	♀	♂	♀	♂	♀	♂	♀	♂
1 – goat	1	-	3	-	3	2	1	-
2 – goat	-	-	-	-	-	-	-	-
3 – goat	-	-	3	-	-	1	-	-
4 – goat	-	-	-	-	1	2	-	-
5 – kid	8	2	-	-	-	-	-	-
6 – goat	-	-	-	-	2	2	-	-
7 – kid	8	1	1	-	6	7	-	-
8 – kid	9	2	-	-	1	1	-	-
9 – kid	2	-	1	-	-	-	-	-
10 – goat	-	-	2	-	-	-	-	-
11 – goat	-	-	6	1	-	-	-	-
12 – kid	2	-	-	-	2	5	-	-
13 – goat	-	-	-	-	1	-	-	1
14 – male	-	-	2	-	4	-	-	-
15 – kid	6	-	4	-	24	38	-	-

Discussion

The current study was conducted in a private farm for extensive breeding of goats after a signal of distress from the owner. Our visit to the farm and the following laboratory studies proved multiple mixed infestation with ectoparasitic insects. The species of lice that were found, *Linognathus stenopsis*, Burmeister (1838) and *Bovicola caprae*, Gurlt (1843) are widely spread in goats around the world. *Bovicola caprae* is a wide spread species in Europe: Germany, Poland, Czechoslovakia, Romania and Italy (Kim et al. 1986). It was found also in the USA, Argentina, Colombia, Brazil and Cuba (Werneck, 1950), in Chile and in France (Tagle, 1966), Uganda, South Africa and India (Singh et al. 1973). The *L. stenopsis* species is spread in different parts of the world and is the only species from the Linognathidae family that was found in the past in goats in Europe (Lapage, 1956), in Romania (Negru and Suci, 1959), in Bulgaria (Touleshkov, 1954). Nedelchev (1985) finds two species of lice in goats in Bulgaria and deduces that a mixed infestation with both is commonly found.

Goats are often hosts of fleas as well. A lot of authors report about infestations in countries with a temperate climate such as France, Italy and Greece (Christodoulopoulos et al. 2003). To present moment it is not confirmed which species of fleas pester the goats in the Bulgaria. From the order of Siphonaptera our study only proved *Pulex irritans*. Christodoulopoulos et al (2003) found the human flea in dairy goats in central Greece.

Hippobosca equina is described as being a parasite in a lot of herbivore species of mammals (Maa, 1962). It is not entirely harmless as it causes painful bites and is a vector for multiple infectious agents such as viruses (Blue tongue disease), bacteria (*Bartonella* spp.). Our study proved that goats are possible hosts for *Hippobosca equina*.

Conclusion

The current study confirmed that the infestation with lice of goats bred in small extensive farms is mostly of a mixed type and includes the *Linognathus stenopsis* Burmeister (1838) and *Bovicola caprae* Gurlt (1843), species. The human flea *Pulex irritans* Linnaeus (1758) is also found in these animals. The goat can also be a host for the ectoparasitic insect *Hippobosca equina* Linnaeus (1758).

References

1. Неделчев, Н. (1985). *Проучване върху фтирантерозата по домашните преживни животни*. Канд. Дис., София.
2. Ashwini, M. S., Puttalakshamma, G. C., Mamatha, G. S., Ojha, R., Chandranaik, B. M., Thimma-reddy, P. M., Placid, E. D., Jalali, S. K., Venkatshan, T. (2017). *Studies on morphology and molecular characterization of oriental cat flea infesting small ruminants by barcoding*. Journal of Entomology and Zoology Studies 2017, 5(4) 301–305.
3. Brown, L, Linde, T., C., Fourie, L, J., Horak, I., G. (2005). *Seasonal occurrence and production effects of the biting louse Damalinia limbata on Angora goats and 2 treatment options*. Afr.vet.Ver. 2005, 76, 74–78.
4. Talley, J. *External Parasites of Goats*. Oklahoma Cooperative Extension Service EPP-7019 1-8 <http://osufacts.okstate.edu>.
5. Christodouloupoulos, G., Theodopoulos, G., Kominakis, A., Theis, J. (2005). *Biological, seasonal and environmental factors associated with Pulex irritans infestation of dairy goats in Greece*. Veterinary parasitology 2005, 137:137–143
6. Kim, K. C., Pratt, H. D, and Stojanovich, C. J. (1986). *The sucking lice of North America. An illustrated manual for identification*. Pennsylvania State University Press, University Park, 241 pp.
7. Lapage G. (1956). *Veterinary Parasitology*. Ed. Oliver and Boyd: 1956, 579–588.
8. Мaa T. C. (1962). *Notes on the Hippoboscidae (Diptera)*. Pac Insects 4: 1962, 583–614
9. Neveu-Lemaire, M. (1938). *Traite d' Entomologie medicale et veterinaire*. Vigot Freres, Paris, 1938, 569–621.
10. Negru, St., Suci, M. (1959). *Pediculide noi pentru fauna R.P.R. (Anoplura Lucas 1840)*. – Comunic Acad. R.P.R., 9, 1151–1153.
11. Ortis, E., Murcia, N., Trujillo, V., Camacho, D., Roza, M., Contreras, A. (2010). *Reporte de caso: pulicosis por Ctenocephalides felis felis en ovinos y caprinos en la sabana de Bogota Colombia*. Revista de Medicina Veterinaria 2010, 19 23–35.
12. Singh, A. and Chhabra, R. C. (1973). *Incidence of arthropod pests of domesticated animals and birds*. Indian J. Anim. Sci. 1973, 43: 393–397.
13. Soulsby, E. (1982). *Helminths, arthropods and protozoa of domesticated animals*.
14. Tagle I. (1966). *Parásitos de los animales domésticos en Chile*. Bol Chil Parasitol 1966, 21:118–121.
15. Taylor M. A., Coop, R. L. and Wall R. L. (2007). *Veterinary parasitology*. 3rd edition by Black well publishing Ltd.
16. Tesfaywet, Z., Simeon. H. (2016). *Major ectoparasites of small ruminants in Bench Maji Zone, souther Ethiopia*. <https://www.researchgate.net/publication/299514479>.
17. Touleshkov, K. (1954). *Veskite (Anoplura) ectoparazity po domasnite zivotni i coveka*. Izv. Zool. Inst., Bulg. A. N. 1954, 3:125–160.
18. Werneck, F. L. (1950). *Os Malófagos de Mamíferos. Parte 2. Ischnocera (Continuacao de Trichodectidae) e Rhynchophthirina*. Edicao do Instituto Oswaldo Cruz, Rio de Janeiro, 207.
19. Zangana, I., Ali, B., Naqid, I. (2013). *Distributions of ectiparasites infested sheep and goats in Duhok province, North Iraq*. Bas. J. Vet. Res. 2013, 12 54–64.