BETTER SAFE THAN SORRY?

Noemi BALINT
"Octavian Goga" School, Aleea Postăvaru str.3, 440234 - Satu-Mare, Romania
E-mail: sz_noemi2005@yahoo.com

Summary: Among all parasites, ticks, along with other ectoparasites seem to have one of the most negative reputations worldwide from the Arctic to tropical regions. Ticks (suborder Ixodida) are obligate blood-sucking acarines attacking a wide variety of hosts from all tetrapod vertebrate classes (*Amphibia, Reptilia, Aves* and *Mammalia*). Medical importance of Ixodida resides both in the direct aggression on the host and indirectly by transmission of pathogenic microorganisms (protozoa, bacteria, viruses).

Rezumat: Dintre toţi parazitii, căpuşele, alături de alţi ectoparaziţi par să aibă în toată lumea, de la regiunea arctică până la regiunile tropicale, unul dintre cei mai negativi reputaţii. Căpuşele (subordinul Ixodida) se hrănesc obligatoriu cu sânge atacând o mare varietate de gazde de la toate clasele de vertebrate tetrapode (amfibieni, reptile, păsări şi mamifere). Importanţa lor medicală rezidă atât în agresiunea directă pe gazdă cât şi în transmiterea indirectă de microorganisme patogene (protozoare, bacterii, virusuri).

Introducere

As a biology teacher I used to take the students on several fieldworks. I tried to make them to understand and to protect Nature with all living creatures, especially the species of herpetofauna. Herpetology is the branch of zoology concerned with the study of amphibians (including frogs, toads, salamanders, newts, and gymnophiona) and reptiles (including snakes, lizards, amphisbaenids, turtles, terrapins, tortoises, crocodilians, and the tuataras). Batrachology is a further subdiscipline of herpetology concerned with the study of amphibians alone. The herpetofauna of Romania is characterized by a nice mixture of southern, Balkan species, many central European ones and a number of endemic taxa.

A large number of herpetological societies exist today, having been formed to promote interest in reptiles and amphibians both captive and wild. Herpetologist's scientific activity offers evident benefits to humanity in the study of the role of amphibians and reptiles in global ecology, especially because amphibians are often very sensitive to environmental changes, offering a visible warning to humans that significant changes are taking place.

Many people are afraid of amphibians and reptiles because they aren't so nice like a puppy or a horse and due to the fact that they know very little about them. They also consider these animals being pests and they kill them. There are as many definitions of the word "pest" as there are authors. Clark (1970) defined pests as "those injurious or nuisance species, the control of which is felt to be necessary either for economic or social reasons", and Dempster (1975) also defined a pest as "any animal which does economic damage to crops or domesticated animals, or is harmful to human health". Allaby (1999) also

Satu Mare – Studii şi Comunicări Seria Ştiinţele Naturii
Vol XII (2011) pp: 81-89.

defined a pest as "any animal that competes with humans by consuming food, fibre or other materials for human consumption or use". Whatever definition is adopted, it is clear that an animal constitutes a pest by merely being a nuisance, or by being injurious to human health or economic well-being.

Indirectly amphibians and reptiles could be pests, because they have parasites and many of these can be dangerous to humans. There are two primary types of parasites. Ectoparasites (Table 1) such as mites and ticks which are not much of a problem in aquatic reptiles, but can be a problem for snakes, lizards and terrestrial chelonians. Crocodilians do not seem to be effected by this type of parasite unless an open wound is involved.

The second group of parasites that effect reptiles are endoparasites (Table 2). These are the group of parasites that pose health risk much more to captive reptiles than to wild reptiles.

These parasites may effect the internal organs of the host and in a captive environment where an intermediate host is not present may multiply and re-infect the host causing very serious complications.

When I was planning a fieldwork I made all the safety measures to prevent any type of accident, but the students were bound up in other problems. It was a frequent question:"Are there ticks in the neighborhoods?" Among all parasites, ticks, along with other ectoparasites seem to have one of the most negative reputations (Waudby et al, 2008). Ticks (suborder *Ixodida*) are obligate blood-sucking acarines attacking a wide variety of hosts from all tetrapod vertebrate classes (*Amphibia, Reptilia, Aves* and *Mammalia*). Three families are currently recognized: *Ixodidae* (hard ticks), *Argasidae* (soft ticks) and *Nuttalliellidae*. The latest taxonomical synopses of the group (Barkel & Murrell, 2008; Guglielmone et al, 2009; http://www.kolonin.org) updated by Guglielmone et al, 2010 consider valid 700 non-fossil species in *Ixodidae* (Mihalca et al, 2011).

Table 1

Ectoparasites (source http://www.angelfire.com/al/repticare2/page10.html)

Parasite	Preferred Reptile Host	Location
Ticks	Snakes, Lizards, Chelonians	Skin
Mites	Snakes, Lizards, Semi Aquatic turtles	Skin, Scales, Cloaca
Chiggers (Larva of Trombiculi mites)	Snakes, Lizards	Skin folds, Joints
Myiasis (Flies, mosquitoes, fleas and gnats) (Eggs are deposited)	Snakes, Lizards, Semi Aquatic turtles	Skin, Scales
Leeches (Both salt & fresh water species)	Aquatic turtles, Crocodilians	Skin, Mouth

Table 2
Endoparasites (source http://www.angelfire.com/al/repticare2/page10.html)

Parasite	Prefered Reptile Host	Location
PROTOZOA		
Amoebiasis	Snakes, Lizards	Intestinal tract
Coccidiosis	Snakes, Lizards, Chelonians, Crocodilians	Intestinal tract
Cryptosporidiosis	Snakes, Lizards	Intestinal tract
Haemogregarines	Snakes, Lizards, Chelonians, Crocodilians	Blood stream
Plasmodium & Haemoproteus	Snakes, Lizards, Chelonians, Crocodilians	Blood stream
Trypanosomiasis	Snakes, Lizards, Chelonians, Crocodilians/	Blood stream
Ciliated protozoa (Considered to be beneficial to some species)	Lizards, Chelonians	Digestive tract
Flagellated protozoa (Some species not harmful to crocodilians and to crocodilians and chelonians)	Snakes, Lizards, Chelonians, Crocodilians	Digestive tract
Sarcosporidiosis	Aquatic Chelonians	Gallbladder
TREMATODES		
Monogenea	Chelonians	Urinary bladder, Nose, Mouth, Esophagus
Digenea	Crocodilians	Digestive tract
Aspidogastrea	Chelonians	Alimentary tract
Spirorchidae	All, esp. Chelonians	Circulatory system
Styphlodora	Snakes	Renal tubules, Cloaca, Ureters
Cestodes		
Pseudophyllidea	All, esp. Pythons	Muscles, Sub-cutaneous tissue
Proteocephalidea	Snakes, Varanid Lizards	Small intestines
Mesocesttoididae	Snakes, Lizards	Intestinal tract
Anoplocephalidae	Lizards, Chelonians, Snakes	Intestinal tract
Nematotaenae	Lizards	Intestinal tract
Dilepididae	Snakes, Lizards	Liver
NEMATODES		
Ascarids	All	Gastric mucosa
Rhabditida	All, esp. Varanid Lizards	Lungs
Strongyloids	All	Esophagus, Intestine
Acanthocepalins	Chelonians	Small Intestine
Filarids	All	Blood stream
Pentastomiasis	All, esp. Varanid Lizards	Lungs, Esophagus
Oxyurids	Lizards, Chelonians, Some snakes	Lower intestine
Capillaria & Eustrongylides	Snakes, Lizards, Chelonians	Liver, Bile Duct

Ticks of *Ixodidae* family have a cosmopolitan distribution (Iacob, 2002; Bowman, 2008). There are areas where ticks are constantly present as extremely large populations (resulting in epidemics of tickborne diseases) and areas where climatic and biocenotic conditions allow only sporadic and inconsistent survival. Wide spreading of the tick species is based on morphological, physiological and behavioral characteristics (Cosoroabă, 2000). The tick's maximum activity period when they are either in the body or the host, is correlated with the frequency of climate factors (Hornok, 2009). In the equatorial area, ticks are active throughout the year while in the temperate regions ticks are particularly active in spring and autumn. Preferred biotopes by ticks of *Ixodidae* family are unused land, bush land, forest edges and meadows with abundant vegetation or marshes. Animal infestation has a seasonal character corresponding to the seasonal activity of the ticks and is performed by host passing or stopping in the tick's characteristic biotope (Hoch et al., 2008).

Medical importance of *Ixodidae* family resides both in the direct aggression on the host (amphibians, reptiles, birds and mammals) and indirectly by transmission of pathogenic microorganisms (protozoa, bacteria, viruses) (Mitrea et al., 2001; Ocaido et al., 2009). Global warming has induced an attenuation of the season boundaries and the occurrence of unexpected thermal values with chaotic oscillations, unknown until now.

Climate change has led to an extension in the activity of *Ixodidae* family ticks even in winter (Iacob&Tronciu, 2010) increasing the frequency of tick-borne illnesses. Tick-borne illnesses are caused by infection with a variety of pathogens, including rickettsia and other types of bacteria, viruses, and protozoa. Because ticks can harbor more than one disease-causing agent, patients can be infected with more than one pathogen at the same time, compounding the difficulty in diagnosis and treatment.

In general, specific laboratory tests are not available to rapidly diagnose tick-borne diseases. Due to their seriousness, antibiotic treatment is often justified based on clinical presentation alone. Those bitten commonly experience symptoms such as body aches, fever, fatigue, joint pain, or rashes. People can limit their exposure to tick bites by wearing light-colored clothing (including pants and long sleeves), using insect repellent with 20%–30% DEET, tucking their pant legs into their socks, checking for ticks frequently, and washing and drying their clothing (in a hot dryer), as I do with the studesnts on our fieldworks.

Major tick-borne diseases include (http://en.wikipedia.org/wiki/Tick-borne_disease):

Bacteria	**Disease**	**Organism**	**Vector**	**Endemic to**	**Symptoms**	**Treatment**
	Lyme disease	*Borrelia burgdorferi sensu lato*	deer tick *Ixodes scapularis* (*I. dammini), I. pacificus, I. ricinus* (Europe), *I.*	North America and Eurasia	Fever, arthritis, neuroborreliosis, erythema migrans, cranial nerve palsy,	Antibiotics

			persulcatus (Asia)		carditis, fatigue, and influenza like illness	
	Rocky Mountain Spotted Fever	*Rickettsia rickettsii*	wood tick (*Dermacentor variabilis), D. andersoni Amblyomma cajennense*	East, South West US São Paulo, Rio de Janeiro, Minas Gerais (Brazil)	Fever, headache, altered mental status, myalgia, and rash	Antibiotic therapy, typically consisting of doxycycline or tetracycline
	Ehrlichiosis anaplasmosis (formerly human granulocytic ehrlichiosis or HGE)	*Ehrlichia chaffeensis, E. equi (renamed to Anaplasma phagocytophilum*)	lone star tick (*Amblyomma americanum*), *I. scapularis*	South-Atlantic South-Central US		
	Relapsing fever	*Borrelia* species	*Ornithodoros* species	West US		
	Relapsing fever typically presents as recurring high fevers, headaches, and muscular pain, with less common symptoms including rigors, joint pain, altered mentation, cough, painful urination, and rash. Antibiotics are the treatment for relapsing fever, with doxycycline, tetracycline, or erythromycin being the treatment of choice.					
	Tularemia	*Francisella tularensis, A. americanum*	*D. andersoni, D. variabilis*	Southeast, South-Central, West, Widespread US		
Viruses	Tick-borne meningoencephalitis	TBEV aka FSME virus, a flavivirus from family *Flaviviridae*	deer tick (*Ixodes scapularis), I. ricinus (Europe), I. persulcatus* (Russia + Asia))	Europe and Northern Asia		
	Colorado	CTF	*D.*	US (West)		

	tick fever	virus, a coltivirus from *Reoviridae*	*andersoni*			
	Crimean-Congo hemorrhagic fever	CCHF virus, a nairovirus, from *Bunyaviridae*	*Hyalomma marginatum*, *Rhipicephalus bursa*	Southern part of Asia, Northern Africa, Southern Europe		
Protozoa	Babesiosis	*Babesia microti, B. equi*	*I. scapularis, I. pacificus*	US:North east West Coast		
	Cytauxzoonosis	*C. felis*	*D. variabilis* (American Dog Tick)	US: South, Southeast		
Toxin	Tick paralysis	Toxin	*D. andersoni, D. variabilis West*	US: East		

Due to tendency of some people to keeping exotic reptiles as pet animals, more attention was done to captive reptile's parasitic infestation. Studies have shown the ease with which exotic ticks have been introduced into other countries on imported reptiles and disseminated from importers to breeders, zoos, wildlife theme parks, pet stores and private hobbyists (Allan et al, 1998; Burridge et al, 2000a; Simmons&Burridge, 2000).

It has been known for many years that reptiles imported into other locations were on occasion infested with ticks (Becklund 1968; Anderson et al 1981, 1984; Wilson&Barnard 1985; Burridge 2001).

However the risk of contracting a disease from a reptile is generally small, as long as owners practice good hygiene. But people with a suppressed immune system are more at risk than the general population. For example, children under 10 and the elderly are considered to be at higher risk. However, by practicing good sanitation and personal hygiene, keeping reptile out of the kitchen and food preparation areas, it is possible to minimize the risk. It is also important to have all new reptile examined and tested prior to introducing them to home (Tavassoli et al, 2007).

Remarkably little data are available on the impact of reptilian ticks on their primary hosts, reptiles. Although parasitaemia may be high and of long duration, there is little documented evidence that haemogregarines are pathogenic to their reptilian hosts (Telford, 1984). Crimean-Congo hemorrhagic fever virus (CCHFV) is the most often transmitted to man following a tick bite (genus *Hyalomma*) (Faye et al, 1999). In Iran, *Hyalomma* spp. probably plays the main role in transmitting the

infection from animals to humans (Chinikar, 2002). Mites also frequently infest reptiles (Reinchenbach-Klinke&Elkan, 1965; Frank, 1981). Goldberg&Bursey (1991) related that *Ophionyssus natricis* occasionally left the studied side-blotched lizard, *Uta stansburiana* to infest the investigator; on the human host they caused episodes of intense itching that lasted for approximately one day. This has been reported previously (Reichenbach-Klinke and Elkan, 1965). On the lizard these mites tended to aggregate on the upper eyelids and around the tympanum but did not embed in the integument. Allen (1948) reported that lesions in humans from a chigger (*Trombicula irritans*) were evident after 8 months and those from tick bites persisted for 18 months. Tobias (1949) studied tick bite granulomas in a patient 11 months after the bite. Lesions appeared to be similar in both humans and lizards. The human lesions consisted of dense dermal infiltrations of eosinophilic leucocytes, plasma cells and histiocytes, not unlike the lesions reported for *U. stansburiana.* Since tick and chigger lesions persist in humans, it might be expected that a similar time course would occur in lizards.

We like it or not, ticks are part of biodiversity. The dilemma of viewing them as biodiversity or pest has been discussed by several authors (Windsor 1995, Rozsa 1992, Pizzi 2009).

The majority of animal conservation projects are focused on the prospering of the wild animals in their natural environment, and thus they are less exposed to the danger of captivity. Cascades of extinctions are in most situations cases of habitat loss in species for which the habitat is another species, like the case of mutualists, commensals and parasites. For ectoparasites, including ticks, not only the endangered status of the host makes them endangered. Twenty species of coendangered ticks are proposed from those specifically associated with reptiles. Threatened chelonians harbor 12 of them (11 in the genus Amblyomma and 1 in the genus Hyalomma). Ten of these chelonian ticks are specifically associated with terrestrial species of the Testudinidae family. On the other hand, Amblyomma supinoi, which seems to have less host specificity, has all reported hosts being threatened chelonians (Testudinidae, Geoemydidae) from Asia. The only coendangered tick species of chelonians from Eurasia and Northern Africa is Hyalomma aegyptium, parasitic on tortoises of the genus Testudo. We can group the eight coendangered ticks of lizards into two major groups (all in the genus Amblyomma), based on the taxonomic and biogeographic data of their host: ticks of Iguanidae endemic to West Indies and Galapagos and ticks of Varanidae from Indonesia (Mihalca et al, 2011).

Protecting the tick's host, theoretical, the tick himself is protected, too. As part of conservation efforts of threatened vertebrates, actions often involve artificial breeding, re-introduction or relocations. During these processes, a common practice is the removal of external parasites, with devastating impact on their population (Durden&Keirans, 1996).

Ticks as such are not dangerous. Disease, if present, is in most of the situations caused by vectored microbes. Moreover, pathology induced by tick-borne diseases in wild animals is seldom dangerous and is usually related to supplemental stressing factors (Mihalca et al, 2011).

However the risk of contracting a disease from a reptile is generally small, as long as we practice good hygiene and respect all the preventive methods thus I will continue to go in the wild with my students

References

Allaby M. 1999. Dictionary of Zoology. Oxford University Press, Oxford.

Allan SA, Simmons LA, Burridge MJ, 1998. Establishment of the tortoise tick *Amblyomma marmoreum* (*Acari: Ixodidae*) on a reptilebreeding facility in Florida. J Med Entoml; 35: 621-24.

Allen, A. C. 1948. Persistent "insect bites" (dermal eosinophilic granulomas) simulating lymphoblastomas, histiocytoses, and squamous cell carcinomas. American Journal of Pathology 24: 367-387.

Anderson JF, Magnarelli LA, Keirans JE, 1981. Aponomma quadricavum (*Acari: Ixodidae*) collected from an imported boa, *Epicrates striatus*, in Connecticut. J Med Entomol, 18: 123–125.

Anderson JF, Magnarelli LA, Keirans JE. 1984; Ixodid and argasid ticks in Connecticut, U.S.A.: *Aponomma latum, Amblyomma dissimile, Haemaphysalis leachi* group, and *Ornithodoros kelleyi (Acari: Ixodidae, Argasidae)* Inter J Acarol. 10: 149-51.

Barker SC, Murrell A, 2008. Systematics and evolution of ticks with a list of valid genus and species names. In Ticks: Biology, Disease and Control. Edited by: Bowman AS, Nuttall PA. Cambridge: University Press;1-39.

Becklund WW1968; Ticks of veterinary significance found on imports in the United States. J Parasitol. 54: 622-28.

Bowman D. 2008. Georgi's Parasitology for veterinarians. Saunders, Philadelphia.

Burridge MJ, Simmons LA, Allan SA. 2000a , Introduction of potential heartwater vectors and other exotic ticks into Florida on imported reptiles. J Parasitol.; 86: 700-4.

Burridge MJ. 2001; Ticks (*Acari: Ixodidae*) spread by the international trade in reptiles and their potential roles in dissemination of diseases. Bul Entomol Res. 91: 3-23.

Chinikar S. 2002; The specific serological investigation of suspected human and animals to have Crimean-Congo hemorrhagic fever in various parts of Iran using ELISA. Hakim. 4: 294- 300.

Clark L. R. 1970. Analysis of pest situations through the life system approach. In Concepts of Pest Management (R. L. Robb and E. F. Guthrie, ed.) North Carolina State University, North Carolina.

Cosoroabă I. 2000. Veterinary parasitology: diseases caused by mites and insects [In Romanian]. Editura Mirton, Timişoara, Romania, pp. 270-310.

Dempster J. P. 1975. Animal Population Ecology. Academic Press, London.

Durden LA, Keirans JE. 1996: Host-parasite co-extinction and the plight of tick conservation. Am Entomol, 42:87-91.

Durden LA, Keirans JE. 1996,Host-parasite co-extinction and the plight of tick conservation. Am Entomol 42:87-91.

Faye O, Cornet JP, Camicas JL. 1999; Experimental transmission of Crimean-Congo hemorrhagic fever virus: role of 3 vector species in the maintenance and transmission cycles in Senegal. Parasite. 6: 27- 32.

FRANK, W. 1981. Ectoparasites. In Diseases of the Heptilia. Vol. 1, J. E. Cooper and 0. F. Jackson (eds.). Academic Press, London, England, pp.359-383.

Goldberg S. R. and Bursey C.R., 1991, Integumental lesions caused by ectoparasites in a wild population of the side-blotched lizard (*Uta stansburiana*), Journal of Wildlife Diseases, 27(1),pp. 68-73

Guglielmone AA, Robbins RG, Apanaskevich DA, Petney TN, Estrada-Peña A, Horak IG. 2009, Comments on controversial tick (*Acari: Ixodida*) species names and species described or resurrected from

2003 to 2008. Exp Appl Acarol 48:311-327.

Guglielmone AA, Robbins RG, Apanaskevich DA, Petney TN, Estrada-Peña A, Horak IG, Shao R, Barker SC.2010, The Argasidae, Ixodidae and Nuttalliellidae (Acari: Ixodida) of the world: a list of valid species names. Zootaxa, 2528:1-28.

Hoch T., Monnet Y., Agoulon A. 2008. Modélisation de la dynamique de population d'Ixodes ricinus: influence de la migration des hôtes. Epidemiol. Sante Anim. 53:45-50.

Hornok S. 2009. Allochronic seasonal peak activities of Dermacentor and Haemaphysalis spp. Under continental climate in Hungary. Vet. Parasitol. 163:366-369.

Iacob O. 2002. Diagnosis of parasitic diseases in animals [In Romanian]. Editura Ion Ionescu de la Brad, Iaşi, Romania, pp. 176-180.

Iacob O. C., Tronciu C., 2010, Hivernal infestation of sheep with Ixodidae in Botosani area: unusual epidem miological aspects, Sci Parsitol 11(4):185-190, December 2010, ISSN 1582-1366

Kolonin GV: Fauna of Ixodid Ticks of the World.[http://www.kolonin.org].

Mihalca A. D., Gherman C. M, Cozma V, 2011, Coendangered hard-ticks: threatened or threatening? http://www.parasitesandvectors.com/content/4/1/71

Mitrea I.L., Ioniţă M., Moise G., Găină D., Onofrei O. 2001. Ixodidae infection in animals from North and South Eastern Romania [In Romanian]. Lucr. Şt., vol. 44, USAMV Iaşi, Romania, pp. 523-529.

Ocaido M., Muwazi R.T., Opuda J.A. 2009. Economic impact of ticks and tick-born diseases on cattle production systems around Lake Mburo National Park in South Western Uganda. Trop. Anim. Health Prod. 41:731-739.

Pizzi R. 2009, Veterinarians and taxonomic chauvinism: the dilemma of parasite conservation. J Exot Pet Med, 18:279-282.

Rheichenbach-Klinke, H., Elkan E. 1965.The principal diseases of lower vertebrates. Academic Press, London, England, 600 pp.

Rózsa L. 1992, Points in question. Endangered parasite species. Int J Parasitol, 22:265-266.

Simmons LA, Burridge MJ.2000;. Introduction of the exotic ticks *Amblyomma humerale Koch* and *Amblyomma geoemydae (Cantor) (Acari: Ixodidae)* into the United States on imported reptiles. Int J Acarol. 26: 239-42.

Tavassoli E., Rahimi-Asiabi N., Tavassoli M., 2007, *Hyalomma aegyptium* on Spur-thighed Tortoise (*Testudo graeca*) in Urnia Region West Azerbaijan, Iran, Iranian J Parasitol: Vol.2, No. 2, pp. 40-47

Telford SR. 1984, Haemoparasites of reptilesIn: Hoff GL, Frye FL, Jacobson ER (Eds) Diseases of amphibians and reptiles. New York, Plenum Press;. p. 385-517.

Tobias, N. 1949. Tickbite granuloma. Journal of Investigative Dermatology 12: 255-259.

Waudby HP, Petit S, Weber D. 2008, Human perception and awareness of ticks in a South Australian rural community and implications for management of *Amblyomma triguttatum triguttatum*. Exp Appl Acarol, 45:71-84.

Wilson N, Barnard SM. 1985, Three species of *Aponomma (Acari: Ixodidae*) collected from imported reptiles in the United States. Florida Entomologist.; 68: 478-80.

Windsor DA. 1995, Equal rights for parasites. Conserv Biol 9:1-2.

http://www.angelfire.com/al/repticare2/page10.html

http://www.kolonin.org

http://en.wikipedia.org/wiki/Tick-borne_disease