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Flea-Borne Rickettsiae in Almaty Oblast, Kazakhstan

Talgat Nurmakhanov[1], Yerlan Sansyzbayev[1], Heidi St. John[2], Christina Farris[2] and Allen Richards[2]

[1]Kazakh Scientific Center for Quarantine and Zoonotic Disease, Almaty, Kazakhstan; [2]Naval Medical Research Center, Silver Spring, MD, USA

Introduction

Flea-borne diseases in Kazakhstan have been a significant health risk to inhabitants and visitors for ages, particularly plague. Flea-borne rickettsial disease threats are unknown in Kazakhstan, we therefore initiated a study to detect and identify flea-borne rickettsiae among fleas collected in the Almaty Oblast, in southeastern Kazakhstan.

Methods

Fleas (n=248) were collected by members of the Taldykorgan anti-plague station from live captured rodents (i.e. the Great Gerbil-*Rhombomys opimus*) and from the rodent burrows collected at five Rayons (districts) within Almaty Oblast (province) during 2015. Fleas were identified morphologically by entomologic keys and then pooled together (1-50 fleas/pool) by species and host/rodent burrow. DNA was extracted from triturated fleas (PrepMan Ultra kit) and tested by genus- (*Rickettsia*), group- (*R. felis* genogroup), and species- (*Rickettsia typhi, Rickettsia felis* and *Candidatus* Rickettsia asemboensis) specific quantitative real-time PCR (qPCR) assays, Rick17b, RfelG, Rtyph, and Rasemb, respectively. With GPS coordinates and GIS (ArcGIS) a distribution map was developed.

Results

Of 248 fleas (*Coptopyslla lamellifer 45, Echidnophaga oschanini 1, Nosopsyllus laeviceps 10, Nosopsyllus tarsus 1, Nosopsyllus turkmenikus 1, Paradoxophsyllus teretifrons 2, Xenopsylla conformis 1, Xenopsylla gerbilli 87, Xenopsylla hirtipes 26, and Xenopsylla skrjabini 74*) assessed by qPCR 56 were identified as having: *Rickettsia* spp. only n=20, *R. felis* genogroup n=8, *R. felis* n=1, and *Ca.* R. asemboensis n=27. *X. gerbilli* was the flea most frequently found to be infected with a rickettsiae (44 of 87;50.6%) and 25 of the 44 rickettsia-infected fleas (56.8%) were infected by *Ca.* R. asemboensis. *X. hirtipes* was the next most commonly infected flea (4 of 26; 15.4%). One flea was infected with *R. felis*, and none were infected with *R. typhi*. *R. felis* and *R. typhi* cause flea-borne spotted fever and murine typhus, respectively.

Conclusions

Fleas captured from *R. opimus* or at their burrows were infected with rickettsiae. Most commonly found rickettsia-infected flea species was *X. gerbilli* and the most commonly found rickettsia was *Ca.* R. asemboensis. Future studies may include testing these and other fleas samples for the presence of other disease agents including *Bartonella* spp. and *Yersinia pestis*.

Keywords

flea-borne disease; rickettsiae; Kazakhstan

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