Flea-Borne Rickettsiae in Almaty Oblast, Kazakhstan

Talgat Nurmakhanov¹, Yerlan Sansyzbayev¹, Heidi St. John², Christina Farris² and Allen Richards²

¹Kazakh Scientific Center for Quarantine and Zoonotic Disease, Almaty, Kazakhstan; ²Naval 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 (Coptopsylla lamellifer 45, Echidnophaga otschani 1, Nosopsyllus laeviceps 10, Nosopsyllus tarus 1, Nosopsyllus turkenicus 1, Paradoxopsyllus 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 flea samples for the presence of other disease agents including Bartonella spp. and Yersinia pestis.

Keywords

flea-borne disease; rickettsiae; Kazakhstan

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