



HOKKAIDO UNIVERSITY

Title	Effects of dietary shift and altered helminth infection on the gut microbiota of two sympatric rodents in urban environments [an abstract of dissertation and a summary of dissertation review]
Author(s)	Anders, Jason Lee
Degree Grantor	北海道大学
Degree Name	博士(環境科学)
Dissertation Number	甲第14336号
Issue Date	2021-03-25
Doc URL	https://hdl.handle.net/2115/81922
Rights(URL)	https://creativecommons.org/licenses/by/4.0/
Type	doctoral thesis
File Information	Jason_Anders_Lee_abstract.pdf, 論文内容の要旨



学 位 論 文 内 容 の 要 旨

博士 (環境科学)

氏 名 Jason Lee Anders

学 位 論 文 題 名

Effects of dietary shift and altered helminth infection on the gut microbiota of two sympatric rodents
in urban environments

(都市化にともなう食性と寄生虫相の改変が同所的に生息する齧歯類の腸内細菌叢に及ぼす影響)

Urban areas represent the most extreme form of anthropogenic ecosystem modification and have a profound effect on the wildlife that inhabit them. One area of recent but rapidly increasing interest is how urbanization affects the gut microbial communities of wild animals. The gut microbiota is pivotal for proper development, nutritional uptake, and immune system function and therefore essential to maintaining overall health. Plasticity in what constitutes a healthy gut microbial community may aid in the successful adaption to rapidly changing environments. Although studies have shown distinct changes in the gut microbiome of urban animals as compared to conspecifics in less disturbed habitats, few studies have investigated the underlying causes. Furthermore, differences in among species life histories such as dietary niche should impact how the gut microbiome is altered within urban environments due to host species-specific requirements in functionality, yet no study has investigated changes in multiple species experiencing the same degree of urbanization. The focus of this thesis is to understand how the gut microbiome of two sympatric species of rodents, the large Japanese field mouse (*Apodemus speciosus*) and the grey red-backed vole (*Myodes rufocanus*), is altered within urban ecosystems and what factors may be affecting those changes. First, I evaluated the heterogeneity in the gut microbial community along the gastrointestinal tract (i.e. small intestine, cecum, colon, and rectum) of each species as well as between species differences in individuals from a more natural environment (i.e. national forest). I found distinct differences between the small intestine and the cecum, colon, and feces in both spe

cies as well as host species-specific gut microbial communities in all gut regions. Next, I examined differences in dietary niche between urban and natural populations using stable isotope analysis and how it affects the gut microbiome of urban populations. I found that both rodent species experienced a dietary niche expansion as well as a shift towards different dietary items in concordance with their life histories within the urban environment that may be related to novel anthropogenic food resources. These dietary changes were associated with specific changes in the gut microbial community structure; however, the relationship was not always clear. Finally, I analyzed differences in the intestinal helminth communities between ecosystems and if their interactions with the gut microbial community is altered by urbanization. I found that urbanization had a negative impact on most species of helminths in both rodent. Furthermore, I found that both helminth prevalence and abundances were associated with changes in alpha diversity and community structure of the gut microbiome, but there was little consistency among gut region or ecosystem type suggesting a complex host-microbe-helminth-environmental interaction. Together, these results suggest that alteration of the gut microbiome in urban areas is species specific but determining the source of alteration is complex.