

タヌキマダニ、アカコッコマダニ、ハシブト
マダニから分離されたスピロヘータの性状と
ライム病ボレリアとの比較

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Applied and Environmental Microbiology 62(7), 2338-
2344(1996)

**Characterization of Spirochetes Isolated from Ticks
(*Ixodes tanuki*, *Ixodes turdus*, and *Ixodes columnae*)
and Comparison of the Sequences with Those of
Borrelia burgdorferi Sensu Lato Strains**

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ABSTRACT *Ixodes persulcatus* serves as a tick vector for *Borrelia garinii* and *Borrelia afzelii* in Japan; however, unidentified spirochetes have been isolated from the other species of ticks. In this study, 13 isolates of ticks (6 from *Ixodes tanuki*, 6 from *Ixodes turdus*, and 1 from *Ixodes columnae*) and 3 isolates from voles (*Clethrionomys rufocanus*) were characterized by sodium dodecyl sulfate-polyacrylamide gel electrophoresis, rRNA gene restriction fragment length polymorphism (RFLP ribotyping), partial sequencing of outer surface protein C (OspC) gene, whole DNA/DNA hybridization, and 16S rRNA gene sequence comparison. All of the results revealed that these *Borrelia* strains clearly represent at least two new species. The third is likely although additional strains have to be isolated and characterized before separate species is designated. We designated all isolates of *I. tanuki* and *C. rufocanus* as the group Hk501 and all isolates of *I. turdus* as the group Ya501. Phylogenetic analysis based on 16S rRNA gene sequences distinguished these *Borrelia* strains from

hitherto known *Borrelia* species. Furthermore, each genomic group involved own tick vectors with enzootic cycles was quite different to each other and also from those of Lyme disease *Borrelia* species known to occur in Japan. The results of 16S rRNA gene sequence comparison suggest that the strain Am501 from *I. columnae* is related with the group Hk501 although its level of DNA relatedness was less than 70%.

抄録 日本においてはシュルツェマダニがライム病ボレリアを保有していることは既に報告されているが、シュルツェマダニ以外のタヌキマダニ、アカコッコマダニ、ハシブトマダニといった稀少マダニ種もスピロヘータを保有している。そこで、これらのマダニが保有しているスピロヘータの SDS-PAGE、菌体表層蛋白 (OspC) 遺伝子解析、DNA/DNA交雑法、16S rRNA 遺伝子解析を行った。その結果、稀少マダニ種から分離されるスピロヘータは既存の種とは異なるボレリアで、タヌキマダニから分離される group Hk501 とアカコッコマダニから分離される group Ya501 に大別された。また、ハシブトマダニ由来のボレリア分離株は 16S rRNA 遺伝子による系統解析では group Hk501 に分類されたが、DNA 相同性が 70% 以下であることから別種である可能性が示唆された。

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