Kidney Structure, as a Function of Conserving Water, of Three Species of Red-backed Vole (*Clethrionomys*) in Hokkaido

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*Clethrionomys rufocanus bedfordiae* seems to require more water than *C. rutilus mikado* (H. Abe and M. Maeda, personal communication). These two species are found in different vegetation types, and the effect of their water requirements on habitat preferences has remained unsolved (Abe, 1966).

Spéder (1944) showed that mammals inhabiting arid regions have relatively thicker renal medullae than mammals from more mesic habitats. The great evaporative water loss from the skin and respiratory tract of the rodent acts on the water-conserving mechanisms of the kidney (Fyhn, 1979). The ability to conserve urinary water is correlated with the relative size of medullary thickness or area (Schmidt-Nielsen and O'Dell, 1961; Heisinger and Breitenbach, 1969; Brownfield and

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*Fig. 1. Midsagittal sections of the kidneys of Clethrionomys rufocanus bedfordiae (A) and C. rutilus mikado (B). Scales represent 2 mm.*
WUNDER, 1976). This study aims to certify the differences in renal structure among these two species and C. montanus, which is closely related to C. rufocanus bedfordiae (MURAKAMI, 1981).

Renal structural indices of the ability to conserve water were calculated from midsagittal sections of the kidney. Methods of index analysis were the same as described in a previous paper (YABE, 1982). Of the indices quoted in the paper, I used two which had smaller coefficients of variation: percent medullary thickness (PMT) (HEISINGER and BREITENBACH, 1969), and percent medullary area (PMA) (BROWNFIELD and WUNDER, 1976). To eliminate age as a possible source of variation, only adult voles were used. The criteria of adult body weight were over 30 g and 20 g for C. rufocanus bedfordiae and C. rutilus mikado, respectively (K. TSUCHIYA, personal communication). C. montanus (a female, 46 g) was identified by Y. FUJIMAKI as an adult.

Fig. 1 shows midsagittal sections of C. rufocanus bedfordiae and C. rutilus mikado. The differences among three species in mean values of each index were not significant at 1% level (Table 1).

Thus these three species probably have similar renal efficiencies to conserve urinary water. The differences in their habitat preferences or water requirements, if any, may be due to other physiological and behavioral adaptabilities.

Dr. K. TSUCHIYA, Miyazaki Medical College, Dr. H. ABE, Hokkaido University, Dr. Y. FUJIMAKI, Obihiro University of Agriculture and Veterinary Medicine, and Mr. Y. SHIMADA, Azabu University, kindly provided vole specimens.

Table 1. Arithmetic means of percent medullary thickness (PMT) and percent medullary area (PMA) with one standard deviation.

<table>
<thead>
<tr>
<th>Species</th>
<th>N</th>
<th>PMT</th>
<th>PMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. rufocanus bedfordiae</td>
<td>9</td>
<td>66.9 ± 3.77</td>
<td>31.1 ± 3.83</td>
</tr>
<tr>
<td>C. rutilus mikado</td>
<td>40</td>
<td>68.6 ± 3.30</td>
<td>33.7 ± 3.29</td>
</tr>
<tr>
<td>C. montanus</td>
<td>2</td>
<td>70.7 ± 3.25</td>
<td>33.2 ± 1.69</td>
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</tbody>
</table>

* The number of kidneys that were measured.

References

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with English abstract).


