Continuous Ambulatory Peritoneal Dialysis Improves Immunodeficiency in Uremic Patients

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Dear Sir,

The high incidence of infections and malignancies in uremic patients [1, 2] is a clear indication of the immuno-suppressive effect of uremia [3–5]. Numerous hypotheses have been put forward, including protein-calorie malnutrition [6], vitamin deficiency [7], and lowered blood zinc levels [8], but so far none of them has proved satisfactory. A more recent suggestion is that serum factors (medium molecular weight) may be responsible for this phenomenon in vitro [9], and in experimental animals [10]. There is still considerable debate however, as to whether middle molecules play a toxic role in cell-mediated immunity in man [11].

In order to evaluate the effect of different degrees of removal of middle molecules by dialysis treatment on cellular immunodeficiency, we analyzed the immunological state of 60 uremic patients treated by continuous ambulatory peritoneal dialysis (CAPD) and hemodialysis (HD) during a follow-up of 12 months.

30 healthy people were also studied as controls. DNCB and PPD skin tests, E- and active E-rosettes, the E-rosette inhibition assay were investigated as markers of cellular immunity [12]. The results of our study are summarized in table I. CAPD patients showed an improvement in cellular immunity, with a significant increase in the E-rosette count (p < 0.01), and improved delayed hypersensitivity reactions 3 months after treatment was started, while no difference was observed in HD patients. The most compelling evidence for a role of middle molecules in cell-mediated deficiency has been provided by the E-rosette inhibition test. Serum from CAPD patients showed a significant reduction of the percentage of E-rosette inhibition (p < 0.02), even 1 month after treatment was started, and the results were confirmed at the following controls. In the HD patients the percentage of inhibition remained high throughout our study.

Our results are in agreement with previous findings in vitro and in animals [9, 10]. Since CAPD removes middle molecules more satisfactorily than hemodialysis [13], and

Table I. Cellular immunity in CAPD and HD patients

<table>
<thead>
<tr>
<th></th>
<th>CAPD (25)</th>
<th>HD (35)</th>
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<tbody>
<tr>
<td>DNCB</td>
<td>10/25</td>
<td>10/35</td>
</tr>
<tr>
<td>PPD</td>
<td>15/25</td>
<td>15/35</td>
</tr>
<tr>
<td>E-rosette</td>
<td>10/25</td>
<td>10/35</td>
</tr>
<tr>
<td>Active E-rosette</td>
<td>5/25</td>
<td>5/35</td>
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</tbody>
</table>

DNCB and PPD skin tests, E- and active E-rosettes, the E-rosette inhibition assay were investigated as markers of cellular immunity [12].
### HD (35) a

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<table>
<thead>
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<tbody>
<tr>
<td>Controls (30)</td>
<td></td>
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<tr>
<td>DNCB positive %</td>
<td>24(6)</td>
<td>36(9)</td>
</tr>
<tr>
<td></td>
<td>48 (12)</td>
<td>28.6 (10)</td>
</tr>
<tr>
<td>DNCB negative %</td>
<td>76 (19)</td>
<td>64 (16)</td>
</tr>
<tr>
<td>PPD positive %</td>
<td>40 (10)</td>
<td>40 (10)</td>
</tr>
<tr>
<td>PPD negative %</td>
<td>60 (15)</td>
<td>60 (15)</td>
</tr>
<tr>
<td>E-rosettes %</td>
<td>26 ± 12</td>
<td>41 ± 7*</td>
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Percentage of inhibition
76 ± 11
33 ± 9**
34 ± 5**
77 ± 9
73 ± 12
74 ± 11
10 ± 5
*p < 0.01 vs. value before treatment; **p < 0.02 vs. value before treatment.
a = Before treatment was started; b = 3 months after treatment was started; c = 12 months after
treatment was started.
Number of patients per group shown in parentheses.
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since cell-mediated immunity improves in subjects treated by CAPD, it seems extremely likely
that middle molecules have an immunosuppressive effect. The significance of this in terms of
resistance to infections and malignancy needs further study.

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