Wearable Artificial Kidney
Home Hemodialysis Devices: Providing Optimal HD with Minimal Burdens

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Objectives
• Describe the wearable artificial kidney (WAK) circuit
• Discuss potential benefits of WAK

Burdens of Hemodialysis
• Foods High in Potassium
  - Avocado, beans, peanut butter, spinach, fish

Minimizing Burdens
• Portable
• Liberal diet
  • Fluid, potassium, phosphate
• Less medications

Hemodialysis (HD) Circuit
WAK Circuit

Regenerating Dialysate

WAK Circuit

Early WAK Trials

WAK 1.0 Trials

London Trial

Table: Function of Sorbents and Regeneration of Dialysate

<table>
<thead>
<tr>
<th>Sorbent</th>
<th>Sorbent Function</th>
<th>Regenerated Solutes</th>
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</thead>
<tbody>
<tr>
<td>Activated Carbon Layer</td>
<td>Absorption of solutes</td>
<td>urea, creatinine, small molecules</td>
</tr>
<tr>
<td>Zirconium Phosphate Layer</td>
<td>Exchange of phosphate</td>
<td>calcium, phosphate</td>
</tr>
<tr>
<td>Rare Earth Carboxylate Layer</td>
<td>Exchange of rare earth elements</td>
<td>metal ions</td>
</tr>
</tbody>
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- 1st tested in vitro
- Then animal studies in pigs

WAK 2.0 Trial

Seattle, Washington
First WAK Trial in the USA

- To establish the ability of the WAK to deliver continuous dialysis safely for 24 hours
- To determine clearance characteristics for urea and other retention solutes over 24 hours of treatment

WAK 1.0 Trials

- 1st Trial - Vicenza, Italy
  - focused on safety & efficacy of ultrafiltration
- 2nd Trial - London, England
  - focused on full capability including hemodialysis
- 14 Patients Total
- 6-8 hours wearing WAK

Victor Gura, MD

Seattle Trial

WAK Circuit
WAK 2.0
Collaboration with Kidney Research Institute (KRI) & University of Washington (UW)

- 7 patients with ESRD undergoing HD, November 2014 through April 2015
- Inclusion:
  - Must have a HD catheter (no fistula/graft)
  - Weight 45-100kg
  - Dialysis > 3 months, in-center or home
  - Agree to 24 hour highly monitored treatment in hospital
  - Telemetry, frequent vital signs
  - Labs approximately every 4 hours
  - Strictly monitored intake/output

WAK 2.0 Trial - Conclusions

- 24-hour treatment with the WAK was safe, well-tolerated, and resulted in effective electrolyte homeostasis, solute clearance, and volume removal.
- Acid-base and electrolyte homeostasis was maintained without restriction on patients’ dietary choices and without phosphorus-binding medications
- Subjects reported greater treatment satisfaction with the WAK compared to conventional HD treatment

Future of the WAK?

- WAK 3.0 is in development
  - Lighter, Smaller
  - Continue to focus on increasing quality of life for individuals living on dialysis
  - Trial for > 24 hours & in the home environment

THANK YOU!
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