Wearable artificial kidney: Cryo-reclamation of dialysate

Department of Extracorporeal Therapy Systems

Dialysis
- Water requirement: 200 L / week
- One out of 1000 individuals
- Pure tap water available?
- Can Monday, Wednesday, and Friday be blocked?
- Reduced life expectancy OK?

Scientific proof already done
Uremic toxins cryo-removal by hand experiments (see chart at right).

Now we’re about to automatize it using a lab demonstrator
Automatic removal by an ice wash column
- wash column (picture top)
- electronics (picture bottom)
- software (underway)
- lab demonstrator (pending)
- worldwide protection (pending, EP 3 272 375 A1)
**Chance: True wearable artificial kidney**

**Features**

High class dialysis everywhere
- at home, at work
- during travel / aircraft
- supply by solar panel
- supply by cars
- water independance
- long term survival
- refill 90 s every 2–3 h
- dialysis center water (avoids reverse osmosis)
- Get the 3 days/w occupied by dialysis released

**Challenge & Fortune**

- Participate in a skilled technical development project
- Clinical trials to prove an innovative technology
- Speed up of prototype & series development
- Experienced dialysis project management
- Be the first in market with a truly wearable artificial kidney
- Dialysis will be diversified by this project
- Patents cover US, Canada, Europe, China & west pacific

**Kidney failure needs smart response to water scariness**

Separation by ice: Flavor vs water-ice

Total uremic toxins content in patient dialysate after single cryo run (purified, original, concentrated from orange stained dry sample)

<table>
<thead>
<tr>
<th>Amount</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1/10</td>
<td>&lt; 10 %</td>
</tr>
<tr>
<td>1</td>
<td>100 % (org)</td>
</tr>
<tr>
<td>&gt; 10</td>
<td>&gt; 1000 %</td>
</tr>
</tbody>
</table>

**Urea, phosphate, cunductivity and color saturation (HSB model) vs creatinine: Correlation by 1x cryo-purification**

https://academic.oup.com/ndt/article/33/suppl_1/i181/4997537, Goldau R et al

**Contact**

Dr. Rainer Goldau  
Department of Extra-corporeal Therapy Systems  
Tel. +49 381 494-2610  
rainer.goldau@izi.fraunhofer.de  
Fraunhofer Institute for Cell Therapy and Immunology  
Schillingallee 68  
18057 Rostock  
Germany  
www.izi.fraunhofer.de