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An Efficient, Simple Dialyzer

The problem:

The design of a miniature dialyzer suitable for small animals should have a low priming volume, thin blood films, countercurrent flow, even flow patterns, and an effective means of membrane support.

The solution:

An easily assembled, efficient, countercurrent, sandwich-type barrier dialyzer was developed.

How it's done:

The developed dialyzer contains six blood chambers that provide a 500-cm² membrane area. These chambers can be connected in series or in parallel for a 5:1 or 2.7:1 ratios of dialysate to blood flow, respectively. With the six blood chambers in series, the priming volume of the dialyzer is 7 ml.

The design contains improved modifications of the Dialung and Klung models. In addition, it includes a 2.1-mm-thick Silastic sheet, or barrier, as the membrane support in the blood chamber. This barrier prevents interdigitation of opposing groups of cones which tend to occlude areas of the blood chamber in the Klung. Assembly of the entire unit in series can be done in 10 min.

The membranes used in this design are cuprammonium cellulose film (Cuprophane PT 150) which are the most permeable of those in general use.

The performance of these units was compared with thirteen other dialyzers. To standardize results, permeability and dialysance/m² were obtained at 50, 100, 200 ml/min per m² of blood flow. Results show that

the barrier dialyzer compares favorably with the best large units. At 23°C and 50 ml/min per m² blood flow, the unit provides permeability of 200 and dialysance/m² of 48.

Notes:

1. In addition to serving as an efficient artificial kidney, the barrier dialyzer is potentially an efficient artificial lung. The design should be applicable to the development of dialyzers and membrane oxygenators for human use.
2. Requests for further information may be directed to:
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Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non-exclusive or exclusive license for its commercial development should be addressed to:

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