Novel technologies for blood purification

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Abstract:
The number of patients with End Stage Renal Disease (ESRD) is progressively increasing and the need for renal replacements therapies is expanding. Worldwide, over 2 million patients suffer from ESRD and each year that number grows by 5%. As transplant options are limited, approximately 70% of patients receive (hemodialysis and peritoneal) dialysis treatments. Despite the high health care costs of dialysis treatment (in the Netherlands over 70,000 Euro per patient per year), dialysis is only partially successful in the treatment of patients with ESRD. Mortality (15-20% per year) and morbidity of these patients remain excessively high, whereas their quality of life is dismally low. Current hemodialysis (HD) therapy achieves insufficient removal of toxins (mainly removes small, non-protein bound substances by diffusion, leaving toxic larger middle-sized molecules and protein-bound uremic toxins untouched). In addition, inadequate volume and blood pressure control, due to the intermittent character of HD contributes to the high mortality in dialysis patients. Continuous treatment (for example using a portable system) or increased frequency and duration can contribute to gradual removal of excess fluids and improve clearance of uremic waste, potassium and phosphate.

In this seminar, we will discuss novel concepts for achieving prolonged and effective patient treatment including:

- Development of a new membrane which combines dialysis with adsorption for toxin removal (the so called mixed matrix membranes) [1-3]
- Development of a bioartificial kidney system, which combines artificial membranes with kidney epithelial cells [4].

Bio:
Prof. Dr. Dimitrios Stamatialis was born in Sarti Halkidiki Greece (1968). He studied Chemistry at the University of Athens - Greece (1989) and obtained his PhD on membrane science at the physical chemistry department of the University of Athens - Greece (1995). He is currently professor in the department of biomaterials Science and technology at the University of Twente, MIRA institute for biomedical engineering and technical medicine – The Netherlands.

His research interests are focused on biomedical membranes and (bio) artificial organs with spearhead activities the development of (bio) artificial kidney,
liver and pancreas. He currently supervises 7 PhD students and 2 Postdoctoral researchers. He is author of 100 scientific papers and inventor of 7 patents. He is a member of European Membrane Society (EMS), European Society of Artificial organs (ESAO), European society of Biomaterials, European Tissue Engineering society (ETES) and he is regularly member of the scientific commissions of various conferences organized by these societies.

Prof. Stamatialis also performs teaching of various courses in the BSc and MSc of the biomedical engineering and technical medicine studies of the University of Twente, including courses on membrane science and technology, (bio) artificial organs and tissue regeneration.