

Nanomaterials to help kidney patients

Nanomaterials offer new hope not just for dialysis treatment but also in the shape of a portable artificial kidney that enables continual and mobile treatment for patients.

With ageing and exponential growth in the incidence of diabetes patients, the number of kidney patients is expected to rise tremendously in the near future – by six to eight per cent annually. Serious kidney failure is a debilitating and irreversible disease and patients for whom there is no suitable donor have to undergo dialysis, a life-saving but still serious and drastic process. Dialysis takes over just ten to twenty per cent of the liver function and is associated with many complications. The treatment is a severe curtailment of the quality of life. Moreover, life expectancy is limited, with the annual mortality rate being one in five dialysis patients.

Kidney patients would feel much better if their blood could be purified continually, 24 hours per day. A portable artificial kidney brings that within reach. It would represent a huge improvement in the quality of life; the patient would no longer need to spend several hours three times a week in the dialysis centre. This device can purify the blood continually just like nature kidneys, give the patient more freedom and lead to fewer complications.

SORPTION FILTER PAD

The emergence of nanomaterials offers new hope for dialysis patients. In a co-funding project new technology is currently being developed to filter blood plasma using a 'sorption filter pad' in which the toxins are captured in a porous matrix containing nanoparticles. The nanomaterials are expected to be so effective that relatively few quantities are needed to remove the daily amount of waste substances. This enables much better cleaning of the blood to be achieved than the current hemodialysis and so lead to a significant boost to the kidney patient's health and less need for medical care. If such development proves successful, this technology will replace conventional haemodialysis. TNO is cooperating with co-financier Nanodialysis BV in this project.

NEPHRON+

In the longer term a portable filtration system, or portable artificial kidney, will be possible. The technology developed in the project will also become part of the European *Nephron+* project that is geared to the development of the next generation solution for kidney dialysis: a continual cleaning of the blood using a portable system. In the context of this project TNO is developing a sensor to constantly measure the concentration of harmful substances in the blood and the readings will indicate when intervention is necessary if there is a hitch in the blood-cleaning process.

Nephron+ began on 1 April 2010 and runs for four years.

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The portable artificial kidney has to provide an alternative to current kidney dialysis.

Photo: Evelyne Jacq / HH

BATTLE OF THE ICE 2010 FOR THE ARTIFICIAL KIDNEY

On 20 February the Battle of the Ice skating event took place in Biddinghuizen. It challenged skaters to skate 200 kilometres in a day, individually or as a team of eight, and so make 500,000 euros for the development of the artificial kidney. Because TNO is involved in the development of the artificial kidney, it took up the invitation of Nanodialysis BV to skate. TNO's Dr Arjen Boersma, Dr Tessa ten Cate, Dr Hartmut Fischer and Sjoukje Wiegersma were part of the Nanodialysis team.