In Memoriam

Willem J. Kolff: A great man

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Willem Kolff, often called the father of the artificial kidney, died in January 2009, 3 days before his 98th birthday. During his long life he received numerous honors and accolades for his work. Many people thought he should have received the Nobel Prize, but as he once said himself, they do not honor people who build mouse traps.

Yet because of the mouse traps he built, almost one million people are now alive who otherwise would have died. True, he did not invent dialysis. Others worked before him, and some developed dialyzers concurrently with his. But Dr Kolff combined a dogged determination with a flair for salesmanship, resulting in dialysis becoming a practical worldwide method of treating uremia.

The details of Dr Kolff’s life are well known. He published his early experiences in March 1965 in the Annals of Internal Medicine in an article that as a fellow I was assigned to edit. At the outbreak of World War II he left his job at the University of Groningen in protest against the actions of the Nazis, and took up a position at the local hospital in the small town of Kampen. There he developed his dialysis machine in collaboration with Mr. Berk, an engineer, availing himself of the recent advent of cellophane (used to make sausage skin) and of heparin. After several attempts he settled on an apparatus consisting of 20 m of cellophane tubing wrapped around a horizontal drum half submerged in a bath filled with dialysate. He had to use rubber tubes and glass connections, because plastics were not yet available. A pump was used to rotate the drum, but on bad days Mrs Kolff had to take turns cranking the machine. As no other funds were available, Dr Kolff used his own money to build the device.

Fifteen patients were dialyzed in the spring of 1943 before the first survived—a woman who had been a Nazi collaborator. Upon waking up, she reportedly said she was going to divorce her husband, which she did. Later 8 dialysis machines were built, of which Dr Kolff sent one to London, one to New York, and one to Montreal. He also sent one to Poland, but it disappeared somewhere behind the Iron Curtain.

In 1947 Dr Kolff moved to the Cleveland Clinic. These were difficult years, working on the mechanism of renoprival hypertension and doing nephrectomies on dogs under the stern stewardship of Irving Page. Exemplifying Dr Kolff’s travails was one episode when he came into Dr Page’s office with the final version of a much-retyped manuscript ready to be sent off. But Dr Page objected to the gender of the pronoun by which the dogs were referred to, and marked the paper from top to bottom. An eyewitness described later how Dr Kolff went into the next room and broke into tears.

Later he began again to work on dialysis. He said that as everything in America was disposable so had to be his dialyzer. With Bruno Watchinger, they rolled cellulose tubing around soft drink cans (alcohol not being permitted at the Cleveland Clinic), then had Baxter Travenol build the “Twin Coil” and the steel tank, and gave them the patent—as doctors in those days did not patent their discoveries. He used to say that he could build a kidney faster than Bruno Watchinger could calculate a clearance—and that he learned nothing from a clearance that he did not know already from the serum creatinine, an unfashionable point of view but one for which he might be vindicated some day.

By the end of the 1950s the Cleveland Clinic created for him a Division of Artificial Organs. It consisted of a
renal and a cardiac section. Every morning the “kidney boys” and the “heart boys” would gather at precisely 9:00 am and woe to him who was late. Even visitors to the unit, and there were many from all over the world coming to see how dialysis was done, became subject to harsh words if they did not arrive on time. Every member of the division would in his turn have to stand up at the blackboard and in 7 minutes—and not seconds more—make a presentation on a subject of his choice, which could be clinical or technical or even as remote from artificial organs as sailing.

Always an innovator, Dr Kolff immediately realized the enormous potential of renal transplantation. A cadaver donor program was started in January 1963, and he became greatly involved in its clinical aspects, calling the fellow on duty every night to find out how the sick patients were doing. Early on the patients were grossly over-immunosuppressed and often became septic. Donor kidneys were hard to come by, and as there was nothing to lose and there was space for only 8 patients in the dialysis program, blood groups were crossed with impunity and even 2 myeloma kidneys were once used. But by 1964 the unit had become greatly experienced, results were good for that time, and the Cleveland Clinic became one of the 4 major transplant centers in the United States—the others being Boston, Richmond, VA, Denver, and Los Angeles.

The “heart boys” worked mainly on developing a mechanical heart. Dr Akutsu produced the first model, made of a plastic material. This was the prototype of the device implanted in Dr Barney Clark in 1982—the so-called Jarvik heart. Earlier on experiments were made on calves, brought up at night on the back elevator of the Cleveland Clinic, so that their lowing would not cause a disturbance. The calves were initially strung up from the ceiling with their legs up in the air, a position poorly tolerated because it caused pulmonary hypertension. So they wrote a paper on pulmonary hypertension in calves, then changed the practice by suspending them upright by an intricate network of hooks, string, and tape, but eventually succeeded in keeping a calf with an implanted mechanical heart alive for many weeks.

Dr Kolff was also interested in developing other artificial organs, even seeing and hearing devices. I remember him asking me during one of his visits to Chicago what I was working on. Unimpressed by my interests in hypertension or renal morphology, he pulled out of his pocket a calculator-like instrument, saying that he was working on the artificial eye. His interests ranged from dialyzing patients with schizophrenia to the artificial lung, to charcoal hemoperfusion, adsorptive resins and encapsulating them with protective material, and of course developing new dialyzers and new methods of vascular access. He encouraged young promising investigators and enthusiastically embraced new ideas. He was a man of high standards, demanding to a point that his assistants said they would again need Maalox whenever he came back from a long trip abroad. In the 1950s new fellows coming to work in his laboratory would receive a printed sheet detailing their duties. In this he explained that as the technical personnel was less than they might be accustomed to, it should not be below them to babysit with a dog, clean after it, and undertake what others might regard menial work. “There is absolutely no work in the laboratory, from cleaning the floors and sweeping up the dog feces to shaving dogs and cleaning the machines, that should interfere with the joy of working at any time.” He also mentioned that persons coming from abroad might not be familiar with modern deodorants, and as the indoor room temperature in the United States was high he recommended Mum, available at every drug store, and applied daily under the arms. Fellows were asked to sign one copy and return it to the secretary for his files.

Dr Kolff was at times equally blunt with his colleagues, with the press, and with hospital officials. He had many grants, was an efficient administrator, and for many years...
was the head of a successful and productive academic unit at the Cleveland Clinic. Periodically he would go out of town for job interviews to get, as he said, a free valuation. And around 1968, when the Clinic decided to split his division into 2, heart and kidneys, and told him he had to choose one or the other, he moved to Salt Lake, where he continued his research for many years. He was a man of action, and always said that in life credit should be given not to the one who had an original idea, but to the one who persevered and brought it to fruition.

It has been said, in another context, that in estimating a person’s achievements the world agrees to call great those who have done or produced something of permanent value. Further, that we call great those who devoted their energies to a noble cause, or influenced the course of things in some extraordinary way; and that to achieve this, there is in every instance a universal condition that the man shall have forgotten himself in his works, without attention to the honors that success will bring him. Viewed in this sense, posterity will indeed remember Willem J. Kolff as a great man.

**REFERENCE**