

Willem Kolff

Invented the kidney dialysis machine and developed the artificial heart

It was among the hardships of Nazi occupied Holland that Willem “Pim” Kolff’s ingenuity and determination bore fruit. This hybrid doctor-inventor used a water pump from a Ford model T, an aluminium drum made from a downed German warplane, and cellophane used to make sausages to create the world’s first kidney dialysis machine.

He developed a method of taking blood from a patient and passing it through the semipermeable cellophane tube wrapped around a drum. This rotated like a washing machine through a bath of salt water to absorb the excess urea. The treated blood was then returned to the patient.

This way he treated 17 patients from 1943 to 1945, while the second world war brought increased deprivation. The last patient survived. It was just a few months after liberation. The techniques of dialysis moved on, but the basic principles by which Kolff saved his patient’s life, remain.

Problems of dialysis

Kolff was born in Leiden in 1911 and grew up in the east of the Netherlands, where his father, Jacob, was the director of a tuberculosis sanatorium. He studied medicine in Leiden and in 1938 transferred to Groningen to work under an influential mentor, internist Professor Leo Polak Daniëls. The loss of a patient from acute kidney failure focused Kolff’s mind on the practical problems of dialysis, whose principles had been discovered by the Scottish chemist Thomas Graham 80 years before. Some people thought Kolff mad, but Daniëls liked his ideas. So Kolff began experiments with new materials such as cellophane, which offered a uniform membrane, and the blood anticoagulant heparin.

In May 1940 the Germans invaded. Kolff’s knowledge of blood and his fearless determination were called upon. Caught in the Hague as German bombers attacked nearby military airfields, he offered to set up a blood bank in the municipal hospital. He scoured the city with a driver, a machine gunner, and a handful of hospital vouchers to buy the equipment.

In four days he had established the first blood bank in mainland Europe.

But within days the Dutch had capitulated and Daniëls had committed suicide. To avoid his successor’s Nazi sympathies, Kolff left to take up an internist post in Kampen, to the south. He was the sole internist for a town of 23 000 and was soon active in the resistance. Most notably he risked his life by insisting on medical treatment for hundreds of sick forced labourers transported through the port. His research continued too. By 1942 he had his first “rotating drum artificial kidney” ready for clinical experiments. Between March 1943 and July 1944 Kolff treated 15 patients on his machine, all regarded as untreatable. All died during or shortly after treatment, but vital progress was being made. Kolff was convinced that his machine would soon save lives. It was not until after liberation on 11 September 1945 that Kolff succeeded. Sofia Maria Schafstadt, a 67 year old Nazi sympathiser, had blood poisoning and kidney failure so critical that the local hospital surgeon reluctantly agreed to refer her to Kolff.

After 11 hours of dialysis, treating 80 litres of blood, and removing 60 grams of urea, Schafstadt opened her eyes and told Kolff, “Now I’m going to divorce my husband.” She did, lived to be 73, and made medical history.

Kolff gained his doctorate with distinction in Groningen and, no longer cut off from the rest of the scientific world, had realised his achievement to perform the first dialysis. Sweden’s Nils Alwall and Canada’s Gordon Murray were just a year or two behind, but Kolff was the first.

Ironically the war, which had caused such practical difficulties, eventually gave him the edge. With scant medical supervision and no

requirement for animal experiments Kolff could move directly to clinical application. He said later, “The only brake on me as a medical researcher in those days was my own conscience.” This allowed him to progress as fast as possible.

Kolff’s invention came to the attention of Professor Isidore Snapper at New York’s Mount Sinai Hospital, who had left Amsterdam in 1938. This contact ensured his international recognition and led to his emigration to the United States in 1950, where he continued to make news.

The father of artificial organs

While at Ohio’s Cleveland Clinic in 1956 he developed a heart-lung machine and the next year he was the first in the world to implant an artificial heart in a dog.

From 1967 till 1986 he worked as the director of the Institute of Biomedical Engineering at the University of Utah in Salt Lake City where he became known as the “father of artificial organs.” In 1982 he and his team were the first to successfully implant an artificial heart in a human: Barney Clark lived for 112 days. Though Kolff officially retired in 1986 he continued work into his 90s on projects such as a portable lung machine.

“His unique approach to the human body was more technical, an engineering process, than a just a medical one,” says Herman Broers, his biographer. “By the 1930s everyone knew [dialysis] was possible; it just took someone with the guts to do it.”

He was nominated unsuccessfully for at least four Nobel prizes, given 13 honorary doctorates, and is said to have saved the lives of millions. He divorced his wife Janke Huidekoper in 2000 after 63 years of marriage. He leaves a daughter and four sons.

Tony Sheldon

Willem Johan Kolff, internist and inventor (b Leiden 1911; q Leiden 1938), died Philadelphia 11 February 2009.

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[He] used a water pump from a Ford model T, an aluminium drum made from a downed German warplane, and cellophane used to make sausages

James Sinclair Rennick Baxter



Former consultant ear, nose, and throat surgeon Kent and Canterbury Hospital (b 1935; q Cambridge/Charing Cross Hospital, London, 1960), died from septic shock on 9 February 2009.

James Sinclair Rennick Baxter (“Rennie”) took up his first consultant post in otorhinolaryngology in King’s Lynn in 1969. He then came to Canterbury in 1971, where he remained until 1997. He was proud to have instigated the growth of the audiology department. A few months before he retired, Rennie had a severe stroke and was nursed at home until his condition deteriorated in 2008. A fine craftsman in carpentry, plumbing, and electrical work, he renovated several old houses. He also played the trumpet and sang in various choirs, including the Canterbury Choral Society. He leaves a wife, Patty; three children; and six grandchildren.

Sara Baxter

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Paul Dawson-Edwards



Former consultant urological surgeon Birmingham (b 1919; q Birmingham 1943; FRCS), died from heart failure on 6 December 2008.

During 1944-6, Paul Dawson-Edwards was called up to the Royal Air Force Volunteer Reserve, becoming squadron leader in Karachi

and specialising in orthopaedics. In 1957 he was appointed consultant surgeon to the United Birmingham Hospitals, having specialised for nine months at Harvard University in transplantation surgery. After some years associated with dialysis and transplantation in Birmingham, he returned to full time urology, particularly retroperitoneal fibrosis, retiring in 1984. An excellent teacher, he was active in national and regional urological societies. He also represented the university in rugby and athletics and played 1st XV rugby for Coventry and Moseley clubs. Predeceased by his wife, Jean, in 2002, he leaves three children and four grandchildren.

Liz Godfrey, Mick Hughes

Cite this as: BMJ 2009;338:b1988

Claire Hazel Epstein



Specialist registrar Royal London Hospital (b 1977; q Royal London and St Bartholomew’s Medical School 2000), died from bowel cancer on 12 February 2009.

Having graduated with honours in paediatrics, Claire Hazel Epstein worked in Brighton and north east London. In her last post, as everywhere else, her energy, quick wit, clinical acumen, and interpersonal skills had impressed staff. She had been asked to apply to join the Helicopter Emergency Medical Service (HEMS), as well as been sounded out for consultancy posts in other departments she had worked in. Claire died just over two weeks after having been diagnosed with an extremely aggressive form of bowel cancer. Throughout her illness, she retained the humour, dignity, determination, and selflessness that had come to define her. She leaves her parents and two brothers.

Helen Parker

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Deryck Michael Denys Lambert



Former general practitioner Keighley and Runcorn (b 1924; q Edinburgh 1951; MBE, FRCGP), d 16 June 2008. Deryck Michael Denys Lambert trained with the Royal Air Force in 1942-4, joining the Pathfinder Force, Bomber Command, and becoming a prisoner of war in 1944. During 1952-76 Deryck combined working as a general practitioner in Keighley with teaching and mentoring in general practice in West Yorkshire through leading roles in the Royal College of General Practitioners and Leeds and Bradford Universities. During 1976-8 he was senior lecturer in general practice at Liverpool while establishing a new practice in Runcorn. He then worked in health education and prevention with the government and the Health Education Council/Authority until his retirement in 1991. He leaves his second wife, Jill; four children from his first marriage; and six grandchildren.

Jill Lambert

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Richard Hartley Martin

Former consultant obstetrician and gynaecologist Wythenshawe Hospital, Manchester (b 1920; q Liverpool, 1942; FRCS, FRCOG), died from pancreatic cancer on 29 October 2008. After qualifying Richard Hartley Martin (“Dick”) joined the Royal Army Medical Corps and served in Africa and Palestine until demobilisation in 1947. He trained in obstetrics and gynaecology in Liverpool, in 1959 moving to Manchester as consultant obstetrician and gynaecologist, initially at Withington Hospital. Dick was instrumental in planning the new maternity unit at Wythenshawe Hospital and was its first consultant in 1964. Under his charge the unit

became a renowned training centre. Dick was a staunch supporter of the Royal College of Obstetricians and Gynaecologists and coauthored a textbook on preparing for the MRCOG. He retired in 1985. He leaves a wife, Gwerfyl, and two daughters.

John S Wynn

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Miriam Claire Ogden



Fifth year medical student Cambridge (b 1984), committed suicide on 22 April 2008.

Miriam Claire Ogden started medicine at Newnham College in 2002. Her investigation during her BA year into saccadic eye movements as a model of decision making was published and presented at an international meeting. Despite discouragement, she worked through her clinical studies at a homeless night shelter and a hostel for underprivileged children. With her strong Christian faith, she ran local church groups, including the alpha course, and she acted as “pastor” to fellow students. She tried to kill herself during the run up to Cambridge exams in 2007, but she was subsequently discharged from the mental health services and was due to sit her final MB pathology before she died. She leaves her parents and three siblings.

Neil Rane

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