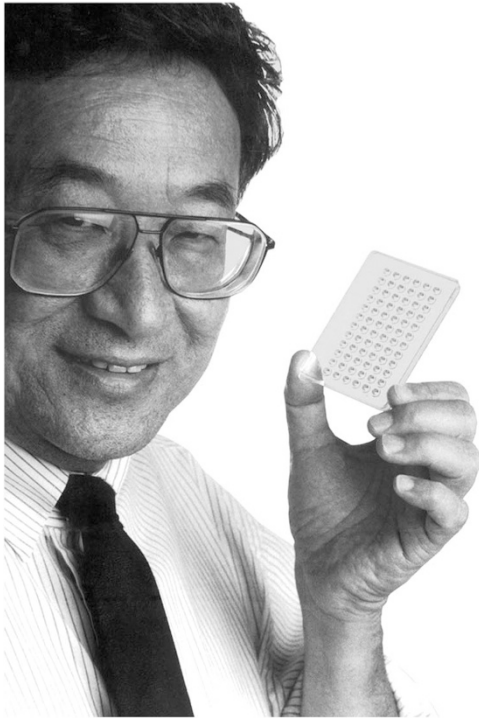


OBITUARY

Paul I Terasaki (10 September, 1929–25 January, 2016)

Bone Marrow Transplantation (2016) 51, 621–622; doi:10.1038/bmt.2016.70



Hey Doc, have you got a cure for a hangover?
Frank Sinatra to Paul Terasaki at a UCLA award ceremony in 1996.

Paul Terasaki loved ice cream, red bean cakes and mariachi music and was often seen at the Sizzler Restaurant in Santa Monica at about 1730 hours in the afternoon with his wife Hisako, an artist, like his father. Paul said he liked the senior discount but was always a generous tipper, perhaps because he had worked as a busboy in the 1940s making \$0.40 per hour.

Although this may seem an odd way to begin an obituary for one of the most important contributors to the field of transplantation, it offers insights into exactly who Paul Terasaki was and what made him great.

Paul was born and grew up in a poor section of east Los Angeles. He was a *nesei* (first generation overseas Japanese) whose parents immigrated to California. His middle name was Ichiro, a typical name for a Japanese first-born male, someone who is expected to be outstanding. Paul did well in school but his life was interrupted by the Japanese bombing of Pearl Harbour. His father opened a cake shop in Little Tokyo in 1941 (which might explain his love of the red bean cakes), but on February 19, 1942 President Franklin D. Roosevelt signed an Executive Order permitting the relocation of persons living in designated military areas. Unbelievably, this included California (who knew Los Angeles was a military area?) and also American citizens like Paul who was 12 and who then spent his high-school years in the Gila

River War Relocation Centre in Arizona. (We prefer to call it by its real name, a detention or incarceration camp.) Paul described the educational facilities as deficient but he busied himself raising bees. Paul rarely spoke of this experience and never with resentment but it greatly influenced him. He and his wife Hisako were committed to preserving the history of Japanese in the US. Paul served on many committees including the Japanese American National Museum in Los Angeles, Memorial to Japanese–American Patriotism in World War II in Washington D.C., the Paul I and Hisako Terasaki Center for Japanese Studies at the UCLA International Institute and the US Japan Council, and gave generously to these charities.

Paul finished high school in Chicago and started training in a radio repair school. His parents disapproved and he was encouraged to begin university as a pre-medical student. As a teenager and young adult he worked as a gardener and handyman to earn spending monies. He also fell into jazz playing the trumpet; he loved Duke Ellington, Ella Fitzgerald and Dizzy Gillespie.

The dreadful winters in Chicago encouraged the family to return to Los Angeles and Paul transferred to UCLA switching to zoology and receiving bachelor, master and doctoral degrees there. After graduating he joined the Department of Surgery where his research focused on skin grafts in chickens. This led to his interest in transplant tolerance and eventually to a post-doctoral position with Nobel laureate Sir Peter Medawar at University College London followed by a brief fellowship in Paris with Prof. Jean Dausset. Dausset, upset by Paul's poor French, quickly dispatched him to the Pasteur Institute. Discouraged, Paul returned to Los Angeles after few months. France's loss was our gain, a sort of reverse Josephine Baker. Dausset went on to win the 1980 Nobel Prize with Baruj Benacerraf and George Snell for the genetically determined structures on the cell surface that regulate immunological reactions. Dausset and Terasaki remained close friends and colleagues over many years.

Oddly, despite his training with Medawar, Paul was mostly a B-cell guy. He had little patience for T-cells, even less for T_{reg} , T_{cons} and the like. We won't even mention mesenchymal stromal cells or regulatory myeloid cells. He could never explain why he chose to focus on antibodies in transplantation. Perhaps it was a rebellion (his suggestion) but more likely the few cases of acute kidney-graft rejection he collaborated on with Prof. Thomas Starzl. Interestingly, for a brief period he and Mitsou Takasugi (who studied with the Hellstroms at the Karolinska Institute) worked on what they called N-cells and which later became known as NK-cells. Their focus was on anti-cancer immunity. Somehow (but not surprisingly) politics interceded and others received credit for their discovery. Had this not happened we might be celebrating Paul as a cancer immunologist.

In 1964, Terasaki introduced the micro-cytotoxicity test for detecting anti-HLA-antibodies, HLA-typing and for cross-matching. The test was revolutionary and quickly adopted as the international standard. Interestingly, the invention was prompted by necessity. Paul could not do a venipuncture so he had to use the few lymphocytes he could get from a finger stick of his technician John McClelland. Also, he had access to only small serum samples left over from Rh-testing of pregnant women. In an age before computers he hooked up his microscope to an electric typewriter

to record results from each well of the 72 well micro-cytotoxicity plate (known to many of us as a *Terasaki plate*).

But Paul's creative genius was even broader. He also invented (with Jeffrey Collins) a simple cold-storage solution for transporting kidneys from deceased donors so that they could be used for the most HLA-compatible recipient and set up a kidney transplant recipient registry before the US Government got involved through UNOS. When HLA-homozygous typing cells were needed for certain mixed lymphocyte culture tests, Paul went to the Catholic Archdiocese of Los Angeles. Such HLA-genotypes are frequently the result of first cousin marriages and Catholics wishing to marry a first cousin need the Church's permission. Voila, Paul had a list of potential donors. (This was, of course, in an era before HIPPA etc.) It's safe to say Paul was a Silicon Valley genius entrepreneur before there was a Silicon Valley.

In 1969, Prof. Terasaki established the UCLA Tissue Typing Laboratory. For nearly 50 years he focused on the study of the humoral theory of transplant rejection. Following his retirement from UCLA he founded the Terasaki Foundation, a research center dedicated to studies of cancer immune therapy and the role of humoral immunity in transplantation. The Terasaki lab at UCLA was always terribly crowded with more than 100 people. Whenever someone went on holiday, however brief, a huge Revco freezer was wheeled into their office. On your return you had to find an empty office to move the Revco to or face the prospect of working while standing. In the 1970s and 80s the Terasaki lab was doing most of the world's HLA-typing and donor-recipient matching. Paul and his colleagues developed kits which could be mailed from almost anywhere in the world and reach Los Angeles with sufficient numbers of cells for cross-matching testing. Every week Robert Graw Jr. and Ronald Yankee sent thousands of blood samples from the NIH to the Terasaki lab for HLA-typing to choose donors for granulocyte transfusions. Whenever Paul travelled overseas, he sent himself kits to measure how quickly they were delivered to Los Angeles. And this was before FEDEX and UPS. Think of what he could have done with drones.

Paul had a systems engineer approach to problem solving. His analysis of the reciprocal problems of graft-rejection and graft-versus-host disease in bone marrow transplant recipients: monitor levels of donor and host lymphocytes with HLA-specific antibodies and give cytotoxic anti-donor or -host antibodies if one side or the other gets the upper hand. A sensible idea; why we don't do it? He also thought B-cells might be the cause of graft-versus-host disease. Recent data of rituximab therapy suggest that he might be right, at least in some instances.

Prof. Terasaki published over 900 scientific reports including 3 in 2016 when he was 86 years old, and more than 20 books. He served on many scientific advisory committees and editorial boards. He was president of the International Transplant Society

from whom he later received the Medawar Prize. During his tenure he spoke out strongly against paying tissue and organ donors. He was also president of the American Society for Histocompatibility and Immunogenetics which established the Paul I. Terasaki Clinical Science Award in his honour and which was interestingly won by our colleague Dolly Tyan.

Paul was first and foremost a scientist. His uncompromising devotion to honesty in research was legendary. In 1970, at a Congress of the Transplantation Society, he delivered his stunning report that HLA-matching using the then available technology did not correlate with kidney-graft survival. This conclusion seemingly reversed conclusions of his prior research on donor-recipient kidney-graft matching. As a consequence, Paul lost his NIH grant and his laboratory went through a period of financial hardship. But he believed in the power of large numbers and statistics, and thought the computer a great tool for transplant outcome research because it keeps you honest. Facts are what matter and if something has to be adjusted or modified it is our hypotheses, not the facts. He was greatly aided in these efforts by M. Ray Mickey, a brilliant if unconventional statistician with an uncanny resemblance to Mr Spock.

In 2014, a *Festschrift* for Prof. Terasaki was attended by more than 300 colleagues, collaborators, students and friends including a star-studded list of *Who's Who* in transplantation. It was a marvellous tribute to Paul's global impact with talks covering every sphere of transplants. Kidney transplants were always Paul's favourite. It's hard to calculate how many people are alive today because they had a successful kidney transplant facilitated by technology developed by Paul Terasaki.

Paul Terasaki, despite great fame and fortune, was always modest and approachable. He had a wry sense of humour, an infectious laugh and genuine affection for colleagues and co-workers. He loved debating colleagues and his lectures always had a touch of humour. In his later years he was known for random acts of kindness. He would wander among the 300 lab workers and ask people what was their dream. One replied: a week in Tahiti. One week later he received two first class air tickets and a hotel voucher. At the annual lab Christmas party Paul dressed as Santa Claus. It was quite a sight.

Paul Terasaki is survived by his wife Hisako, four children, six grandchildren and a brother. He will be greatly missed and long remembered. What current or future scientist has not or will not encounter a Terasaki micro-well plate? Think of him when you do your next experiment.

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