

# This Week's Citation Classic®

Iwakata S & Grace J T, Jr. Cultivation in vitro of myeloblasts from human leukemia. *NY State J. Med.* 64:2279-82, 1964. [Roswell Park Memorial Institute. Buffalo. NY]

It is not surprising that an investigation that opened the door to the establishment and propagation of continuous lines of human leukemic cells should endure and become a *Citation Classic*®. Used worldwide today almost 30 years after it was first reported, Iwakata's and Grace's method of sustaining in vitro proliferation of lymphoblastoid cells remains a standard part of the repertoire in tissue culture research. It has enhanced and intensified research on human cancer cells. [The *SCF*® indicates that this paper has been cited in more than 210 publications, making it the most-cited paper published in this journal.]

## The Cultivation of Human Hematopoietic Cells from Peripheral Blood

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James T. Grace, Jr. and Sutetoshi Iwakata were working together at Roswell Park Memorial Institute (RPMI) when they published their *Citation Classic*®.

It was a time of considerable activity at Roswell Park, where a first-rate team of scientists was being assembled to embark on a multifaceted thrust into viral oncology. It was also a time when modern tissue culture science was beginning to unfold.

The successful in vitro growth of leukemic cells was a key priority in those days. Various formulae were reported and then discarded. But the recipe of Grace and Iwakata continued to meet with success and became widely recognized and used, even to this day, leading to the well-deserved citation of their publication as a permanent classic.

At the time the viral oncology group was led by Grace (1923-1971) an MD from Harvard Medical School who was also as-

sistant director of RPMI and chief of gastrointestinal surgery. Sutetoshi Iwakata (1931-1982) received his MD at Kyoto University, Japan, and joined the group in 1962 as a research fellow responsible for developing human cell lines from the organs of leukemic patients to aid in the search for human cancer viruses.

Grace and Iwakata were studying Burkitt's lymphoma when they identified viral particles in the tumor cells. At that time, the existence of human cancer virus was still speculation rather than fact. Their discovery was a major breakthrough, but Michael Epstein publicly reported a similar observation a few weeks later. Their work was not invalidated but much of the thunder was stripped from their independent discovery.

In the midst of their work, Grace and Iwakata parted company in 1970. Iwakata moved to Canada planning to return to Roswell Park to join Grace again as soon as his visa problems were solved. Tragically, Grace was killed in an accident in 1971, prematurely ending a productive scientific career. It also ended Iwakata's plans to return to Roswell Park, and he remained in Canada at the Central Research Laboratories of Ontario's Ministry of Health, the largest public health network in the country. In contrast to his work at Roswell Park, Iwakata's research now focused on diagnostic virology. He continued to study the Epstein-Barr virus, however, as well as other virus systems, making numerous contributions to medical virology.

Tragedy continued to stalk this quiet, dedicated scientist. He calmly endured a severe attack of pancreatitis. His vivacious wife finally succumbed to cancer, a blow from which he never fully recovered.

The wide recognition of his work brought Iwakata an offer of a chief virologist's position at the University of Tokyo. He regretfully turned down the honour for the sake of his family. Shortly thereafter, in the spring of 1982, sudden death ended his innovative contributions to public health, as with Grace, cut short in mid-bloom: an irreplaceable loss.

1. Epstein M A, Achong B G & Barr Y M. Virus particles in cultured lymphoblasts from Burkitt's lymphoma. *Lancet* 1:702-3, 1964. (Cited 920 times.) [See also: Epstein M A. Citation Classic. (Barrett J T, ed.) *Contemporary classics in the life sciences. Volume 1: cell biology*. Philadelphia: ISI Press. 1986. p. 156.]

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