



# NATIONAL VETERINARY LABORATORY

P.O. Box 239, 1Tice Road  
Franklin Lakes, NJ 07417  
877-NVL-LABS (877-685-5227)  
[www.natvetlab.com](http://www.natvetlab.com)

## NEWSLETTER

### Donald Armstrong, MD: A Pioneer in Infectious Diseases<sup>©</sup>

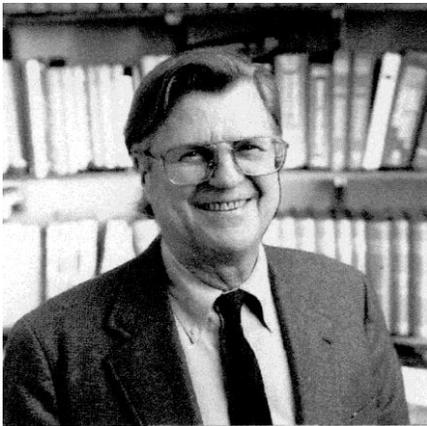
Evelyn E. Zuckerman, Editor

Summer 2019

Vol. 18 Number 3

#### In This Issue:

The Summer 2019 NVL Newsletter will pay tribute to Donald Armstrong, MD who, died in November of 2018. Don was interested in infectious diseases of all animals especially pet animals and humans. He was the Chief of the Infectious Disease Service at Memorial Sloan Kettering Cancer Center for 33 years and was at the forefront of the AIDS epidemic in the 1980s as many gay men presented at Memorial Hospital with unusual cancers and severe immunodeficiencies. He, along with a department filled with competent young physicians, Drs. Johnathan Gold, Edward Telzak, Kent Sepkowitz, and Arthur Brown, contributed clinical material which helped to elucidate the cause of AIDS. Evelyn Zuckerman and I were fortunate to have been members of his Infectious Disease Service at that time.



Donald Armstrong, M.D.

#### Parts excerpted from the New York Times Obituary, December 5, 2018.

Donald Armstrong received his medical degree from Columbia University's College of Physicians and Surgeons in 1957. During his internship at the Cornell Division of Bellevue Hospital, he served a three-month rotation at Memorial Sloan-Kettering Cancer Center (MSKCC) to which he returned as a chemotherapy fellow. After two years at the National Institutes of Health in the Laboratory of Infectious Diseases of NIAID working with Robert Huebner on animal tumor viruses, he moved on to the Virus Laboratory of the Children's Hospital of Pennsylvania where he studied general virology with Werner and Gertrude Henle and continued his work with tumor viruses. He returned to MSKCC in 1965,

first as the Director of the Microbiology Laboratory and later as the first Chief of the newly established Infectious Disease Service in 1970 which he held until his retirement 1998. He became professor of medicine at Cornell University Medical College in 1976.

“Don had tenacity and an unfailing instinct for clinical truth, and he set the standard for the management of infections in people with cancer, an approach that helped move cancer treatments into the modern age and continues to be followed to this day. He also trained hundreds of young doctors, many of whom came to MSKCC expressly to work with him. Midway through his career, the AIDS epidemic took hold in New York City, and Don met the challenge head on, becoming a national expert in the management of opportunistic infections in people with AIDS, but more importantly, working to ensure that patients were treated with the utmost compassion.”

His astute clinical and microbiology-based observations enabled him to write the papers that define our approach to management of the patient with cancer and fever and, in essence, provided the framework for our thinking over time about infection in all immunocompromised patients. With tenacity and an unfailing instinct for clinical truth, he moved cancer treatments into the modern age by minimizing the greatest risk of chemotherapy: infection. His work defined the management of infections in people with cancer, approaches still used in practice today.

He was a fellow of the Infectious Disease Society of America (IDSA), and a past President of that Society. He served as editor or associate editor of numerous journals and was the founding editor-in-chief of the International Journal of Infectious Disease and, along with numerous fellows, published hundreds of papers and reviews, even one on *Bartonella*. Don gave generously of his expertise and time, including working as one of the first physician volunteers at a community-based clinic in Chinatown, NY and at the Khao-I-Dang Cambodian refugee camp in Thailand. He was a visiting professor on several occasions in Taiwan, where he helped establish the Infectious Disease Society, and in the People's Republic of China, where he was appointed honorary professor of medicine at the Chongqing University of Medical Sciences. Don Armstrong was a 'renaissance man,' fluent in Mandarin Chinese, and widely travelled. He would stand at his

lectern early each morning reading the medical literature, positioned so that all his associates would see him at work which was intended to impart a reminder to all of his expectations. In short, Don Armstrong was a giant in infectious diseases.

#### Our Affiliation with Don Armstrong:

We were lucky to have been a colleague of Don and a member of his Infectious Disease Service at MSKCC. After doing an internship at the Henry Berg Memorial Hospital of the ASPCA in NY city, I did a Fellowship from 1967-69 as a Research Fellow in the Division of Immunology, in Dr. Lloyd Old's laboratory at MSKCC. For 14 years, from 1973 to 1987, I had my own laboratory, the Laboratory of Veterinary Oncology at MSKCC where we studied retroviruses, FeLV, FeSV, mouse retroviruses, searched for human retroviruses and tried to develop therapy for naturally occurring cancers of pet animals, an alternative to the laboratory mouse models.

#### The AIDS Epidemic:

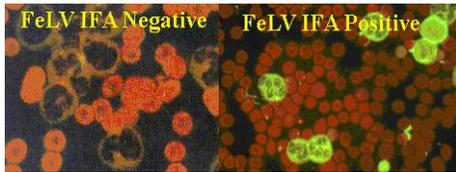
In the early 1980s, the AIDS epidemic struck in New York City and Don's ID service was seeing homosexual men with unusual cancers and immune deficiencies. We, and veterinarian Max Essex at Harvard University and others, had described FeLV-induced cancers and immunodeficiency disorders in pet cats infected with the FeLV. Don knew of our research and, with his early training in retroviruses at the NIH, was interested in our naturally-occurring cat retrovirus model.<sup>1-3</sup> I was asked about my knowledge of animal viruses that homosexuals may have been exposed to that might be causing their immunodeficiencies. With the cooperation of many of Don's ID physicians, who supplied clinical samples to Dr. Robert Gallo at the NIH, Gallo and Luc Montagnier discovered the etiology of AIDS to be a retrovirus, HIV-1.

At this time in the mid-1980s a new Director of MSKCC decided to re-direct the emphasis at MSKCC to molecular biology and cancer. My laboratory was studying basic virology, epidemiology and therapy of naturally occurring pet animal cancers and Don invited my laboratory to join his Infectious Disease Service. Thus, from 1987 to 1991 we joined his ID Service at MSKCC and I became an Associate Attending Virologist in the Department of Medicine. We studied HIV, HTLV-1 (Human T-Cell Leukemia Virus),<sup>4-6</sup> antiviral compounds for HIV<sup>7</sup> and began our research into *Bartonella* that was causing severe

infections in HIV-infected immunosuppressed patients.<sup>8-11</sup> We developed our first *Bartonella* isolate from the cat owned by an HIV-infected patient with zoonotically transmitted *Bartonella* infection. During this time Evelyn Zuckerman and I observed the compassionate care Don and his entire medical service gave to HIV-infected patients at MSKCC when many of these patients were shunned by family, friends, society, and even some medical facilities. Later, Don was the senior author of a paper describing *Bartonella* isolation from the catheter of an HIV-negative cancer patient in 2000.<sup>9</sup>

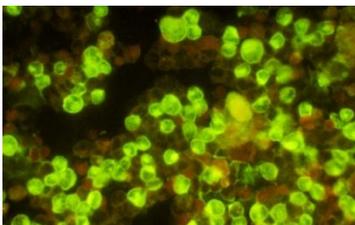
### HTLV-I:

The FeLV blood test met with great success in the veterinary field, and the hope was that a similar test could be developed if a human retrovirus was ever discovered.



FeLV negative WBCs FeLV positive WBCs

While we were members of the Infectious Disease Service in MSKCC, we developed an IFA test for detection of the human T-cell leukemia virus (HTLV-I) in people.<sup>4</sup> This is a retrovirus found to cause rare skin tumors and neurologic disease in humans. It is mainly transmitted sexually but, can also be transmitted via contaminated blood transfusions. Our HTLV-I IFA test for antibody to this virus was used to indicate infection in blood donations.



HTLV-I positive IFA test for detection of antibody in patients infected with HTLV-I. Antibody in infected person's serum giving positive fluorescence in HTLV-I Infected cells.

Evelyn Zuckerman and I performed these tests on blood donated for transfusion into patients with leukemia at Memorial Hospital.<sup>4</sup> We tested all blood donations for about six months before a commercial blood test was introduced. This was truly, "One Health" whereby a veterinary team was testing human blood so that it would be safe for transfusion. As HTLV-1 is common in China, Don and his wife, Lili, arranged a visit for us to Taiwan to teach our technique in a medical center there.

### Bartonella:

After 24 years at MSKCC, I became Professor of Medicine at the Albert Einstein College of Medicine and Director, Center for Infectious Diseases at Bronx Lebanon Hospital Center from 1991-1999. The discovery of *Bartonella* in 1990, from an HIV infected man with bacillary angiomatosis, illustrates the "One Health" concept. Here, a zoonotic veterinary pathogen of cats was discovered by a physician in a person

with a retrovirus induced immunodeficiency. While at MSKCC and Bronx Lebanon Hospital, a number of AIDS patients were admitted with serious, life-threatening, *Bartonella* infections transmitted by their cat contacts. This stimulated us to develop the first *Bartonella* test, the FeBart® WB test, for detection of *Bartonella* infected cats so that veterinarians could protect their clients from this zoonotic pathogen.<sup>8-11</sup> WB detection of a profile of at least 7 antibodies against *Bartonella* proteins (Figure below) insures the specificity of the technique.<sup>2</sup> We are able to detect infection with all 6 known species infecting cats and dogs since the sera of infected cats and dogs are cross-reactive for all infecting *Bartonella* species. In addition, cross-reacting antibodies to other bacteria are discounted by WB. As with other chronic pathogens such as FIV, HIV, and *Borrelia* (Lyme), antibodies to *Bartonella* co-exist with the chronic persistent infection and rarely are sterilizing of the infection.

### FeBart® Western Blot (WB) Test

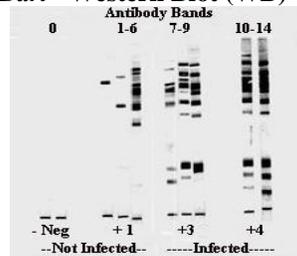


Figure: Grading system for the FeBart® Western Blot Test. - & +1: not infected, +3 & +4: infected.<sup>2</sup>

Since then the veterinary and medical communities have worked together to define these pathogens and to develop, methods of prevention and therapy. Unfortunately, many veterinarians and physicians are unfamiliar with bartonellae or are dismissive of their veterinary and medical importance. "One Health" *Bartonella* educational programs are needed for veterinarians and physicians.<sup>11</sup>

### World Zoonoses Day- Every July 6<sup>th</sup>:

Appropriate to Don Armstrong's infectious disease career, every July 6<sup>th</sup> is declared World Zoonoses Day. About 150 zoonotic diseases exist, and, as has been discovered over the years, about 60% of the 1,415 known human pathogens, originate from animals and are zoonotic diseases. Recently, the study of zoonotic diseases has been included in the umbrella of the One Health movement. People can get zoonotic diseases from contact with live poultry, rodents, reptiles, amphibians, insects and domestic and wild animals. A common way for transmission is via the bite of insects, commonly mosquitos and ticks. *Bartonella* zoonoses are excellent examples of a One Health concept and we as veterinarians should take the lead in preventing this zoonosis.

### Don Armstrong's Legacy:

**There is much to admire in Don Armstrong's life and career: his humility, his devotion to his family, to his community and international work, his clinical acumen, and perhaps most remarkably, his unflinching commitment to the dignity of each person for whom he cared. We will always be grateful to Don for his expertise, guidance and friendship.**



Dr. Hardy speaking at Don Armstrong's memorial

### References:

- Hardy, WD, Jr., Hirshaut, Y., and Hess, P. Detection of the feline leukemia virus and other mammalian oncornaviruses by immunofluorescence. Vth International Leukemia Symposium. Padova, Italy. September 1971. Bibl. Haemat. Vol. 39, Karger, Basel/New York, 1973. pp. 778-779.
- Hardy, WD, Jr, Old, LJ, Hess, PW, Essex, M, and Cotter, S. Horizontal transmission of feline leukemia virus. Nature 244: 266-269, 1973.
- Hardy, WD, Jr, McClelland, AJ, Zuckerman, E, Hess, PW, Essex, M, Cotter, SM, MacEwen, EG, and Hayes, AA. Prevention of the contagious spread of feline virus and the development of leukemia in pet cats. Nature 263: 326-328, 1976.
- Minamoto, GY, Gold, JWM, Scheinberg, DA, Hardy, WD, Jr., Chein, N., Zuckerman, E, et al. Infection with human T-cell leukemia virus type I in patients with leukemia. N. Eng. J. Med. 138: 219-1988.
- Pan XZ, Qui ZD, Chein N, Gold JW, Hardy WD Jr, Zuckerman E, Wang QN and Armstrong D. A seroepidemiological survey of HTLV-I infection in Shanghai and Chongqing cities in China. AIDS, 5: 782-3, 1991.
- Telzak, EE, Hershov, R, Kalish, LA, Hardy WD Jr., Zuckerman E, Levine A, Delapenha, R, DeHovitz, J, Greenblatt, RM and Anostos, K. Seroprevalence of HTLV-I and HTLV-II among a cohort of HIV-infected women and women at risk for HIV infection. Women's Interagency HIV study. J Acquir Immune Defic Syndr Human Retrovirol. 19: 513-8, 1998.
- Baron PA, Polsky B, Gold JW, Zuckerman EE, Hardy, WD Jr, Meyer-Glauner W, and Armstrong. Peptide T does not inhibit HIV-1 infection in an in vitro serum-free system. AIDS, 2: 227-8, 1988
- Hardy, WD, Jr, Zuckerman, EE, Gold, JWM, Baron, P, Kiehn, TE, Polsky, B, and Armstrong, D. Immunogenic proteins of *Bartonella henselae* defined by western immunoblots with naturally infected cat sera. 95th General Meeting, American Society for Microbiology, Wash. D.C., May, 1995.
- Fischer, CT, Senining, RC, Welch, DF, Kiehn, TE, and Armstrong, D. *Bartonella* (Rochalimaea) quintana as a cause of catheter-related bacteremia in an HIV-negative cancer patient. Infect Dis in Clin Pract, 9: 299-300, 2000.
- Hardy, WD Jr., and Zuckerman, EE. Human bartonellosis: diseases caused by feline *Bartonella*- 84 cases. The 5th International Conference on *Bartonella* as Emerging Pathogens. Pacific Grove, CA, 2006.
- Hardy WD Jr, and Zuckerman E.: *Bartonella*: The pet cat-human connection. EcoHealth 7: S67, 2011.

**Bartonella references can be obtained at:  
www.nlm.nih.gov/ or natvetlab.com  
National Veterinary Laboratory, Inc., 2019©**