



# NATIONAL VETERINARY LABORATORY

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## NEWSLETTER

### The One Health Initiative: Our Experience<sup>©</sup>

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#### In This Issue:

In the winter 2018 issue of the NVL Newsletter (our 17<sup>th</sup> year and 65<sup>th</sup> issue- all issues are available at [www.natvetlab.com](http://www.natvetlab.com)) we will discuss our experience with the genesis of “One Medicine,” now termed “The One Health Initiative” and its development into a truly interdisciplinary effort (see NVL Newsletters Vol. 9, No. 3 and Vol. 10, No. 3 on our web site). This is timely as the 5<sup>th</sup> International One Health Congress is scheduled for June 22-25, 2018 in Saskatoon, Canada. Evelyn Zuckerman and I attended, and presented a paper on Bartonellosis, at the 1<sup>st</sup> International One Health Congress in Melbourne, Australia in 2010.

#### The One Health Initiative:

##### Mission Statement:

Recognizing that human health (including mental health via the human-animal bond phenomenon), animal health, and ecosystem health are inextricably linked, One Health seeks to promote, improve, and defend the health and well-being of all species by enhancing cooperation and collaboration between physicians, veterinarians, other scientific health and environmental professionals and by promoting strengths in leadership and management to achieve these goals. [www.onehealthinitiative.com](http://www.onehealthinitiative.com)



Courtesy of Ceva Co., One Health Poster

##### Vision Statement:

One Health (formerly called One Medicine) is dedicated to improving the lives of all species—human and animal—through the integration of human medicine, veterinary medicine and environmental science.

#### Introduction:

This “Initiative” evolved from the term “One Medicine,” first promoted in the latter half of the 20<sup>th</sup> century by veterinarian Calvin W. Schwabe. Dr. Hardy will give some examples of our “One Medicine” research, in collaboration with Evelyn E. Zuckerman, beginning in the late 1960s. The

description of our early research is by no means meant to insinuate that we were the first to do “One Medicine” studies.

#### Early Studies:

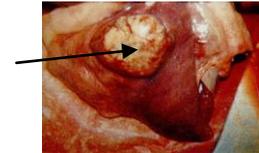
As a student at the University of Pennsylvania, School of Veterinary Medicine, in the early 1960s, Dr. Hardy was exposed to a faculty dedicated to “One Medicine”. There was a heart station at the school, manned by both veterinarians and physicians doing cardiac research and teaching. In addition, Dr. R.S. Brodey, a prominent veterinary oncologic surgeon and stimulating teacher, was collaborating with the nearby oncology faculty at the Medical School. The Department of physiology also had collaborative research studies with the Medical School at Penn. As students, we took our biochemistry course with the medical students at the Medical School. There was a rich environment of medical and veterinary interdisciplinary teaching and research and Dr. Hardy was able to begin research as a student with a project on the immunologic aspects of the thymus gland which instilled a desire in him to seek out that what was not known.

#### Memorial Sloan Kettering Cancer Center (MSKCC):

After graduating, Dr. Hardy did an internship at the Henry Bergh Hospital of the ASPCA in New York City. He became interested in exploring the causes of some of the newly recognized veterinary diseases of the time such as feline leukemia and FIP. The feline leukemia virus (FeLV) had just been discovered in Scotland a few years earlier and he thought this would be a good subject to explore. He contacted Dr. Robert Marshak, Director of the Bovine Leukemia Research Unit at the University of Pennsylvania to see if he could return to Penn to study in his unit. Dr. Marshak said he was welcome to come back to Penn but thought he should first get virologic training in this type of virus, retroviruses, from his physician friend Dr. Lloyd Old at the Memorial Sloan-Kettering Cancer Center (MSKCC) in New York City. This was the most important advice that Dr. Hardy received in his career which enabled him to do a postdoctoral fellowship in Dr. Old’s laboratory where he studied retroviruses and cancer. Dr. Old was a champion of “One Medicine” at that time as he thought there would be a similar retrovirus found in some human cancers. Thus, Dr. Hardy spent 2 years looking for a human tumor virus along with

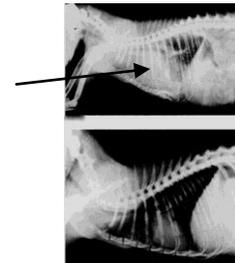
studying the FeLV. The physicians at MSKCC were eager to learn of the similar types of naturally occurring cancers found in pet animals and humans. They accepted Dr. Hardy as an equal and shared their expertise in the pursuit of comparative knowledge and he eventually spent 24 years at the Center.

While at MSKCC, Dr. Hardy and Dr. Old were able, along with the help of Drs. Greg MacEwen and Bill Kay, to establish the Donaldson Atwood Cancer Unit at the Animal Medical Center, only a few blocks from MSKCC. Dr. Old had always wanted to try new forms of therapy in naturally occurring cancers of outbred animals, such as dogs and cats, rather than relying on the experimentally-induced tumors of inbred mouse and rat systems.



Naturally occurring lung adenocarcinoma in a pet dog living in New York City

This veterinary cancer unit has seen many thousands of animals with cancer and helped to develop new treatments for pet animals. We studied the treatment of canine lymphosarcoma using a new drug called L’asparaginase which proved effective in the first dog we treated. This finding led to its rapid clinical trials in humans. Under Dr. Old’s leadership, the early field of immunotherapy of cancer was being born and we attempted immunotherapy trials with nonspecific immune therapies in dogs with naturally occurring tumors. We also used antibody therapy for lymphosarcoma in cats with some success.



Anti-tumor antibody therapy of a cat with mediastinal lymphosarcoma- top before therapy, bottom after therapy.

Another example of collaboration of medical and veterinary teams occurred when we studied the antiviral compound AZT from the Burroughs Wellcome Company, and found it to be effective against FeLV in cell culture as well as in FeLV infected cats. This enabled the company to

quickly test AZT (now Zidovudine) in human trials. Unfortunately, AZT is too toxic for use in FeLV-infected cats but it was the first successful drug used to treat HIV in people.

While at MSKCC, we also collaborated with botanists at the New York Botanical Gardens to test compounds, extracted from plants from Central and South America, for their anti-retroviral effects. We screened dozens of compounds extracted from exotic plants but were unable to find any that were truly effective.

Our research was published in scientific journals, but some was also featured by lay publications such as Time Magazine and Scientific American.



Time Magazine, Medicine: Clues from the cat. August 20, 1973 on the contagious spread of FeLV.

This can be a double-edge sword as it can heighten expectations that do not always pan out. However, in the case of FeLV and immunotherapy of cancer, these lines of research eventually proved to be very relevant. The use of FeLV testing has reduced the prevalence of infection of this deadly virus in cats and immunotherapy of cancer is now common (Time Magazine, Toward the Control of Cancer, March 19, 1973).

## Retroviruses and One Health: FeLV:

By the early 1970s we developed the immunofluorescence antibody test for detection of FeLV in the white blood cells of infected cats and showed the virus was transmitted horizontally or contagiously among cats.



Although controversial, this changed the paradigm of retroviruses that were thought only to be inherited genetically, to some that were transmitted contagiously and led to the development of an FeLV vaccine. Dr. Hardy eventually formed his own laboratory at MSKCC, the Laboratory of Veterinary Oncology, where Evelyn Zuckerman became the chief technical scientist. MSKCC allowed Dr. Hardy to establish the private National Veterinary Laboratory, Inc. in 1973, as well as remain at MSKCC, which allowed him to make the FeLV IFA test routinely available to veterinarians. Although now routine and even encouraged today for dual private industry and academic appointments, this was revolutionary then.

## HIV-1:

In the 1980s, the AIDS epidemic began. There were many theories and investigations into the cause of this acquired immune deficiency

syndrome. Dr. Bill Jarrett and his colleagues discovered the FeLV retrovirus in 1964 and a similar FeLV-induced immune deficiency syndrome (FAIDS) had been recognized in cats, years before the human AIDS origin, by veterinarians Max Essex and Susan Cotter at Harvard and Angel Memorial Animal Hospital in Boston, Bill and Oswald Jarrett at the Glasgow University Veterinary School in Scotland, Ed Hoover and Jennifer Rojko at the Ohio State Veterinary School, and us at MSKCC.



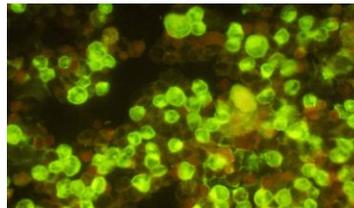
Veterinarians who collaborated to identify the immunosuppressive effects of FeLV. Left to right: Oswald Jarrett, Susan Cotter, Bill Hardy, Evelyn Zuckerman, and Max Essex, circa 1978.

Our interdisciplinary friendships and collaborations with physicians and PhD's at the NIH, especially physician Robert Gallo, enabled he and physician Luc Montagnier to eventually discover the human AIDS virus, HIV-1. As with FeLV, a blood test for the AIDS virus was rapidly developed by Dr. Gallo's lab which helped to define and control the epidemic. I feel this "One Health" effort has been one of the major accomplishments of this initiative.

When the first identified Ebola epidemic (viral hemorrhagic fever) struck in 1976, Dr. Don Francis, a physician retrovirus researcher, working in veterinarian Dr. Max Essex's lab at Harvard, who had collaborated with our lab, immediately left for the Ebola epidemic area in Zaire, Africa. Similarly, one of our earliest FeLV collaborators, Max Essex, who established the AIDS Institute at Harvard, has focused his research on the HIV epidemic in Africa for the past 30 years.

## 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. 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. 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 (NEJM 138: 219,

1988). 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, we were invited to Taiwan to teach our technique in a medical center there.

## Eco and Wildlife One Health:

In 1995-6, we collaborated with Dr. Steve Osofsky, who was the first Wildlife Veterinary Officer for the Department of Wildlife and National Parks, in the Botswana Department of Wildlife and National Parks, Botswana, southern Africa. We studied the prevalence of FeLV and FIV in free-ranging lions, leopards and cheetahs in Botswana. Steve has had positions in the World Wildlife Fund, Wildlife Conservation Society and is now the Jay Hyman Endowed Professor of Wildlife Health & Health Policy at Cornell University, College of Veterinary Medicine. Steve's efforts have been focused on wildlife migrations and human co-habitation in Africa which are major problems and are under extreme pressures. Steve has become very involved in The One Health Initiative.

## Bartonella: A Truly "One Health" Zoonotic Pathogen:

After 24 years at MSKCC, Dr. Hardy 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<sup>®</sup> WB test, for detection of *Bartonella* infected cats so that veterinarians could protect their clients from this zoonotic pathogen. 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 physician are unfamiliar with *Bartonellae* or are dismissive of their veterinary and medical importance. More "One Health" efforts to educate veterinarians and physicians about *Bartonella* are needed.

## One Health Journals "Open Access"

1. Infection Ecology and Epidemiology The One Health Journal (Sweden) <http://www.infectionecologyandepidemiology.net/index.php/iee>
2. Veterinary Sciences (Switzerland) <http://www.mdpi.com/journal/vetsci>
3. International Journal of One Health (India) <http://www.onehealthjournal.org/>
4. One Health Official Journal of the One Health Foundation <http://www.journals.elsevier.com/one-health>
5. Journal of Animal Genetics, Transgenesis and Zoonoses (JAGTZ) <http://www.obm-pc.com/journals/jagtz>

**Bartonella references can be obtained at:**

[www.nlm.nih.gov/or natvetlab.com](http://www.nlm.nih.gov/or natvetlab.com)  
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