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NEWSLETTER

Bartonella Induced Oral Inflammatory Disease of Cats[©]

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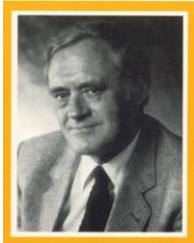
In This Issue:

In the fall 2011 issue of the NVL Newsletter we will discuss the association of *Bartonella* with oral inflammatory diseases of cats. We are presenting our data at the 2011 Veterinary Dental Forum in Boston this month. In addition, there have been a recent number of deaths of major scientists. We will review the accomplishments of some of these scientists of interest to veterinary medicine in future newsletters. Our first scientist's obituary is that of William Jarrett who discovered the feline leukemia virus (FeLV) and who was a colleague and friend to Dr. Hardy.

Tribute to: Professor William Jarrett

By William D. Hardy, Jr., V.M.D.

Professor William Jarrett FRS, FRSE, Born: 2 January, 1928, in Glasgow. Died: August 27, 2011, in Blanefield, Stirlingshire, Scotland, at age 83. Leading veterinary researcher, discoverer of the FeLV in 1964 whose work gave insight into both leukaemia and HIV.¹



It was with deep sorrow that I learned of the passing of Bill Jarrett from his bother Oswald. Bill was the father of FeLV research having discovered the virus from a cluster of cases in 1964. After discovering FeLV, Bill was the main force behind bringing together young veterinary scientists from around the world to work on this virus. His intuition was that FeLV would be an excellent model for cancer viruses of humans which were yet to be discovered. When I began my FeLV research at Sloan Kettering Cancer Center in the late 1960s shortly after graduation, Bill and his brother Oswald welcomed me into the field and were collaborators for years to come. We published more than 10 papers together. As an upstart you can imagine how thrilled I was to have been accepted so quickly and enthusiastically. The Jarrett brothers were very generous in providing reagents and advice. Bill and his lovely wife Anna even had me as a house guest to celebrate Guy Fawkes Day with fireworks in their backyard in a typical Scottish November 5th sleet storm. Later, Bill and Os

entertained all of us with scotch and Scottish songs in Bill's home.

Bill Jarrett organized the first International FeLV Meeting at the Villa Serbelloni, Bellagio, Italy (Lake Como) in October of 1974. The Villa Sebelloni was a Rockefeller Foundation facility reserved for important International Meetings and Bill had enough scientific credentials for the Foundation to allow a group of fledgling feline retrovirus researchers to hold their first meeting there. The FeLV scientific meetings continue to this day and have fostered scientific collaborations that have enabled progress in this field culminating with FeLV testing and vaccination protocols that help to control this deadly feline virus. One of Bill's group's earliest publications showed FeLV budding from the leukocytes in cat blood.² After reading the paper, I immediately knew that my group at Sloan Kettering would be able to develop a test for detection of the virus in cat's blood. This proved successful and we, and others, were able to quickly define the FeLV-induced diseases.^{3,4,5}



From left to right: Bill Jarrett, Bill Hardy and Oswald Jarrett in 1974 at the 1st International FeLV Meeting, Villa Serbelloni, Bellagio, Italy.

The following is reproduced, with modifications, from The Scotsman, September 29, 2011 15:39: **William Fleming Hoggan Jarrett** (known as Bill), although born in Glasgow, was brought up near Cumbernauld, Lanarkshire where his family farmed. The son of farmers, Bill Jarrett was one of three brothers who became veterinarians. He attended Glasgow Veterinary College, graduating with honours in 1949 and winning the Gold Medal. He was one of the most distinguished veterinary pathologists of his generation and became internationally renowned for his discovery, in 1964, of the retrovirus that causes leukaemia and lymphoma in domestic cats.

While writing his PhD, Jarrett joined William Weipers at the new veterinary school in Glasgow where Bill's research concentrated on bronchitis in calves, which was then a major illness in southwest Scotland. Their research led to the creation of the vaccine Dictol, irradiated larvae of

the lungworm parasite (*Dictyocaulus viviparus*). The vaccine was widely used in Africa and this led to Jarrett joining an international team to establish a veterinary school in Nairobi, Kenya.

After his year in Africa, Jarrett returned to Glasgow where his research interests lay principally in the fields of tumours, viruses, leukaemia and immunology. His identification of the FeLV laid the groundwork for the discovery of the human leukaemia virus and the HIV. This research led Jarrett to further join forces with the renowned American biomedical researcher Robert Gallo and together they carried out key studies into T-cell tumours in humans. Their work led to the discovery of the first human retrovirus, the human leukaemia virus, HTLV. Writing a review in: *Oncogene* (2005) 24, 5926–5930 entitled: History of the discoveries of the first human retroviruses: HTLV-1 and HTLV-2, Robert C Gallo wrote: "In the early 1970s, I also began to study animal retroviruses because in several animals these kinds of viruses caused leukemias. My co-workers and I also decided to search for human retroviruses, an unpopular goal at this time considering the decades of attempts and failures. I was mainly encouraged in this effort by discussions with William Jarrett, the Scottish veterinarian who discovered feline leukemia virus..."

Bill's quest for knowledge never ceased and in the mid-1970s he investigated the reasons for stomach cancer in cattle in some parts of Scotland. He discovered that a papillomavirus causes the disease in association with the consumption of bracken fern, which contains carcinogens. His discovery was the definitive proof that this family of viruses is implicated in cancer development. He and his colleagues developed a vaccine that was the forerunner of the vaccine for cervical cancer in women.

Bill was a charismatic character and hugely entertaining, which won him many friends and research collaborators. He was a courageous man, both physically and intellectually. Over the years, he and Anna engaged in sports that carried a certain frisson: mountaineering, skiing and particularly sailing off the coasts of west Scotland, France and Mallorca. His wife Anna, who he had married in 1953, died last year. He is survived by his daughters, who followed in his footsteps and became medical pathologists and his brother Oswald, who is also an authority on retroviruses. We have lost a veterinary scientific giant and pioneer.

Oral Inflammatory Disease in Cats:



Oral inflammatory diseases (OID) are among the most common diseases of pet cats. They occur in all regions of the oral cavity and consist of gingivitis, stomatitis, caudal stomatitis (faucitis), tonsillitis, and pharyngitis, periodontitis, oral ulcers, glossitis, and cheilitis. Cats of all ages suffer from OID, even kittens less than one year of age. There are numerous infectious causes of OID including: bacteria (biofilm- bacterial plaque, numerous oral bacteria, *Staphylococcus* spp. *Streptococcus* spp., *Pseudomonas* spp., *Dermatophilus congolensis*, *Actinomyces*, *Pasteurella multocida*, and *Bartonella* spp.); viruses: (feline Calicivirus (FCV), feline Herpesvirus (FHV), FIV, FeLV, Panleukopenia virus), and Mycoses: (Cryptococcosis). Infectious agents can invade the oral cavity locally or systemically as generalized infections.

Bartonella have been shown to cause disease in humans, dogs and cats. Humans have served as the "animal model" for *Bartonella* diseases of dogs and cats. Almost all of the *Bartonella* diseases of cats and dogs were first discovered and published from humans infected most often with *Bartonella* originating from pet cats. An exception to this is the strong association of *Bartonella* induced OID of cats that has not been seen in humans. However, there are several reports of finding *Bartonella* in the oral cavities of humans, dogs and cats. OIDs have not yet been induced by experimental infections of cats.



Gingivitis in young cats with little or no calculus. All were *Bartonella* WB seropositive.



Gingivitis and oral ulcer in a *Bartonella* WB seropositive cat.

Etiologic Evidence for *Bartonella*:

Our evidence for the association of *Bartonella* with OID in cats is: 1) the serologic detection of *Bartonella* infections in approximately 48% of cats with OID^{6,7}, 2) the excellent clinical response to specific anti-*Bartonella* antibiotic therapy⁸ and 3) the correlation of the clinical improvement with the elimination of *Bartonella* after therapy.^{7,8} There is often inflammatory disease in other systems such as the eye (uveitis) respiratory tract (URI, rhinitis, sinusitis), and GI

tract in cats with OID caused by *Bartonella*. The inflammation in all the sites often resolves after therapy for the *Bartonella* infection in these cats.



Stomatitis and posterior stomatitis (faucitis) in *Bartonella* WB seropositive cats.



Severe stomatitis- *Bartonella* WB seronegative cat.

Interpretation of a western blot serology positive *Bartonella* FeBar[®] test results in a cat with OID:

1. *Bartonella* is the sole cause of the OID.
2. *Bartonella* is a contributing cause of the OID along with another agent(s).
3. *Bartonella* is not the cause of any of the OID- (*Bartonella* is in the cat but not causing the OID).
4. *Bartonella* is not in the cat any longer but the antibody persists (history of infection).

Interpretation of the Comparative Therapy Titration Test and Clinical Response to Therapy in OID:

Clinical Response:	Titer Reduction*	Interpretation:
100% resolved	Yes	Cause
100% resolved	No**	Not Cause
Excellent:		
80-99% improved	Yes	Polymicrobial
80-99% improved	No**	Not Cause
Good:		
60-79% improved	Yes	Polymicrobial
60-79% improved	No**	Not cause
Fair:		
50-59% improved	Yes	Polymicrobial
50-59% improved	No**	Not cause
Failure:		
<50% improved	Yes	Not cause
<50% improved	No**	Unknown**

* A reduction in *Bartonella* antibody titer 6 months after therapy indicates elimination of the infection.

** Must retreat to eliminate the infection and re-titer 6 months after therapy.

Polymicrobial= *Bartonella* and other organisms- viruses & other bacteria.

Bartonella Therapy- Clinical Response:

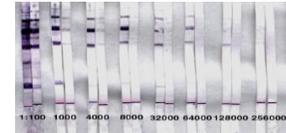
As summarized in the table above, the involvement of *Bartonella* in cats with OID can best be determined after specific antibiotic therapy. If there is a 100% resolution of the OID, especially in cats who have failed previous other antibiotic therapy, *Bartonella* was the sole cause of the OID. Cats with between 50 and 99% improvement should be considered co-infected with *Bartonella* and other microorganisms such as other bacteria or viruses. Each agent contributes to the inflammation to various degrees.



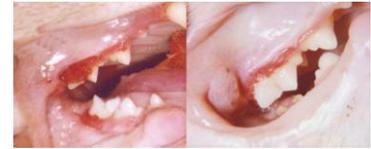
Therapy result- 100% resolution and titer decrease- *Bartonella* was the sole cause of the OID.



Therapy result-Cat #44703 100% resolution and titer decrease- *Bartonella* was the sole cause of the OID.



Cat #44703- 16 fold titer reduction indicating elimination of *Bartonella* infection.



Therapy result- 80% improvement and titer decrease- indicating a polymicrobial cause- *Bartonella* and other agent(s).



Therapy result- no improvement and titer decrease- indicating *Bartonella* was not the cause but was eliminated from the cat.

Public Health Considerations:

Bartonella infected cats with OID may have an enhanced ability to transmit the bacteria to humans due to the oral inflammation which may allow *Bartonella* to leak into the oral cavity.

References:

1. Jarrett, WFH., Crawford, EM, Martin, WB & Davie, F: A virus-like particle associated with leukemia (lymphosarcoma). Nature 202: 567, 1964.
2. Laird, H, Jarrett, O, Crighton, GW, Jarrett, WFH & Hay, D. Replication of leukemogenic type virus in cats inoculated with feline lymphosarcoma extracts. J Natl Cancer Inst 41: 879, 1968.
3. Hardy, WD, Jr., Hirschaut, Y & Hess, P: Detection of the feline leukemia virus and other mammalian oncornaviruses by immunofluorescence. in Unifying Concepts of Leukemia, 778, 1973.
4. Hardy, WD, Jr., Old, LJ, Hess, PW, Essex, M & Cotter, S.: Horizontal transmission of feline leukemia virus. Nature 244: 266, 1973.
5. Hardy, WD, Jr., McClelland, AJ, Zuckerman, EE, Hess, PW, Essex, M, Cotter, SM, MacEwen, EG, & Hayes, AA: Prevention of the contagious spread of feline leukemia virus and the development of leukemia in pet cats. Nature 263: 326, 1976.
6. 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, Washington, D.C., May 21-25, 1995.
7. Hardy, WD, Jr., Zuckerman, E., & Corbishley, J. Serological evidence that *Bartonella* cause gingivitis and stomatitis in cats. American Veterinary Dental Society Meeting, Savannah, GA, October 2002.
8. Hardy, WD, Jr., Zuckerman, EE, Corbishley, J, Gold, JWM³, Baron, P, Polsky, B, Gilhuley, K, Kiehn, TE, and Armstrong, DA. Efficacy of high dose, long duration Doxycycline or Azithromycin treatment for *Bartonella* infections in pet cats. Internat Conf Am Soc for Rickettsiology, Big Sky, MT, August, 2001.

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Bartonella references can be obtained at: www.nlm.nih.gov/ or natvetlab.com