Ben Roy Burmester

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The Life of Ben Burmester

Dr. Ben Roy Burmester, known to his many friends as Ben, had a long and productive career in poultry research on avian tumors and tumor viruses. Ben was born in Petaluma, California on June 13, 1910 to a family where rearing laying chickens was a way of life. His father was Carl Frederick Dietrich Burmester (1870-1958) and his mother was Amalie Rose (Benedetti) Burmester (1874-1966). Ben's dad was able to support a family of 8 children comfortably with a single flock of 5000 layers that generated a yearly income of about $1/bird. In the 1920's, Petaluma was considered the egg capitol of the world. Ben was involved with the 4-H program in high school, built a brooder house and raised batches of 2000 pullets as one of his projects. Chickens ran deep in the Burmester family. Ben spent the summer between high school and college running his uncle's poultry farm. While the uncle was on an extended vacation, Ben filled every house with chicks and proceeded to raise and sell 10,000 pullets to finance his first year in college.

Ben attended University of California in Davis and Berkeley. He enrolled at Davis in 1929, but transferred to University of California, Berkeley after 2 ½ years because the poultry research program was located in Berkeley at that time. He graduated with his B.S. in 1932 and then continued with his graduate program, receiving the M.S. and Ph.D. degrees in 1933 and 1936, respectively. Ben was encouraged to consider a research

career by Dr. Holst at Berkeley, a person Ben remembers as a principal mentor. Holst had an orientation in human physiology (medical school) and Ben took many of his graduate courses in human physiology. Ben worked as a technician for a period under the tutelage of H.J. Almquist. He also authored papers on egg formation with V.S. Asmundson. His master's thesis was on a method for iron determination in blood. His Ph.D. research, conducted under the guidance of Sherburn Cook, was on a chemical and spectrophotometric study of immature red blood cells.

After graduation from Berkeley, Ben took a job in 1936 at the University of Illinois where he received $1800 a year and was assigned a non-tenure track position. At Illinois, he worked with L.E. Card on reproductive physiology in the chicken. He also worked with Elmer Roberts, head animal geneticist, on genetic resistance to pullorum disease. Another collaborator was H.M. Scott from Kansas. In 1940, when he was contacted by J. Holmes Martin about a federal job in East Lansing, Michigan that paid the princely sum of $3600, Ben did not hesitate.

He joined the USDA's Regional Poultry Laboratory (RPL) in East Lansing, Michigan in September 1940 as a poultry physiologist, complementing a group of scientists representing various disciplines in poultry biology. The RPL (later the Regional Poultry Research Laboratory and, ultimately, the Avian Disease and Oncology Laboratory) was a new facility, dedicated in 1939, with a mission to solve mortality associated with "leukosis" in laying chickens. The first director, Dr. J. Holmes Martin, assembled a group of specialists in various disciplines in the hope that a multidisciplinary approach would permit progress towards the control of a disease that was poorly characterized and for which the cause was still unknown. These pioneers included Nelson Waters (genetics) and Carl Brandly (veterinary medicine) and later by Alfred Lucas (cytology). In 1940, Martin left and was replaced by Dr. Berley Winton who directed the laboratory for the next 25 years. It appears that Martin was recruited mainly to accomplish the initial staffing of the laboratory because of his prominent stature in the field and his large network of contacts. History shows that he accomplished his mission with distinction.

Ben's first published research in East Lansing detailed characteristics of a transplantable lymphoid tumor developed by Carl Olsen at the University of Wisconsin in Madison. Apparently, Olsen was involved with World War II and needed a laboratory to watch over this newly created tumor line. Burmester was the recipient of this gift and proceeded to isolate from these tumor cells a virus which, through cell-free transmission studies published in 1946, was ultimately proved to be the cause of avian leukosis. The virus strain isolated from this tumor was identified as RPL-12 and served as a prototype strain for many years.

The stage was set for this development by factors associated with World War II. The several original veterinarians at the RPL, including Brandly, Cottral, Nelson, and others, all were needed for various aspects of civil defense work and some physically left the laboratory. Ben was exempt from the defense effort, and was able to continue his research on avian tumors. His seminal discovery of avian leukosis virus occurred at much the same time as the first recognition that viruses were important causes of cancer

in mammals. His work, therefore, was of immediate interest in both human medical and poultry fields.

Burmester went on to study avian leukosis and its virus for the next 25 years, contributing significantly to knowledge of its pathology, pathogenesis and epidemiology. Ben had access to the highly susceptible 15I chicken strain, developed by Waters, which appeared free of the infection. He developed a system of plywood cubicles where small groups of chickens could be reared in partial isolation for long periods without spread of leukosis to birds in adjacent cubicles. His success derived in large part because of this highly useful biological assay system. Probably the most important finding was that the virus was commonly transmitted through the egg. This work was done in collaboration with George Cottral, one of the original veterinarians who later returned to the lab. Considering that the only virus assay was to inoculate susceptible chickens and wait 6-9 months for tumors to develop, progress was measured. However, it laid a firm foundation for later work following the development of technology for the culture of the causative virus in cell cultures. Another notable achievement from the early 1960s was the collaboration with Robert Good, Ray Peterson and Max Cooper that elucidated the role of the bursa of Fabricius in the pathogenesis of lymphoid leukosis. Bob Gentry, a veterinarian, did graduate work under Ben and contributed to the avian leukosis work in the 1950s. Gentry went on to a productive career in poultry diseases at Pennsylvania State University.

In the process of his work on avian leukosis, Ben's research had necessarily moved into the fields of pathology and microbiology. He also recognized that "if he were ever to be in charge of anything at East Lansing" (his own words), he would need a veterinary degree. He enrolled in the College of Veterinary Medicine at Michigan State College as a special student, attending classes part time while continuing his employment at the RPRL; he graduated with a D.V.M. in 1951.

During the 1950s, Ben emerged as a leading scientist in the arena of poultry disease research. However, Ben split his allegiance between medical and poultry colleagues, which was unique for that time period. He was a valued member of the group of scientists working on newly discovered tumor viruses in mice and other animals, thus contributing to a basic understanding of this fast developing and important field. He was a friend of Ludwig Gross, Frank Rauscher, Werner Schäfer, Bob Huebner, Fritz Deinhardt, and other early movers and shakers within the tumor virus field. He even introduced the author to Dr. Peyton Rous in the twilight of Rous' career. Especially notable was his close and personal friendship with Joe and Dorothy Beard, scientists at Duke University who contributed so much to knowledge of avian myeloblastosis virus. Ben spent 3 weeks with the Beard's early in their relationship.

He also interacted with workers in the poultry health and production community as the poultry industry endeavored to gain technology to help stem the increasing losses from leukosis in chickens. Ben learned early that avian leukosis virus could induce tumors of many cell types. This grounding may have delayed the realization that some of the lymphoid tumors in commercial chickens might be caused by other infectious agents, an

alternate hypothesis advocated by Hutt and Cole in the United States, and by Campbell and Biggs in the United Kingdom. This controversy was ultimately resolved but for many years served to stimulate interest and discovery.

Ben made two major attempts to address this problem. On both occasions he collected tumors from acute field cases in Georgia and elsewhere, brought the frozen tumors back to the laboratory, and inoculated cell-free extracts. In most cases lymphoid leukosis was induced, but the treatment of the samples, dictated by procedures in normal use for viral isolation, was later learned to have been improper for the isolation of Marek's disease virus. Thus, these experiments failed to reproduce the acute disease seen in the field and further confused the etiological distinction between the two syndromes. This must have caused considerable frustration. These forays into the field, however, resulted in a rich collection of field strains of avian leukosis virus that became an important resource for later studies.

Ben Burmester became strongly committed to professional organizations. He was a charter member (1957) and the 4th president (1961-1962) of the American Association of Avian Pathologists (AAAP). He was also actively involved with the World Veterinary Poultry Association (WVPA) for many years and served as its president 1977-1981. He was the co-chair of the 1977 WVPA meeting in Atlanta (with Bruce Calnek). This meeting was hosted by the AAAP and was the first meeting of the WVPA to be held in the United States. He was elected a life member of AAAP in 1983. His leadership roles in these organizations probably more reflected his considerable stature as a scientist and the reputation of RPRL than his skills in organizational management, which were adequate but not exceptional. There was no doubt, however, that he was highly respected by many.

By the start of the 1960s, it was increasingly clear that a second disease was contributing to the lymphoid tumors of chickens in the field. Early work by Sevoian in the United States, and by Biggs and Payne in the United Kingdom, indicated that a neural form of leukosis could be transmitted in the laboratory by inoculation of normal chicks with whole cells from diseased chickens. Ben recognized the need to investigate this new aspect of avian tumors. He obtained material from Sevoian in 1962 that Torgny Fredrickson, a scientist at the RPRL, used to induce lesions that would soon be known worldwide as Marek's disease. Although Sevoian properly deserves credit for establishing a successful transmission model, Ben and his team perfected this system and used it to good advantage, even to the present time.

In 1964, Berley Winton retired after many years as laboratory director and Ben was selected as the new director. He hired the author of this article in the same year and a focused program on Marek's disease was launched. The discovery of the causative virus of Marek's disease in 1967 and a successful vaccine based on the turkey herpesvirus in 1970 were crowning achievements of Ben's career. A new cadre of scientists including Purchase, Okazaki, Crittenden, Witter, Nazerian, Lee and others assembled by Ben during the 1960s contributed to this team effort. Credit for the significant accomplishments on the etiology and control of Marek's disease was shared by the

Houghton Poultry Research Station (HPRS). The English lab had a similar program and had made essentially identical and simultaneous findings at every step of the Marek's disease story.

Early in the 1960s, Ben had established a strong friendship with Peter Biggs, director of the HPRS, which was probably initiated by a visit by Biggs to East Lansing early in the 1960s. This friendship endured all through the period of intense competition between the two groups. Ben invited Jim Payne, a colleague of Biggs, to spend a year (1965) in the RPRL. Likewise, Graham Purchase of the RPRL spent a year in the English lab. The mutual respect and friendships forged during this period endures.

By the mid 1960s, Ben was spending most of his time as an administrator. He gave up his laboratory and his long-time research technician (Bart Larkins). He functioned as a catalyst and spokesperson for the program he had assembled. He was the consummate animal experimentalist and mentored his staff effectively in the art of in vivo assays.

Throughout his career, but especially following his appointment as Director, Ben was a strong promoter of international relationships, both scientific and personal. Ben traveled extensively throughout the world due to his tall stature in the field of avian tumor viruses. The list of foreign scientists invited to the RPRL for short or long term experiences is extensive and many of these persons also became personal friends. In addition, many of the RPRL senior scientists also were from foreign countries giving the RPRL a truly international flavor. Ben set an example at RPRL in international relations which continued long after his retirement.

Ben's relationship with the pioneer scientists of cancer virology ha been mentioned. He moved easily in the basic science and virology field, by virtue of his stature and unique contributions. Later collegial friendships were established with Maurice Hilleman, the premier vaccinologist at the Merck Institute, Peter Vogt, and others.

The laboratory received many accolades in the 1970s for the development of the first effective cancer vaccine and for virtually saving the poultry industry. Of course, other laboratories also contributed to this success, some perhaps even more than the RPRL. However, Ben's career prior to his retirement in December 1974 was replete with recognition and must have carried much satisfaction for finally contributing in a most spectacular and tangible way to the reduction of disease in commercial poultry. Ben received many honors and was also promoted to GS-17, a supergrade designation in the USDA accorded to very few scientists. Notable among his more than 20 major awards for research were the Borden Award, Senior Sigma Xi Award, American Feed Manufacturers award, and the Edward W. Browning award. He was a fellow of the American Academy of Microbiology, and an honorary member of the prestigious Deutsche Akademie der Naturforscher Leopoldina (the German equivalent of the National Academy of Science). He received several awards from the United States Department of Agriculture including the Distinguished Service Award, and from Michigan State University including an honorary doctorate. He was also elected to the

Poultry Hall of Fame, where his portrait is displayed in the National Agricultural Library in Beltsville, MD.

Following his retirement in December 1974, Ben remained associated with the laboratory for a number of years. In fact, he contributed to several pieces of laboratory research as a collaborator, some of which were noteworthy. After the Marek's disease vaccine, one of the most important discoveries at the RPRL was the technique of *in ovo* vaccination for Marek's disease. When this work started about 1980, Ben had been retired for 5 years but was still in close contact with the RPRL. Jagdev Sharma had conceived the idea that if the HVT vaccine was introduced into the embryo and did not kill it, the resulting chick might be protected against the disease more effectively. Ben agreed that HVT might not be lethal for embryos and encouraged Sharma to conduct pilot trials. Ben directly collaborated with Sharma on the initial studies. Sharma and Burmester published the seminal paper confirming this hypothesis in 1982. The resulting patents provided the basis for the creation of a company known as Embrex, located in Research Triangle Park, NC. This technology is now used to provide MD vaccine to over 90% of the commercial broiler population in the United States.

On the personal side, Ben and his first wife, Mary Alice, whom he married on June 17, 1933, were always gracious hosts to laboratory employees and especially to guests and visiting scientists. Ben (or maybe it was Mary Alice) would invite a group in for a major feast on what seemed to be a moments notice. Ben formed significant friendships with many persons from foreign countries and the opportunity to travel extensively in his later years was a rewarding experience. Ben and Mary Alice with their 3 children built a cottage on Bass Lake, near Pentwater, MI. in 1946. This cottage has become a family treasure and continues to be a summer retreat for the entire Burmester clan. After Mary Alice died in the late 1970s, Ben married Zoe Barrons Alderman, sister to their neighbors and close friends at Bass Lake. Ben and Zoe soon moved to Petaluma, CA. For many years, they lived in Petaluma from September to May, and at Bass Lake for the summer. He and Zoe moved to Idaho in later years to be with family.

Ben participated in the historical reflection on Marek's disease, held as part of the 5th International Symposium on Marek's disease in East Lansing, MI in September 1996. His thoughts on his career and the development of Marek's disease research were recorded on videotape, which are catalogued in the AAAP archives. At that time, he once again entertained old friends from many countries. He celebrated in June 2000 his 90th birthday in Petaluma with many accolades from his family.

Truly, Ben stands tall among the scientists who contributed significantly to veterinary microbiology and avian medicine in the 1940-1970 period. His 35-year career at the RPRL was chronicled with achievements in both avian leukosis and Marek's disease. His legacy also includes a group of mentees, many of whom have had distinguished careers in avian medicine, and a worldwide network of personal friendships. His efforts, first as a scientist and later as director, made the Regional Poultry Research Laboratory (now Avian Disease and Oncology Laboratory) the preeminent laboratory in the world for the study of neoplastic diseases of poultry, a distinction it still enjoys.

This paper was prepared between July 2000 and January 2001 for deposit in the historical archives of the American Association of Avian Pathologists. It was based on archival materials at the Avian Disease and Oncology Laboratory, notes from a personal interview with Ben in July 2000, subsequent discussions with Ben and his son, Alan Burmester, and the author's own recollections which include many discussions with Ben over the years.

Biography solicited by the Committee on the History of Avian Medicine, American Association of Avian Pathologists.

Additional biographical materials may be available from the AAAP Historical Archives located at Iowa State University. Contact information is as follows:

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