

WW II intervened; Elmer was drafted in Nov 1941. George wanted to join the Navy and my draft date was Aug 1 1942. The cows were sold, 52 head, because there was no one to milk them and process the milk.

I volunteered for Army Air Force Pilot training, was commissioned, trained a crew and completed 35 bombing missions as a B-24 pilot flying from England to Germany. During training I met a most lovely WAC (Women's Army Corps Volunteer). We were married when I returned from Europe, my combat tour completed.

We returned to Davis in the fall of 1945. The war had delayed the construction of the Veterinary school at Davis until the fall of 1948. I used the time to earn a bachelors degree in Animal Husbandry and to take graduate courses. Being a veteran and having taken the extra courses contributed to my being selected for the first class in the new Veterinary School.

Like most in that first class, I had to support a family while in college. I worked in the small animal clinic before the college opened, then I got a technician's job in the Avian Medicine Department where I worked with early staff members, Mathey, Adler, Yamamoto, Bankowski and Zander. I liked the job and the opportunity to work with these fine men.

Through my work, I got a taste for research; with Dr Donald Jasper, I worked on chronic copper toxicity in sheep; with Dr. Donald Zander, a project of isolating *Hexamita meleagris* in mono culture which resulted in my first published paper. The fascination of discovery lasted a lifetime, as did the realization that chickens did not inflict the degree of damage from bites and kicks compared with other animals.

On graduation in 1952, I was hired into a general Veterinary Practice at Lancaster, CA. I tried to establish a Poultry practice there. That opportunity died with my principal client in a plane crash in Montana.

While at Lancaster, I co-authored, with Dr. Zontine, a paper reporting a successful laparotomy on a pony in the treatment of a case of Sand Colic.

In 1954, I joined the practice of Dr. D. E. Davis and Dr. Bill Dungan's "The Poultry Clinic" in Petaluma CA. It was a pure Poultry practice; vaccinating, debeaking, worming, diagnosis and treatment. From my billing records, I had individually handled 1 million chickens and treated another million.

I was employed by Kimber Farms, a chicken breeding organization, in August 1955. In December, I was appointed as the Veterinary Laboratory Director. The Kimber Laboratory had an illustrious history. Dr Kermit Schaaf became the first full time veterinarian in 1937. Prior to his tenure, veterinarians from the University of California Poultry department consulted. Other early staff veterinarians were Drs. Hamilton, C. N. Brewer, William Urban and Irvin Peterson.

The Kimber Laboratory isolated and produced all its own vaccines, starting with Fowl Pox before 1940. It solved the riddle of Avian Encephalomyelitis and the vaccine that resulted was used to protect commercial chicks from AE for nearly 10 years prior to a commercial vaccine was marketed. The Kimber Newcastle vaccine was remarkable. The virus was isolated from one of Kimber's isolated flocks where only mild Newcastle symptoms were observed, yet the flocks were immune by SN and later HI tests. The vaccine virus was maintained in continuous chick passage for years until techniques for embryo propagation became available. It was the most effective vaccine in the 1971 – 1972 VVND outbreak in southern California.

A New Disease

During 1955 to 1957, I saw several cases of “spontaneous fright” in chicken flocks. There were no similar reports in the literature. An old time husbandman told me it was caused by a snake or some other animal getting into the hen house. He called it “Snake in the house.”

Following extensive field observation, I described the condition and named it “Avian Hysteria” I suggested a nutrient imbalance as the cause and proposed a specific nutritional regimen as a method of partially alleviating the condition. The cause is still unproven but no better description or method of control has been advanced in the intervening 50 years. This little episode got me known as “The Crazy Chicken Doctor”.

All-in, All-out

When I completed Veterinary School, I felt very comfortable in the field of ECOLOGY. Degrees in Husbandry and Medicine with extra courses in Nutrition gave me a background and a strong interest in the broadest range of relationships of animals and their environment. As my first formal task at Kimber Farms, Dr. Welford Lamoreux, Director of Research, asked me to review the causes and possible means for control of the serious disease problems plaguing the California Egg Laying Industry. In the first report I advanced the concept of avoiding Horizontal Transmission of Infectious Agents, recognizing that most of the diseases were being spread from older to younger birds on the same farm.

At the second session, two weeks later, I described a management system which I named “All-in, All-out Husbandry. The concept included requirements for times, distances and age separation of flocks. The Ideal was isolation of each flock from hatching to disposal. The program recognized that gains in performance were incrementally related to the amount of the system that was economically practical for each commercial poultryman to adopt. This seems obvious today but in those days of enormous expansion of both size and number of poultry farms it was a major problem. Most expanded by building another house and brooding an additional flock each year, a certain route to increased disease exposure from “On Farm” sources.

Another part of my flock management package was a Flock Projection system. It was derived from the Kimber Farms system for projecting daily chick output from its hatcheries, 24 months in advanced of chick delivery date. The flock projection program allowed poultrymen to project their farm's daily egg production, including egg size and grade, two years in advance. It was very advantageous to those trying to reduce the number of age groups on a farm, for disease control, while maintaining a uniform product flow for their market.

The Performance Concept

In late 1956, Kimber Farms recognized that the results of Genetic Gain shown in field trials were not appearing in commercial flocks. Hens of lower genetic capability were doing as well for many poultrymen as the "Genetically Superior Kimber Chicks.

Kimber Farms assigned Vern Miller, Husbandman, Dr. Kenneth Goodwin, Geneticist and me to investigate the problem. We found that when both types of hen did well, the Kimbers were far superior, but when neither did well, the Kimber hens often had poorer production. More importantly we found that among poultrymen there was no concept of how their flocks should perform.

The result was the development of the Performance Goal Concept. We prepared charts of daily performance of our best flocks as guides to expected performance on which customers flock results could be entered daily for direct comparison. Its acceptance was immediate Industry wide. The competitive hen that precipitated it, the California Grey, disappeared from the market in 3 years. The basic factor was nutrition. The California Grey could live and lay on cheaper, low energy barley food but on more efficient diets she could not compete economically.

Body Weight

The use of the Production Goal Graphs revealed great differences in the performance of identical genetic stocks on different poultry farms. Physical handling of hens from MANY farms led me to propose that the degree of fleshing at peak production (then 32 weeks of age) was highly correlated with total performance of the flock. A review of body weights of Kimber research flocks which were always weighed at 32 weeks of age, and daily production, confirmed the field observation. Subsequent work showed that weight at 20 weeks of age was also highly predictive of lifetime performance and was a measure that could be applied while there was still time to change underlying nutritional or disease problems. Weighing pullets immediately became a standard husbandry procedure.

Leucosis

Kimber Farms had ongoing research on poultry tumors. Geneticists had selected for resistance to tumor development since 1935. In 1947, Brewer and Brownstein developed tumor transplants highly lethal for day old chicks. By 1955 Urban had shown high levels of passive immunity in chicks as a result of inoculation of

parent females with these (liver) cell transplants. He planned a large scale test (50,000 chicks) to determine whether this passive immunity would influence lifetime LEUCOSIS loss in their progeny. I inherited this project in 1956 and reported the negative results at the 1958 WPDC meeting at Pullman WA. There was no difference in tumor death loss among progeny of inoculated and control hens.

RIF Test

In 1961, Dr. Harry Rubin of the Univ. of Calif. Molecular Biology Laboratory came to the Kimber Laboratory to inquire about the cause for a reduction of foci produced by Rous Sarcoma Virus in cell cultures derived from some of the fertile eggs we supplied. All of his embryos came from eggs produced by the Tumor Research flock at Kimber Farms. Dr. Schaaf and I proposed that the factor was endemic leucosis virus, known to be egg transmitted through work done at East Lansing. Dr. Rubin confirmed this was true and went on to develop the RIF (Resistance-inducing factor) test to detect the presence of avian leukosis virus in cell cultures. One simply challenged cell cultures of each embryo with Rous virus and the resistant (virus-infected) cultures were an indication of virus shed by the respective dam. A corollary test for antibody was also developed, based on the neutralization of the related Rous sarcoma virus. These tests were useful in research, but were also the keys to eradicating avian leukosis virus from flocks in the field.

Kimber Laboratory immediately applied the RIF and antibody tests to our "Tumor Research Flock" of chickens. We found that most chickens without antibody had virus in their eggs and most with circulating antibody did not transmit virus through the egg. By testing multiple eggs from each hen exhibiting antibody before saving eggs for hatching and raising each hatch in isolation, we were able to produce an adult flock demonstrably free of virus and antibody.

This natural history of the virus suggested that relatively simple measures would prevent spread among flocks; thus eradication from commercial flocks might be practical. Due to unforeseen genetic problems it took 20 years to accomplish.

The incidence and type of tumors in the LL virus free flock, ovarian, kidney, neural and proventricular, did not materially change in this first year. This was a shock because I had never seen the European literature, nor was I taught about a second tumor virus, Marek's Disease, which our results demanded.

There was an immediate demand for eggs from the Leucosis virus free flock. Research laboratories across the nation used them for testing embryo.

Marek's Disease

Marek's Disease became a world wide pandemic in the mid 60's. Again utilizing the world wide flock and hatchery system of Kimber Farms I attempted to unravel the natural history of Marek's Disease. In 1966 I orally reported to the WPDC

that “The final cause of Marek’s losses were not egg transmitted and did not accompany the chick”. Chicks took on the Marek’s patterns of the region in which they were brooded, grown and housed. They did not carry the Marek’s pattern of the flock from which they were hatched nor of the area where the eggs were laid. This added to the great diversity of tumor incidence in chicks from a single breeding flock being sent to many growing farms, led me to propose that two viruses were required to explain the facts: one protective and the other a promoter. Flock losses were then dependent on timing of infection by the viruses. Biggs and Churchill had just defined the cause of Marek’s disease as a Herpes virus. My inclination was to look for an egg transmitted virus in order to explain the failure of isolation and sanitation to reduce losses. Fortunately my friend and Colleague whom I worked under at Davis, Dr Donald Zander found the second (protective) chicken Herpes virus on a farm with a history of low Marek’s losses.

The struggle for Marek’s control

The failure of Isolation and Sanitation to reduce Marek’s losses greatly confused the problem. The first system that had any effect was the inclusion of litter from grow houses with low levels of Marek’s as a part of the litter on which baby chicks were brooded. This program helped on some seriously affected farms but did not on others. There was great reluctance to promote the practice. 1. We had spent many years trying to isolate baby chicks from older flocks for disease control. 2. This was a time of major effort to eradicate Mycoplasma gallisepticum from poultry farms, Brooding babies on old litter was the antithesis of both programs.

After Churchill and Biggs reported the cause of Marek’s as a herpes virus, Witter and the group at East Lansing reported that the Blood of turkeys commonly carried a herpes virus which protected chicks when the blood was inoculated intraperitoneally.

In the summer of 1969 Kimber Farms Turkey Breeding Division transferred a group of adult Toms to our Laboratory isolation. Inoculation (.2 ml) with pooled (5 birds) fresh whole blood was made available for chicks destined for chronic high loss farms. This procedure was effective in reducing loss. It was, however, quite costly at eight cents per chick.

In 1969, Witter reported the effectiveness of Turkey Herpes Virus as a vaccine for protection of chickens against Marek’s disease. The Kimber Laboratory obtained the virus in the summer of that year and converted it’s RIF tissue culture program to the production of Turkey Herpes virus.

In 1964, we had developed a Marek’s cell transplant through continuous intraperitoneal passage of liver homogenate. It was called K-64. It was used as the challenge strain in safety and potency tests for Kimber Farms Turkey Herpes Vaccine.

Test results from 450,000 chicks in controlled tests, Laboratory and Field, were submitted in a California license application. A license was issued in 1971, the first licensed (state level) in the United States. Production of vaccine continued until 1974 when Kimber Farms closed.

I left Kimber Farms in 1971 to accept a position as Vice President for Operations at Fairview Farms, the egg production division of Olson Farms.

The direction of my research changed toward Nutrition, Housing and Husbandry. This was the early days of High Rise poultry housing and the beginning of very large flock sizes. Two areas of design carry my imprint; Ventilation and evaporative cooling systems for large “high rise” poultry houses in hot and dusty areas.

Bill Shupe and I designed a successful, large (60,000) chick brood-grow system utilizing a hot water radiant heat source needed for large numbers of chickens raised on wire.

A nephew, Kevin Hughes and I developed a flock and farm management computer program incorporating all the earlier Kimber Programs plus reports on efficiency of Nutrient Utilization.

In 1955, I reported at Logan Ut, and Loma Linda Ca. meetings that the demographics of the egg industry were such that the rapid move of the egg production industry to the Midwest would ultimately impose a price ceiling on all the other egg production areas of the United States. I added that there was no way for large western egg producers (exporters to other states) to escape this economic time bomb except to move a portion of their production to the Midwest. This prediction was fulfilled by 1990

In Review:

The daily tasks of a poultry veterinarian, diagnosis of disease, vaccination, eradication programs, new diseases and new treatments were in themselves very satisfying. I was fortunate to be among those able to contribute to the long struggle for the control of tumors of poultry. It was a frustrating and fascinating chase.

I believe my most useful work was not specifically Veterinary Medicine, but required expertise in the “Whole Chicken”. It was “Disease” but not solely Medical Disease.

Three Seminal Concepts and Inventions came from my work between Husbandry and Medicine.

- “ALL-IN ALL-OUT HUSBANDRY” This concept was designed for Disease Control. In that pursuit, we recognized that intermediate control produced intermediate economic gain. With the companion scheduling system, it provided a means for predicting performance of Husbandry

- Systems and estimating the costs and gains to be expected from changes such as reducing the number of flocks on a single premise.
- PERFORMANCE GRAPHING AND PROJECTIONS, (Recording and Comparing). A program for evaluating reproductive performance of poultry, designed for commercial application.
 - BODY WEIGHT. A means for predicting poultry performance, at a time when it is still possible to modify the prediction.

These three concepts in concert set the parameters for development of today's large scale egg production industry and changed Poultry Husbandry, Nutrition and Disease Control more radically and more rapidly than any other events in my lifetime. All were known and in practice World Wide within 10 years.

This work was possible because I had the opportunity to study Avian Disciplines in addition to Medicine and to observe and act on those problems that spanned the Disciplines

Editor's note: Walter Hughes was born on January 27, 1922 on a farm near Santa Barbara, CA. He was active in 4-H Club work in both poultry and dairy. In 1941, he was awarded a Diamond All Star which is the highest award for 4-H members in California. His 1963 publication in Avian Diseases describing the production of an experimental flock free of avian leukosis virus was selected as the best paper published in Avian Diseases that year. This was the first of the "best paper" awards given by the American Association of Avian Pathologists, an award now designated as the P.P. Levine Award. Dr. Hughes also co-authored the chapter on "avian leukosis" with Erwin Jungherr in the 5th edition of Diseases of Poultry, published in 1965.

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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