NATIONAL ACADEMY OF SCIENCES

RAYMOND ALEXANDER KELSER

1892—1952

A Biographical Memoir by

RICHARD E. SHOPE

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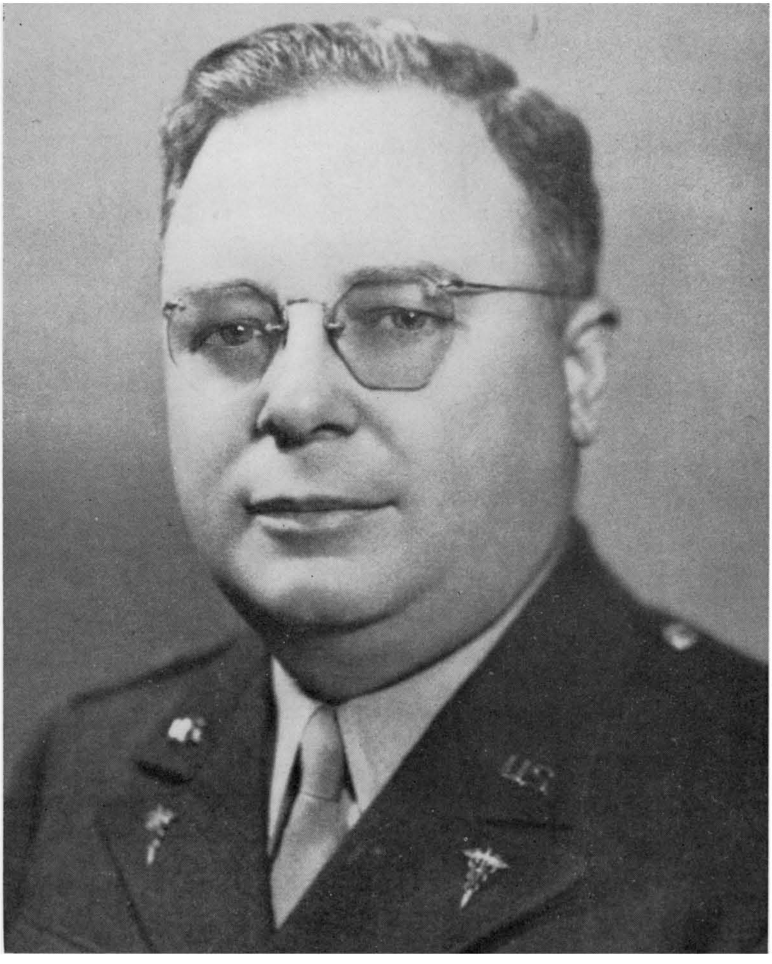

Raymond A. Kelser

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BY RICHARD E. SHOPE

Raymond Alexander Kelser was born in Washington, D. C. on December 2, 1892, and died in Philadelphia on April 16, 1952. While scarce 135 miles separated the place of his birth from that of his death, much of his scientific career was lived in farflung places and the influence of his work and the reputation which he achieved as veterinarian, bacteriologist and immunologist were world-wide.

Ancestry and Boyhood

Raymond Kelser's ancestors on his father's side were of German-English origin, his great-grandparents "Kelser" having emigrated to Baltimore in the early 1800's. His mother's people were of English descent through several generations in Virginia. His father, Charles Kelser, because of family illness, the death of his father, and financial reverses, had to go to work as a young boy, apprenticing himself at various trades and becoming a skilled mechanic. Charles Kelser married Josie Mary Potter when both were quite young. Eight children were born to them, 7 sons and 1 daughter, and Raymond was their first-born. Although Raymond was born in Washington, D. C., part of his early childhood was spent in Baltimore where the family lived for a few years.

Raymond's schooling was entirely in Washington, where he attended various public elementary schools in the northeast section of the city. According to Miss Julia Mae Rawlings, who taught him in his 7th grade work, he was an excellent, serious, and very responsible young student. He was an ambitious child with an intense desire for a good education, and by the time he had finished the elementary grades he knew definitely that he wanted a profession, either law or medicine. His youthful consideration of law as a profession undoubtedly stemmed from the countless hours he spent in his boyhood years around the Capitol, attending sessions of Congress, and also attending sessions

of Court in the various courts in Washington. The knowledge he retained therefrom was apparent in his adult years.

There were in Washington, during Raymond's boyhood, three Academic High Schools, one Technical High School, and one Business High School. Raymond had hoped that, on finishing 8th grade, he might enter one of the Academic High Schools. However, at about this time the Kelser family finances, none too good at the best, took a turn for the worse, and Raymond, therefore, received no encouragement at home regarding the higher education he so keenly desired. Instead, his father contended that a good business education in the Business High School, then a job, and then progress in the business world, was the course that Raymond should follow. Young as Raymond was, he understood that his father's decision was not from lack of desire for a higher education for his first born, but to a proud and independent spirit which prevented him from seeking financial assistance from those in his family who could have granted it. Although very much disappointed, Raymond followed his father's advice, and started his business course. To help finance this schooling, he acquired two paper routes, one an early morning one, and the other an evening one, and, in addition, did odd jobs in his spare time to earn extra money.

Towards the end of his "business course" Raymond decided to try to take advantage of the opportunity that then existed in Washington for taking collegiate courses in evening classes. He had learned that many Government employees were obtaining college degrees by attending these evening classes and that degrees in almost anything, including medicine, could be obtained in that way. He felt that if he could get a "Government job" which permitted him finishing his work by 4:30 P.M., he could not only finance, but would also have the time for, this evening college training.

With this plan in mind he went to the Civil Service Commission to try to obtain an appropriate "Government job". However, getting a "Government job" in those days presented numerous difficulties, especially to a resident of the District of Columbia. At that time no resident of the District of Columbia was eligible for a permanent appointment as a "clerk", the sort

of job Raymond had hoped to obtain. This apparent discrimination against D. C. residents seems to have resulted from the fact that on the State quota system then in effect the District had, at the time Raymond applied, far surpassed its allotment. Temporary appointments through Civil Service examinations for non-professional positions were few and far between (undoubtedly Uncle Sam was attempting to balance his budget even in those far-off days) and could be made only for a maximum of six months in any one Department of the Government and with a total of only eleven months in the Government service in any one year. The income resulting from such indefinite employment did not warrant assurance of the financing of a college education. As a consequence, in order to get an appointment as a clerk, Raymond would have had to go to some State for a year to establish "residence", take an examination, and then get his appointment from that State. Such a course of action was impracticable and so some alternative plan of procedure had to be worked out.

The alternative plan was simple but less remunerative. However, as will become evident, that alternate plan proved to be the deciding factor in molding the remainder of Raymond's life and his whole professional career and thus, while its prospects for immediate financial gain were poor, its value from the destiny standpoint was very great. The alternative plan involved the taking of a Civil Service examination for "messenger" instead of "clerk". A D. C. resident was at the time eligible to become a "messenger" even though barred by virtue of his residence from becoming a "clerk". The starting salary of a messenger was $30 per month and by gradual stepwise increases could eventually reach a top of $50. So at age 17 he took and passed the examination for "messenger".

At this point "Fate" or "Destiny" seems to have offered a guiding hand for Raymond's appointment as "messenger" was in the Bureau of Animal Industry of the United States Department of Agriculture. Fortunately, after working for a very short period of time as a messenger his ability was recognized by the late Dr. John R. Mohler, who was at that time Chief of the Pathological Division of the Bureau of Animal Industry.

Dr. Mohler set young Raymond to doing secretarial work in his division and eventually to working as a laboratory assistant. Raymond finished his preparatory schooling after office hours in various schools which offered evening courses.

Dr. Mohler took a very personal interest in Raymond and tried in many ways to have him appointed to other Government payrolls in order to obtain for him a salary that more nearly represented that which his work warranted. However, his efforts were unsuccessful because Raymond was a District of Columbia appointee and Civil Service could do nothing about it on a permanent basis. Raymond became Dr. Mohler's secretarial assistant and an assistant in the Pathological Laboratories of the Bureau. He was happy and interested in his work despite the small salary he drew during those years. It was natural that he became interested in the field of veterinary medicine and that he gave up the idea of studying law or medicine.

He enrolled in The School of Veterinary Medicine of George Washington University and completed the work required for his doctorate in veterinary medicine by attending evening classes there after he had completed his day's work in the Bureau of Animal Industry. Undoubtedly Dr. Mohler was Raymond's inspiration during the time that he was struggling to obtain his professional education. Equally certain it is, however, that Raymond was endowed with a tremendous will to succeed and achieve on his own in order to fight through to the completion of his higher education against odds that would have stopped a slightly less determined and ambitious boy. He graduated and received the D.V.M., to which he was to add such lustre, in 1914. Certainly had Horatio Alger himself planned Raymond's career along the usual lines used in his tales, he could not have outlined a more dramatic beginning nor one initiated in a more "self made man" manner.

Professional Career

After earning his doctorate in veterinary medicine in evening classes at George Washington University, young Dr. Kelser in 1914 did two things of importance. One of these was to marry Eveline Harriet Davison of Brookings, South Dakota, and the

other was to take his first professional position. His marriage, which occurred at the home of the bride's parents in Prince Georges County, Maryland, on September 5, 1914, was an extremely happy one, and lasted throughout the remaining 38 years of his life. His first professional appointment, on the other hand, that of bacteriologist at the H. K. Mulford Company, Glenolden, Pennsylvania, which he accepted immediately upon graduation, satisfied him less than a year and appears to have demonstrated to him that he was not cast for a role as a commercial scientist. Late in 1914 through Civil Service examination in his profession, he returned to Government service in the Bureau of Animal Industry, United States Department of Agriculture, and was assigned to field work in the eradication of foot-and-mouth disease, which had reached epidemic proportions in the United States. In the spring of 1915, he was assigned to the Pathological Division in Washington.

Back in the laboratory where he had worked as a "messenger" and secretarial assistant during his night school days, young Kelser again came under the inspiring influence of Dr. Mohler. Also he associated professionally on his return to the Pathological Division with other scientists and his natural bent for investigative work was stimulated by association with men like Eichhorn, Schoening, Traum, Hall and others in the division. He "took" to laboratory work very naturally and during the period 1915-1918 that he served in the Bureau of Animal Industry he demonstrated clearly that he possessed genuine talent for original investigative work. With Eichhorn and Berg he fractionated anthrax serum and found its therapeutic activity to reside in the globulin fraction. He worked with Berg on tetanus antitoxin and by studying its inactivation with acids, alkalis and proteolytic enzymes came to the conclusion that, while the antitoxic activity was closely associated with the serum proteins there was good evidence for its not being protein in character. Working with Eichhorn he developed a spore vaccine for anthrax that was a definite improvement over the older Pasteur vaccine previously used. In his first single-handed and entirely independent investigation he carried out studies of methods of immunization against blackleg and made interesting and im-

portant observations on the efficacy and mode of action of natural aggressins and toxic culture filtrates in inducing immunity. In this work he observed that the mechanisms by which the natural aggressin and the toxic culture filtrate induced immunity to blackleg were probably different. He did a piece of work on equine infectious abortion (bacterial) which advanced the then current knowledge of the etiology, diagnosis and immunology of that condition.

In March 1918, with the United States involved in World War I, Kelser gave up his work in the Bureau of Animal Industry and entered the Veterinary Corps of the United States Army as a Lieutenant. His Army career extended through 28 years until his retirement as Brigadier General and Chief of the Veterinary Corps in January 1946. Dr. Kelser's 3 years of work in the Bureau of Animal Industry had fully demonstrated his ability to do investigative work of an imaginative and original character, and from this beginning one might have predicted at least a part of the course that his Army career would follow if the Army gave him the opportunity to follow his natural bent and inclination. As it turned out, the Army appears early to have recognized Kelser's talents for research and to have given him opportunities to do investigative work; opportunities which he eagerly seized and made the most of.

His first military assignment was in the Army Veterinary Laboratory at the University of Pennsylvania for a few months training in Army laboratory procedure. His second assignment was that of Chief of the Veterinary Laboratory at the Letterman General Hospital in San Francisco. After about a year there he was returned to the University of Pennsylvania as Commanding Officer of the Army Veterinary Laboratory. In none of these assignments did he remain long enough to undertake original investigative work.

Kelser resigned his commission in the Army in 1920 and returned to work in the Bureau of Animal Industry. He remained there for only a few months. Late in 1920 he went back to military service, this time in the Regular Army, and was assigned to duty as Post Veterinarian at Camp Jackson, South Carolina. It was not until 1921, when he began a 4-year tour

of duty as Chief of the Veterinary Laboratory Division at the Army Medical School in Washington that he again got his research under way.

At the Army Medical School, Kelser showed his first interest in the filtrable viruses, a field in which he was later to make his most significant contributions. He worked for a while with equine infectious anemia and wrote a general review paper in which he speculated, from the results of his own work, that the causative virus might be protozoan in character. He studied equine influenza, compiling a general treatise on the method of handling the disease. In this he speculated at considerable length concerning the possibility that a virus was of etiological importance. Later he conducted experimental work with rabies in which he presented evidence that the Negri body, which he considered to be protozoan-like, actually represented a visible stage in the life history of the rabies virus.

In addition to his work in the field of viruses, Kelser, while at the Army Medical School, made a study of *Clostridium botulinum* and its toxin in culture and canned food products. In connection with this study, he perfected a complement fixation test which was of considerable practical value for detecting botulinus toxin in suspected canned foodstuffs.

During his 4-year tour of duty at the Army Medical School, instead of spending his "off duty" hours leisurely, Kelser registered as a graduate student in the Graduate School of American University in Washington, D. C., securing therefrom his A.M. and Ph.D. degrees.

From 1925 to 1928, Dr. Kelser served as a member of the United States Army Medical Department Research Board in the Philippine Islands and it was while working with this board that he made one of his most significant findings. Cattle plague had long been a serious scourge in the Philippines, affecting as it did both cattle and carabao, and markedly hampering agricultural pursuits in the islands. Kelser studied the disease as it prevailed and undertook the development of a vaccine to combat it. Using blood and tissues of animals ill of the disease he sought a chemical agent which would be capable of inactivating the virus without destroying its immunizing

properties. After many trials he found that chloroform possessed the chemical activity he desired, and that the addition of it to the virus in tissue suspension yielded a preparation that was safe to administer to cattle and carabao and that possessed good immunizing powers. This was the first "killed virus" vaccine that utilized chloroform as the inactivating chemical.

Kelser's vaccine, as finally perfected, was made using a suspension of spleen, liver and lymph nodes from cattle ill of cattle plague in which the virus was inactivated by 0.75% chloroform. It was used extensively and with marked success and is generally credited with being the main factor responsible for the eventual eradication of cattle plague in the Philippines.

Aside from the practical importance of the vaccine, certain theoretical considerations of fundamental interest emerged from Kelser's work with cattle plague. He observed that though the blood of sick cattle was rich in virus, it was devoid of immunizing capacity when treated with chloroform. This led him to the interesting hypothesis that the immunizing principle was not the chloroform-inactivated cattle plague virus itself but rather either some tissue product of reaction between virus and cells or some particular stage of the virus occurring only in tissue cells. While his work did not settle the matter concerning the nature of the immunizing substance in the vaccine, it did rather clearly demonstrate that it was not merely "killed virus". The question is still one of considerable theoretical interest in the virus field.

Another study of interest and importance carried out by Kelser in the Philippines was one dealing with the mechanism of transmission of surra among horses. In a series of ingenious experiments he proved that the fly *Tabanus striatus* was the vector responsible for transmitting *Trypanosoma evansi* to the horse in inducing surra. He demonstrated that transmission of the trypanosome by the tabanid fly was purely mechanical and that the horse was an accidental host. The true animal hosts of *T. evansi* appeared to be cattle and carabao and Kelser found that approximately 50% of these were trypanosome carriers. He pointed out the interesting fact that if *T. evansi* had been carried by a permanently infected insect that fed on horses,

instead of being transferred mechanically by the tabanid, horses would have been wiped out in the Philippines long ago.

The Army brought Kelser back from the Philippines in 1928 and placed him once again in charge of the Veterinary Laboratory Division at the Army Medical School. He remained in this position for 5 years and found the time and opportunity, in spite of heavy routine and teaching responsibilities, to do two pieces of research; one good, and the other outstanding. Following up the success he had achieved in developing a cattle plague vaccine using chloroform as a virus-inactivating agent he applied similar methods in attempting to perfect a better rabies vaccine than was then available. He found, as he had in the case of cattle plague, that chloroform added to tissue suspensions containing rabies virus inactivated the virus and rendered the suspension safe for administration to susceptible animals. Furthermore, infected tissue suspensions containing the chloroform-inactivated rabies virus proved effective in immunizing against the disease. The new vaccine possessed certain advantages over the then currently used "killed virus" rabies vaccines in the protection of dogs and other animals. A fact of some theoretical interest observed by Kelser was that tissue components, in addition to virus *per se,* were essential to the production of a satisfactory rabies vaccine. Kelser reasoned from this, as he had in the case of his cattle plague vaccine, that the immunizing substance must be more than merely dead virus and might be either a particular developmental stage of the virus or a cellular principle resulting from reaction between virus and tissue cells. Again, however, his work left undecided and unsettled the question of the nature of the immunizing substance.

The second piece of research carried out by Kelser on his second tour of duty at the Army Medical School, and the one for which he is probably most widely known, dealt with the mode of transmission of the virus of equine encephalomyelitis. The epidemiology of equine encephalomyelitis was at the time a complete mystery and there were not even any very good guesses as to how the causative virus spread from horse to horse to cause the highly fatal and widespread epizootics that prevailed in the

late summer and early autumn in many parts of our country. The disease, being one with predominantly neurological signs and in which virus was present in high concentration, during the time animals were clinically ill, only in the central nervous system did not on the surface suggest an insect vector. However, Kelser was aware of the fact that a stage of viremia, frequently almost asymptomatic, preceded the fatal neurological stage of the disease and he reasoned that it might be during this period that the virus was transmissible and that when it was present in the blood stream, a blood sucking insect conceivably might be important as an intermediate host. With this idea in mind he tested the possibility that mosquitoes might serve to transmit the virus from animal to animal. Working first with experimentally infected guinea pigs he demonstrated transmission from infected to normal animals by the mosquito *Aedes aegypti*. Later he proved transmission to horses by the same mosquito. Kelser's important initial observation has been repeatedly confirmed and the species of mosquitoes, other than *A. aegypti* that can and do serve as intermediate hosts for the equine encephalomyelitis virus under both experimental and natural conditions have been extended.

Kelser's discovery of the role played by a mosquito as intermediate host for the equine encephalomyelitis virus constituted the first demonstration of transmission of a neurotropic virus by an insect. It led to the discovery by other workers that a similar mechanism of transmission prevailed in other neurotropic virus infections of man and animals and has done much to influence medical thought on the epidemiology of this class of disease. It was a very important observation.

From 1933 to 1935 Kelser was at Harvard as a research fellow in Zinsser's department. He gained much of intellectual and scientific value from this contact with Zinsser and others at Harvard and often spoke of those two years in happy terms. He had an opportunity for extensive reading and for perfecting himself in certain laboratory techniques that might later be useful to him. He published only one paper while at Harvard, a piece of work done with Lester King, dealing with a paralysis syndrome produced in rabbits and guinea pigs by extracts of

normal primate bone marrow. In this work it was proven that the paralysis producing principle present in normal bone marrow, spleen and leucocytes of man and monkey was not viral in nature, nor did it enhance the effect of low grade viruses. Rather it was considered that the principle was chemical or enzymatic in character and was probably identical with Jochmann's proteolytic ferment.

Upon completion of his Harvard research fellowship, Kelser returned to full Army duty and was assigned for a three year tour in Panama, doing investigative work with other members of the Army Medical Research Board located in the Gorgas Hospital area in Ancon, Canal Zone. In addition, he cooperated in investigative work with the Gorgas Memorial Laboratory located in Panama City, Republic of Panama. His work in Panama dealt with Chagas disease, equine encephalomyelitis, and degenerative arthritis. He perfected a medium in which heavy cultures of *Trypanosoma cruzi,* the causative agent of Chagas disease, could be grown, and utilizing such cultures in the preparation of antigen, developed a satisfactory complement fixation test. This test made possible an accurate survey of the Canal Zone for Chagas disease. Johnson and he, using this test, found a much higher incidence of the disease in Panama than had been formerly thought.

While in Panama, Kelser had an opportunity to study equine encephalomyelitis further under natural conditions. Cases of the disease occurred in horses in the Canal Zone and the causative virus was the so-called Western type. Kelser studied the epidemiology of the natural disease and did experimental transmission experiments in guinea pigs. He found that the mosquito, *Aedes taeniorhynchus,* was capable of transmitting the western type of equine encephalomyelitis virus. Furthermore, he demonstrated that the mosquito did not transmit the virus mechanically but that the virus must undergo a developmental period within the mosquito before it was capable of transmission. He did not determine the maximal period during which transmission could be effected, but did learn that the infected mosquito could infect animals that it fed upon as long as it could

be kept alive under laboratory conditions which in one case was 32 days.

With Callender, Kelser did some work of a pathological observational character in Panama on degenerative arthritis in man and horses. The differentiation of degenerative arthritis of equines from the nutritional deficiency disease of "big head" in mules was an example of the forming of a well conceived plan involving the nutritional and chemical fields, including not only the metabolism of the animals, but the nutritive value and chemistry of their diet.

Kelser's work in Panama turned out to be his last opportunity to conduct research. After 3 years there he was brought back to Washington and appointed Chief of the Veterinary Division in the Office of the Surgeon General of the War Department. He had, in the relatively short span of 20 years of Army duty, reached the highest position to which an Army veterinarian could attain. He served as Chief of the Veterinary Division from 1938 to 1946, which covered the active, important and exciting period of World War II.

Administrative Military Career

While Kelser had, throughout his earlier military career, certain administrative responsibilities inherent to the Army, his main responsibilities and contributions had been as a scientist doing research in the field of animal pathology. Now, with his appointment as Chief of the Veterinary Division in the Office of the Surgeon General, he was taken completely away from his beloved laboratory work and the opportunity to do research, and placed in charge of the entire Veterinary Corps of the Army. In 1938, with war clouds already gathering on the horizon, this was a very major administrative and organizational job as the Veterinary Corps, like all other branches of our armed services was rapidly expanding and increasing in complexity to meet the war emergency that even at that time seemed eminent. Kelser worked extremely hard. Being naturally an early riser, he spent inordinately long days in his office. Friends of his used to josh him about arriving at his

office early in order to have it open for the cleaning people and janitors when they should arrive.

During the time of Kelser's service as Chief of the Veterinary Division, the Veterinary Corps underwent an orderly expansion from 126 officers in 1938 to over 2200 at the height of its wartime activities. In conjunction with this marked increase in personnel there was also great expansion in Army veterinary facilities which only one of outstanding administrative ability such as Kelser possessed could have carried through successfully. It was he who in the end was responsible for the orderly running of the enormous military meat, food and dairy products inspection service that the Veterinary Corps conducted, both in this country and in foreign lands during the war, and it was his administrative competence that added much to the effectiveness of the service. It was necessary that the activities of the veterinary service be coordinated with other agencies of the Government such as the Department of Agriculture, the War Production Board, the Navy, the War Food Administration, the Pure Food and Drug Administration, and the Public Health Service, as well as with the civilian veterinary profession. This was done in a superior manner and with excellent results under Kelser's administrative guidance and aided greatly by his tact, diplomacy and ability to get along well with his fellow men. Kelser had a very large personal acquaintance with many of the people in key Government positions during the war and this facilitated the accomplishment of those of his tasks requiring close cooperation between governmental departments. He had the respect and friendship of all who knew him.

Kelser was a complete patriot and service to his Government was his creed. Many demands were made on his knowledge and talents by Government services outside the Army and each time he was called upon he responded wholeheartedly. He aided the Bureau of Animal Industry frequently and in many ways. Even during the busy war years, when his position as Chief of the Army Veterinary Corps kept him so fully occupied, he accepted appointment as Chairman of the Joint United States-Canadian Commission dealing with biological

defense matters and carried out this assignment with great effectiveness and distinction.

It was during the time that Kelser served as Chief of the Veterinary Corps that the Army advanced the rank of its chief from Colonel to Brigadier General. Kelser was pleased and proud that "the star" had come to the Veterinary Corps, not because the star was on his shoulder, but because the Army had given this recognition to the Veterinary Corps and the veterinary profession.

Return to Civilian Life

Upon his retirement from the Army in 1946, Dr. Kelser had a number of professional positions in civilian life offered to him. He decided to accept an appointment at the University of Pennsylvania as Professor of Bacteriology and Dean of the School of Veterinary Medicine. During his six years at Pennsylvania he made outstanding accomplishments in building up the physical plant, faculty, and general program of the Veterinary School. By his example and through his encouragement he stimulated an active and productive research program and a far-seeing program in teaching. He aided in initiating a retirement program for faculty members. By applying his dynamic energy and his remarkable capacity to draw enthusiasm and support from others, he was especially effective in obtaining much needed financial support for the school. Kelser was known in his profession as one of the most widely experienced and best informed veterinarians of his time. His grasp and vision of veterinary science and education were extremely broad and he promoted the advancement of his profession whenever opportunity offered.

Dean Kelser was respected and liked by his faculty and was popular with the student body of the veterinary school. He was never too busy to participate in student activities when he was asked. It is of interest to point out in this connection that on the day of his death he had attended a luncheon at noon with his senior students.

During the time that Kelser was Dean of the School of Veterinary Medicine at Pennsylvania, he also had a host of

other activities. Among other things he served as Consultant to the Secretary of Defense in Biological Warfare problems, and to the Chief of the Bureau of Animal Industry on Foot-and-Mouth disease research. He was Chairman of the Board of Scientific Advisers of the Grayson Foundation. He gave unselfishly of his time and energy to these outside activities despite his already full schedule of university activities.

Personality

Kelser was a well built, robust man, with an apparently boundless energy for work. He had a delightful sense of humor and a remarkable ability to tell stories illustrating points he wished to make in discussions. He was forceful and possessed of a natural aptitude for leadership. He was persuasive, firm and determined in the face of opposition if he felt that his views were the correct ones. He had a sincere respect for achievement in others and recognized just authority unquestioningly. During his career, he was frequently placed in the position of having to make decisions that were not always popular with all concerned and at times that even appeared arbitrary to some, but he held no apparent rancor for those who opposed or disagreed with him. His ability to pass easily and rapidly from a serious to a jocular mood and to see the humorous sides of tense situations was a characteristic that proved valuable on many occasions. He threw himself wholeheartedly into anything in which he participated and was apparently incapable of playing a passive role. On committees and in discussion groups, Kelser was always an active and intelligent participator and there was nothing of the "rubber stamp" in his make-up. He had an almost uncanny ability to analyse motives and to himself think clearly through situations in which divergent opinions prevailed. He could marshal his own thoughts in an orderly manner and express them clearly and persuasively.

Kelser was socially alert and completely human in his zest and joy for life. He liked people and was an entertaining conversationalist. He made friends easily. He enjoyed parties and social gatherings with friends, though he had little time for such things. He was musically talented and played several

instruments well. He also enjoyed watching the horse races. He was sympathetic and understanding towards the problems of others and willingly gave of his help and advice if it was asked and he considered it would be of value. He possessed not a trace of snobbery.

In his young manhood he took an active interest in Free Masonry, becoming a thirty-second degree Mason, and a Shriner. As a young Army officer, he was active in the Sojourners, Heroes of '76, and the Military Order of the Carabao. He was a member of the Army and Navy Club in Washington, D. C., and a founder member of the Army-Navy Country Club in Arlington, Virginia. The Lenape Club of the University of Pennsylvania claimed him as one of its members.

A former military colleague of Kelser's has written as follows: ". . . Wherever he served he left a host of admirers high in his praise as a scientist, soldier, and gentleman, and, I assure you, he was a difficult man to follow. I should know, having relieved him on four separate occasions. Considering the pace maintained by Ray, I guess the Good Lord deemed his earthly attainments sufficient and called him to loftier chores and, who knows, perhaps his spirit may be busily engaged in whispering encouragement and suggestions to frustrated scientists who, also, are endeavoring to make this a better place of abode."

Kelser was deeply devoted to his family and was with them as much as his busy life permitted. He never took a vacation trip without them and during his earlier military assignments his wife and daughter accompanied him to his foreign posts. Mrs. Kelser was his complete confidante and much of the personal material that the writer has used in this memoir has been obtained from her. From the wealth of this personal material it is evident that Kelser shared his full life completely with his wife. She was his helpmate and frequently typed, proofread, and criticized his manuscripts, though she never worked with him in his laboratory. The Kelsers were devoted to one another and enjoyed a real husband and wife comradeship.

Kelser had but one child, a daughter, Evelyn Rae, now Mrs. John A. Allgair (wife of Lt. Col. John A. Allgair, C. E. U. S.

Army) whom he affectionately called "Boots." It was readily apparent to all who knew him that she was the "apple of his eye" and he frequently spoke of her to his close friends. He also often told amusing anecdotes of his two grandchildren, and was very much wrapped up in their lives. Mrs. Allgair has given the writer some of her impressions of her father which shed considerable light on his personality. Some brief quotations from her letter furnish an insight into Kelser's personality that many who knew him only casually may have missed.

She wrote, " . . . No matter how busy he was or how overworked or tired, he never objected to my bringing home one or a whole gang of my friends and if I wanted his assistance, was always willing to help with the plans for my entertaining. He wasn't the kind who could relax his dignity and romp with us kids, but he was always glad to foot the bills, do the chauffeuring, run the movie projector, or mix the punch.

"As you probably know, dad was a complete 'softie' when it came to his grandchildren. Though he was a strict disciplinarian with me, my two could wrap him around their fingers. I seldom remember him even getting angry with either Bucky or Cherrie, no matter how aggravating they became. During the 18 months I lived at home during the war, hardly a night went by that he didn't spend an hour or so making up lengthy cowboy and Indian tales which he told to the kids. It was always a new and different story, and, like everything else that dad did, was well done. I used to often wonder how, after a full day of dealing with the many wartime problems which confronted him, he still had the mental energy to create the children's stories. Dad was always the one who took on the nursing duties when the children were sick, no matter how tired he was.

"For a scientist, I think dad had an unusual appreciation of art and music, and the beauties of nature. He probably could have been quite a musician if he had had the time for it. I remember the pleasure he found in the flowers, particularly the roses, in our various gardens. He would often cut just one or two of the most perfect ones in bloom and comment a number of times upon their beauty. He was artistic in his gardening and

in the decoration of his home, and it was usually dad who did most of the decorating of our Christmas trees as he was the one who could do it best."

Raymond Kelser was active right up to the time of his death which occurred suddenly on April 16, 1952, as a result of cerebral hemorrhage. He will be missed by his host of friends, both in and outside his profession, and in Government and military circles, who admired, respected and loved him. While no one is abolutely indispensable, Raymond Kelser, because of his unique and wide and varied talents and expert knowledge in his particular and specialized fields of interest, comes about as close to being irreplaceable as anyone could be.

Honors and Memberships in Scientific Societies:

National Academy of Sciences
American Association for the Advancement of Science
American Veterinary Medical Association (Vice-President 1929-31)
American Public Health Association
American Academy of Tropical Diseases
American Society of Tropical Medicine
American Association of Pathologists and Bacteriologists
Association of Experimental Pathologists
Association of Military Surgeons
Washington Academy of Sciences
New York Academy of Sciences
Sigma Xi
Phi Zeta
Distinguished Service Medal
Gorgas Medal
12th International Veterinary Congress Prize
George Washington University Alumni Achievement Award
Diploma, Honorary Associate of the Royal College of Veterinary Surgeons, London

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KEY TO ABBREVIATIONS USED IN BIBLIOGRAPHY

Am. J. Path. = American Journal of Pathology
Am. J. Pub. Health = American Journal of Public Health
Am. J. Trop. Med. = American Journal of Tropical Medicine
Ann. N. Y. Acad. Sci. = Annals, New York Academy of Sciences
Cornell Vet. = Cornell Veterinarian
J. Agric. Res. = Journal of Agricultural Research
J. Am. Vet. Med. Assn. = Journal of the American Veterinary Medical Association
J. Bact. = Journal of Bacteriology
Mil. Surg. = Military Surgeon
Philippine J. Sci. = Philippine Journal of Science
Proc. 12th Internat. Vet. Congr., U.S. Govt. Printing Office = Proceeds of the 12th International Veterinary Congress, United States Government Printing Office
Tr. Seventh Congr. Far Eastern Assn. Trop. Med. = Transactions of the Seventh Congress of the Far Eastern Association of Tropical Medicine
Vet. Alumni Quart. Ohio State Univ. = Veterinary Alumni Quarterly, Ohio State University
Vet. Bull. U.S. Army = Veterinary Bulletin, United States Army
Vet. Exten. Quart. Univ. Pa. = Veterinary Extension Quarterly, University of Pennsylvania
Vet. Med. = Veterinary Medicine

BIBLIOGRAPHY

1916

Preparation of culture media from whole blood. J. Bact., 1, 615-617.

1917

(With A. Eichhorn and W. N. Berg) Immunity studies on anthrax serum. J. Agric. Res., 8, 37-56.

1918

(With W. N. Berg) Destruction of tetanus antitoxin by chemical agents. J. Agric. Res., 13, 471-495.

Improved methods of immunization against symptomatic anthrax (blackleg). J. Agric. Res., 14, 253-262.

1921

Equine infectious abortion. J. Am. Vet. Med. Assn., 59, 284-293.

1922

(With G. H. Koon) The control of equine infectious abortion in the United States Army. J. Am. Vet. Med. Assn., 62, 193-196.

Equine infectious anemia. J. Am. Vet. Med. Assn., 62, 319-331.

1923

Identification of *Bacillus botulinus* and its toxin in culture and in canned foodstuffs by serological methods. Am. J. Pub. Health, 12, 366-376.

A discussion of the factors concerned in the etiology of equine influenza and contagious pneumonia. J. Am. Vet. Med. Assn., 63, 162-169.

1924

A study of rabies from the standpoint of etiology. J. Am. Vet. Med. Assn., 46, 678-689.

1927

A new vaccine for rinderpest immunization. Mil. Surg., 61, 31-33.

(With Dr. S. Youngberg and Dr. T. Tapacio) An improved vaccine for immunization against rinderpest. Tr. Seventh Congr. Far Eastern Assn. Trop. Med., British India, 3, 628-646.

Transmission of surra among animals of the equine species. Philippine J. Sci., 34, 115-139.

1928

An improved vaccine for immunization against rinderpest. Philippine J. Sci., 36, 373-393.

Mercuric iodide in the treatment of equine epizootic lymphangitis. Philippine J. Sci., 37, 69-72.

1930

Chloroform-treated rabies vaccine. J. Am. Vet. Med. Assn., 77, 595-603.

1932

(With Lieut. R. W. Mohri) Comparative germicidal tests of mercurochrome and tincture of iodine. J. Am. Vet. Med. Assn. 80, 87-95.

1933

Mosquitoes as vectors of the virus of equine encephalomyelitis. J. Am. Vet. Med. Assn., 82, 767-771.

1934

Equine encephalomyelitis. Vet. Alumni Quart., Ohio State Univ., 22, 45-51.

1935

Mosquitoes as vectors of the virus of equine encephalomyelitis. Proc. 12th Internat. Vet. Congr., U. S. Govt. Printing Office, 11, 336-347.

1936

(With Lester S. King) Studies of a paralysis syndrome produced in rabbits and guinea pigs by extracts of normal primate bone marrow. Am. J. Path., 12, 317-332.

A complement-fixation test for Chagas' disease employing an artificial culture antigen. Am. J. Trop. Med., 16, 405-415.

1937

Equine encephalomyelitis in Panama. Vet. Bull., U. S. Army, 31, 19-21.

Transmission of the virus of equine encephalomyelitis by *Aedes taeniorhynchus*. Science, 85, 178.

(With Carl M. Johnson) The incidence of Chagas' disease in Panama as determined by the complement-fixation test. Am. J. Trop. Med., 17, 385-392.

1938

Transmission of the virus of equine encephalomyelitis by *Aedes taeniorhynchus*. J. Am. Vet. Med. Assn., 92, 195-203.

(With G. R. Callender) Degenerative arthritis, a comparison of the pathological changes in man and equines. Am. J. Path., 14, 253-271.

(With G. R. Callender) Equine degenerative arthritis. Vet. Med., 33, 307-320.

1940

The epidemiology and prophylaxis of rabies, article in Virus and rickettsial diseases. Harvard University, Harvard Press, Cambridge, Mass. 642-660.

Prophylaxis in equine encephalomyelitis. Cornell Vet., 30, 350-358.

Measures for the control and prevention of rabies. Cornell Vet., 30, 321-330.

1941

Veterinary research and public health in Univ. Pa. Bicentennial Conference. The relation of diseases in lower animals to human welfare. Univ. Pa. Press, Phila.

Equine encephalomyelitis and its control. Proc. 45th meeting U. S. Livestock Sanitary Assn., 22-27.

1947

Equine encephalomyelitis. Ann. N. Y. Acad. Sci., 48, 385-392.

Adaptation of filtrable viruses to different host species and different tissues. Mil. Surg., 100, 289-293.

1948

What the veterinary profession means to mankind. Vet. Exten. Quart.. Univ. Pa., 112, 3.

1949

Biological warfare considerations which may be of interest to veterinarians. Vet. Exten. Quart., Univ. Pa., 115, 50.

1950

Foot-and-Mouth disease with special reference to important facts and problems emphasized by the current outbreak in Mexico. Vet. Exten. Quart., Univ. Pa., 119, 81.

1951

Diseases of animals important to man in time of war. Vet. Exten. Quart., Univ. Pa., 123, 87.

BOOKS

1922

Carriers in Infectious Diseases by H. J. Nichols, with a section on Carriers in Veterinary Medicine, by R. A. Kelser, Williams & Wilkins Co., Baltimore, Md.

1927

Manual of Veterinary Bacteriology, Williams & Wilkins Co., Baltimore, Md. First edition 1927, second edition 1933, third edition 1938, fourth edition, 1943, and fifth edition, 1948, with H. W. Schoening.