AD NUMBER

ADB061165

LIMITATION CHANGES

TO:

Approved for public release; distribution is unlimited.

FROM:

Distribution authorized to U.S. Gov't. agencies only; Proprietary Information; JUN 1981. Other requests shall be referred to Commander, US Army Combined Arms Center & Fort Leavenworth, Attn: ATZL-PTS-IS. Fort Leavenworth, KS 66027.

AUTHORITY

CGSC CARL ltr dtd 24 apr 1996

MILITARY WORKING DOGS AND CANINE EHRLICHIOSIS (TROPICAL CANINE PANCYTOPENIA) IN THE VIETNAM WAR

A thesis presented to the Faculty of the U.S. Army
Command and General Staff College
in partial fulfillment of the requirements
for the degree

MASTER OF MILITARY ART AND SCIENCE

by

WILLIAM J. KELCH, MAJ, USA

B.S., Michigan State University, 1966
D.V.M., Michigan State University, 1968
M.A.S., University of Alabama in Huntsville, 1975
M.S., Oregon State University, 1977

Fort Leavenworth, Kansas

1981

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-B061 165L	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Military Working Dogs and Canine Ehrlichiosis (Tropical Canine Pancytopenia) in the Vietnam War		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis 5 June 1981
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Kelch, William J., MAJ, USA		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Student at the U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Command and General Staff College Attn: ATZL-SWG-DP		12. REPORT DATE 5 June 1981
		13. NUMBER OF PAGES 102
14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)* Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*
"Distribution limited to U.S. Government agencies only; proprietary information; June 1981. Other requests for this document must be referred to: HQ, TRADOC, ATTN: ATCS-D, Fort Monroe, VA 23651."

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*
Same as 16.

18. SUPPLEMENTARY NOTES
Master of Military Art and Science (MMAS) thesis prepared at CGSC in partial fulfillment of the Masters Program requirements, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*
Military Dogs; South Vietnam; Southeast Asia; Veterinary Medicine; History; Veterinary Diseases; Blood Diseases; Infectious Diseases; Military Forces (United States); Canine Ehrlichiosis; Tropical Canine Pancytopenia; Infectious Hemorrhagic Syndrome; Tracker Dog Disease

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The United States employed large numbers of military working dogs as sentries, scouts, trackers, and mine detectors in Vietnam. In mid-1968 an epizootic occurred which threatened the working dog program and led to 250 canine deaths. Military veterinarians launched an extensive effort to control this disease and to determine its cause. This study, using primary and secondary written sources, describes the epizootic, the identification and control of the disease, and its implications for the future use of military working dogs.

Canine ehrlichiosis, a highly fatal tickborne rickettsiosis caused by

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

20. ABSTRACT (Continued)

Ehrlichia canis, was identified as the cause of the epizootic. Clinical and experimental experience proved that canine ehrlichiosis can be successfully treated with tetracycline; this treatment and serologic testing to detect infected animals brought the epizootic under control, although ehrlichiosis still remains a problem among military working dogs. This study concluded that the future control of canine ehrlichiosis and related diseases requires: serologic screening of prospective and active duty military dogs, rigorous tick control, evaluation of the disease threat in areas where military dogs are employed, disease education of personnel who deal with military dogs, and additional veterinary research.

MASTER OF MILITARY ART AND SCIENCE

THESIS APPROVAL PAGE

Name of candidate: William J. Kelch

Title of thesis: Military Working Dogs and Canine Ehrlichiosis (Tropical Canine Pancytopenia) in the Vietnam War

Approved by:

James R. Heil, Thesis Committee Chairman
LTC James R. Heil, D.V.M., M.P.H.

James E. Cantrell, Member, Graduate Faculty
LTC James E. Cantrell, M.S.

David L. Huxsoll, Member, Consulting Faculty
COL David L. Huxsoll, D.V.M., Ph.D.

Allen W. Jones, Member, Consulting Faculty
COL Allen W. Jones, Ph.D.

Accepted this 18th day of June 1981 by Philip J. Brookes,
Philip J. Brookes
Director, Graduate Degree Programs

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

MILITARY WORKING DOGS AND CANINE EHRLICHIOSIS

(TROPICAL CANINE PANCYTOPENIA)

IN THE VIETNAM WAR

by Major William J. Kelch, USA, 102 pages

The United States employed large numbers of military working dogs as sentries, scouts, trackers, and mine detectors in Vietnam. In mid-1968 an epizootic occurred which threatened the working dog program and led to 250 canine deaths. Military veterinarians launched an extensive effort to control this disease and to determine its cause. This study, using primary and secondary written sources, describes the epizootic, the identification and control of the disease, and its implications for the future use of military working dogs.

Canine ehrlichiosis, a highly fatal tickborne rickettsiosis caused by Ehrlichia canis, was identified as the cause of the epizootic. Clinical and experimental experience proved that canine ehrlichiosis can be successfully treated with tetracycline; this treatment and serologic testing to detect infected animals brought the epizootic under control, although ehrlichiosis still remains a problem among military working dogs. This study concluded that the future control of canine ehrlichiosis and related diseases requires: serologic screening of prospective and active duty military dogs, rigorous tick control, evaluation of the disease threat in areas where military dogs are employed, disease education of personnel who deal with military dogs, and additional veterinary research.

ACKNOWLEDGMENT

Many individuals assisted me in completing this thesis. Colonel Leeland B. Carter, a retired veterinary officer, Colonel Thomas J. Keefe, Chief, Veterinary Laboratory Service, Brooke Army Medical Center, Colonel Sidney R. Jones, Chairman, Department of Veterinary Pathology, Armed Forces Institute of Pathology, and Miss Patty F. Vidrine, Air Force Medical Service Center provided valuable information without which I could not have completed this study. My thanks to them.

Miss Rosemary C. Marlowe, Mrs. Patricia N. Wells, and Mrs. Mary M. Crow of the Combined Arms Research Library led me through the maze of library materials. Without them I would still be lost somewhere in the "stacks."

Ms. Marilyn A. Harre in the Graduate Degree Programs office cheerfully responded to an interminable stream of inane questions. I appreciate her tolerence.

My thanks also to McMan Associates for their skillful manipulation of words. They made the mechanics of thesis writing much more bearable.

My sincere thanks are extended to the members of my graduate committee. Lieutenant Colonel James E. Cantrell and Colonel Allen W. Jones helped throughout with their substantive critiques and editorial skills. Double thanks to Colonel David L. Huxsoll, the world's acknowledged authority on canine ehrlichiosis, for both providing valuable information about the disease and for critiquing and proofreading the thesis. Finally, special thanks to Lieutenant Colonel James R. Heil, whose buoyant attitude and perceptive comments kept the project afloat and, hopefully, steaming in the right direction.

Table of Contents

Chapter I

INTRODUCTION

Man domesticated the dog in prehistory. He used the dog to keep him company, to guard his cave, to alert him to intruders, and to help him fight his wars. No one knows exactly when dogs were first used in war, but Assyrian, Babylonian, Egyptian, Greek, and Roman armies all employed dogs.

Assyrian soldiers used trained mastiffs as early as 2300 B.C. (24). Babylonians and Egyptians utilized dogs in war as did Alexander the Great (126), while the Greeks and Romans employed large mastiffs for guard duty and attack (101). Plutarch and Pliny both mention war dogs in their writing, and Aeneas speaks of dogs carrying messages in their collars (117). The Romans used dogs to bite Goths (19), and their mastiffs, which were equipped with armored collars, forced enemy foot soldiers to lower their shields to protect their legs, thus exposing their upper bodies (11). Their garrisons were warned of approaching enemy troops by keen-smelling canine sentinels posted on the watch towers, and they were themselves confronted with fighting dogs when they invaded Britain (126).

Soldier dogs were also used during the Middle Ages and early modern history. Dogs were equipped with coats of mail with protruding spikes or small scythes to disrupt enemy calvary (126), and armored dogs accompanied knights during the crusades (153). Henry VIII of England gave Charles V of Spain a gift of 400 war dogs fitted with iron collars (117,126). Charles was reportedly so pleased when his

dogs defeated the French dogs at Valencia that he held up their performance as an example to his soldiers (117,126). Elizabeth I presented 100 warrior dogs to the Earl of Essex when he set out to subdue the Irish (126). Balboa was accompanied by combat dogs when he crossed Panama in the early sixteenth century. His favorite dog was Leoncito (Little Lion) who warned of many Indian ambushes (11). Also in the New World, Christopher Columbus used bloodhounds to track American Indians (117,126), and the Indians themselves used dogs as sentries and beasts of burden (139).

Attila the Hun, Philip of Spain, Frederick the Great, and Napoleon all used dogs as sentries (126). Frederick reportedly said, "The more I see of men, the more I like dogs (118)." Napoleon's favorite warrior dog, Moustache, was a particularly interesting animal.

Moustache, a cross-bred poodle, was born in Calais in 1799 and raised by a grocer in Caen. Moustache, apparently bored with his pleasant but humdrum life in Caen, voluntarily joined the French Grenadiers as they marched through town. Moustache attached himself to the band and marched away with Napoleon's soldiers. Near Alexandria, Moustache detected a surprise attack by the Austrians, gave the alarm, and the Austrians were forced to retreat. As a result, Moustache was given the full rations of a grenadier, a collar with the name of the regiment, and the barber was ordered to comb and shave him weekly. Shortly after this incident, Moustache was wounded by a bayonet in the left shoulder, and, before he completely recovered, the Battle of Marengo took place. During this battle Moustache remained with the regimental flag; he was able to recognize

it among the dozens of others. At Austerlitz Moustache again followed the regimental flag. The ensign carrying the flag was wounded and fell, but Moustache, limping and bleeding, retrieved the flag and carried it back to camp. Moustache, despite his exploits, was later struck by an ungrateful lout with the flat side of a saber. Deeply disturbed, Moustache deserted his regiment and attached himself to some dragoons who were bound for Spain. He was killed in action by a cannonball at the Battle of Badajos on 11 March 1811, and was buried on the scene with his collar and a medal he had won earlier. The grave was topped with a simple stone inscribed, "Here Lies the Brave Moustache." The grave was later desecrated by the Spaniards by order of the Inquisition (118).

Dogs played a minor role in early nineteenth century American military history. In 1839, Brigadier General Zachary Taylor, "Old Rough and Ready," decided to use bloodhounds to seek out recalcitrant Seminole Indians in the Florida Territory. The Seminoles steadfastly refused relocation in Arkansas and offered resistance to American military forces. General Taylor's proposal to use dogs against the Seminoles in Florida met opposition in Congress. Gentlemen simply did not sic dogs on other people, not even savage Indians; such atrocious, barbarous conduct could not be permitted. After much debate and delay, the Congress in the spring of 1840 finally acceded to the use of the dogs, but only after firm assurance that the dogs would be used only to track Indians, not to attack them. General Taylor, sensitive to the controversy, ordered that the dogs be leashed and muzzled when employed so that no one would be injured. When sixteen controversial

canines marched to war to the sound of fifes and drums, they showed no interest whatever in Indians. Despite several weeks of training in tracking Seminoles, the dogs remained uninterested in Red Men. So Zachary Taylor's political problems were solved by the dogs themselves. Not to be outdone by the Army, the Navy and Marines also employed bloodhounds to hunt Seminoles. While the bloodhounds enjoyed riding through the Florida swamps in canoes, they found no Indians. Thus, the bloodhound projects ceased (18).

Dogs were employed by several armies in the late nineteenth and early twentieth centuries. They were used during the American Civil War (117,126). They were utilized by the British to haul supplies (19) and light equipment (11) during the Crimean War, and the Germans used them as watchdogs (11) and to locate wounded soldiers during the Franco-Prussian War (11,19). Dogs also carried flasks of brandy to wounded Russian soldiers during the Russo-Japanese War (126), and World War I saw the first large scale use of military dogs.

At the beginning of World War I, Germany, Italy, Belgium, France, and England all had war dog services. The French dog service was abolished by Marshal Joseph-Jacques-Cesaire Joffre after the Battle of the Marne, and the English dog service ceased to exist after the Battle of Aisne when the one British military dog, an Airedale, was killed. Both the French and English reestablished dog services in 1915 (87).

The Germans had 6,000 trained dogs in service when they advanced into France in 1914 with another 4,000 dogs in reserve (87). They eventually enlisted 30,000 dogs and the French 20,000 during World War I (19). Canine casualty estimates vary considerably for World War I: 5,000 French dogs (70); 7,000 dogs for all armies (9); 16,000 German dogs (87). In any case, canine casualties were numerous. At the end of the war, France disposed of 15,000 surplus dogs (70). The Americans did not have dogs of their own, although the American Expeditionary Force used a few dogs provided by the French and the Belgians (21). Nevertheless, American soldiers frequently made pets of dogs found on the battlefield.

Rin-Tin-Tin may be just a run-of-the-mill movie and television star to some, but he actually was a World War I veteran. Rin-Tin-Tin was born in a German trench at Metz. He was abandoned by his mother when the Germans retired and was subsequently adopted by an American lieutenant. The lieutenant raised Rin-Tin-Tin in Europe during the war, took him to America when the war ended, and eventually made him a movie star (8).

Dogs were used extensively in World War II. The United States Marine Corps trained more than 1,000 dogs during this war (11), and Marine war dog platoons served in Guam, Pelelieu, Iwo Jima, Okinawa, and Saipan (19). A ninety pound Marine shepherd named King was credited with pointing 132 Japanese snipers (11).

The United States Army had no war dogs at the beginning of World War II, but established a dog program shortly after the war began. With the assistance of a group of dog breeders and fanciers called

Dogs for Defense, the Army recruited about 20,000 dogs into the "K-9 Corps" (49). These dogs saw combat service in Europe, North Africa, and the Pacific (9) where they were employed as mine detectors, guards, messengers, scouts, sentries, and sled dogs (89).

Approximately half the dogs recruited by the Army were retained for training by the Army (70). About thirty breeds of both sexes entered military service, but by the fall of 1944 the breeds preferred included the German Shepherd, Belgian Sheep Dog, Doberman-Pinscher, Farm Collie, Siberian Husky, Malemute, Eskimo Dog, and various crosses of these breeds. They were trained at seven training centers: Front Royal, Virginia; Fort Robinson, Nebraska; Camp Rimini, Montana; San Carlos, California; Gulfport, Mississippi; Beltsville, Maryland; and Fort Belvoir, Virginia (27). Of those trained, 9,000 were trained as sentry dogs; 6,000 of these were used by the Army and 3,000 by the Coast Guard to patrol sparsely inhabited beaches in the United States (70). Army dogs were employed worldwide as mine detectors, guards, messengers, scouts, sentries, and sled dogs (89).
The exact number of Army war dogs trained during World War II is as follows (27):

Type and Number of Dogs Trained

Type of Dog	Trained for Army	Trained for Coast Guard	Total
Sentry	6,121	3,174	9,295
Scout	571	0	571
Sled and Pack	268	0	268
Messenger	151	0	151
Mine Detection	140	0	140

One famous collie-husky war dog named Chips was volunteered for service by his master after Chips bit the garbage man. Chips served with the 3rd Infantry Division in Algeria, Morocco, Tunisia, Sicily, Italy, and France. Chips "singlehandedly" attacked an Italian machinegun position and forced the surrender of its crew. He was credited with the capture of several other prisoners and was once wounded by a pistol shot. Chips was awarded the Silver Star and the Purple Heart; although the awards were subsequently revoked because animals were prohibited by regulation from receiving decorations, Chips was the subject of two speeches in Congress and widespread acclaim. Chips reportedly bit General Eisenhower on the hand during the Roosevelt-Churchill conference in Casablanca in January 1943 (50,101). Dogs such as Chips were romanticized heroes of the war, even inspiring fictional accounts of canine war heroics (149).

Other nations used dogs during World War II. The Russians trained dogs to eat under tanks; then, when the German tanks attacked, the hungry dogs were sent under the German tanks with mines strapped

to their backs (11). This was a risky practice since the dogs did not distinguish between German and Russian tanks. The total number of dogs used by the Russians is not available, but estimates are in the tens of thousands (70). The Japanese used dogs in Hong Kong to locate hiding Chinese who were then shot by Japanese snipers who accompanied the dogs (11). The Germans used about 200,000 dogs during World War II (6). One British dog was decorated by Field Marshal Bernard Law Montgomery for his work in Normandy during D-day (67). Another British dog named Judy, a pedigree pointer, served as mascot on several British naval vessels in the Pacific. She was captured by the Japanese in March 1942, became an officially registered prisoner-of-war, and, when released at war's end, was awarded the Dickin Medal for courage, endurance, and lifesaving (135). Altogether, more than 250,000 dogs were used by the Allies and the Axis during World War II (54).

American dogs saw service in the Korean War on a limited, but useful, basis. The Air Force used sentry dogs to guard airstrips and supplies (49), and Army patrols used scout dogs (19,24,147). Scout dogs may have reduced casualties by as much as sixty percent (147), and enabled infantry to move farther and faster with less risk of ambush (9,147). A scout dog named York reportedly led 148 combat patrols without the loss of a single man to enemy fire (21). The 26th Infantry Scout Dog Platoon, which was trained at Fort Riley, Kansas (27), participated in more than 500 patrols and received the Meritorious Unit Citation and the Korean Presidential Unit Citation (24).

The uses of dogs in war seem to be limited only by man's ingenuity. Dogs can attack the enemy or guard against his approach. They can be used as dray animals: pulling sleds (89), pulling wagons (87), and carrying supplies on their backs (70). A good team of dogs on good roads can reportedly pull a half ton (87). They can serve the military police by detecting drugs and explosives (31,53,94), assisting in crowd control (35), and escorting funds (108). Dogs can carry messages and pull telephone wire between locations (9). They can assist as medics: locating the wounded, especially at night; pulling stretchers; carrying first aid forward; and leading blind soldiers (87). Dogs have been used to steal army rations and documents (67). They improve morale and esprit de corps by serving as mascots (112), and have even protected their masters from venomous snakes (68,145). They can protect from infiltrators, even those completely submerged in streams and breathing through hollow reeds (124). Dogs can detect booby traps (113), tripwires (113), and tunnels (25,113), and can be parachuted into an area of operations (26,28,106). They can scout the enemy and track the enemy (64). Clearly, the dog has many roles in war.

Chapter II

USE OF MILITARY WORKING DOGS DURING THE VIETNAM WAR

General

Dogs were used in many capacities during the Vietnam War. The French introduced twenty dogs in Indo-China as early as 1948. These dogs were trained and maintained by the French Army Veterinary Service and served in three different roles. First, man-dog teams were used to support the infantry in reconnaissance, searches of villages and other areas, and in establishing ambushes, a role corresponding roughly to the present day scout dog. Second, the French employed dogs as mine-detectors just as the United States Army did later in the war. And, last, the French dogs were used to guard installations such as air bases, ammunition supply points, general supply depots, and gasoline depots. This role corresponds to the present employment of dogs as sentry dogs and patrol dogs. The French dogs did not adapt well to the climate in Indo-China, but generally received good ratings as scouts and excellent ratings as sentries. Their performance in mine detection was poor (72).

The United States used military working dogs in many different roles throughout the Vietnam War. They served as sentry, patrol, scout, tracker, mine and tunnel detection, and contraband detection dogs. They served with the Air Force, Army, Navy, and Marine Corps.

The Republic of Vietnam Armed Forces also used sentry, scout, and patrol dogs during the Vietnam War.

Dog Procurement

In 1964 the responsibility for procurement of military working dogs was transferred from the Army Quartermaster Corps to the Air Force Air Training Command at Lackland Air Force Base, San Antonio, Texas (85). The Commander of Lackland Air Force Base was directed to procure dogs for the military services. The Air Force thus assumed responsibility for the recruitment, examination, and acceptance of animals into the military working dog program. Dogs were obtained by donation and by purchase from their owners; they were generally of German Shepherd type, one to three years old, male or female (if spayed), any color except white, at least sixty pounds, and not less than twenty-three inches tall at the shoulders (21). These specifications were relaxed during emergency procurements or when dogs of different breed, size, or color were required for special purposes.

Two methods were used to procure dogs: an advertising and publicity program and mobile dog procurement teams. The Air Force conducted an advertising and publicity program through the United States Air Force Recruiting Service. The Air Force's number one recruiter was a dog named Nemo, a Vietnam War hero who was severely wounded, losing an eye during a Viet Cong attack on Tan Son Nhut Air Base on 4 December 1966. Nemo was retired from the sentry dog program after receiving these wounds. He then traveled the country as a canine recruiter (46).

Dog owners were told that the military services needed dogs, and were advised to query the Military Working Dog Center at Lackland Air Force Base if they were interested in selling or donating a dog.

Based on this query, if the dog met the required specifications, documents were forwarded to the owner which included a contract for the sale or donation of the dog to the United States government and a veterinary examination form. The owner then was required to have the dog examined by a military or civilian veterinarian. These documents were forwarded to the Military Working Dog Center, and, if the dog was still qualified for service, a shipping crate was forwarded to the owner. The dog was transported to Lackland Air Force Base at government expense for final evaluation. The dog was examined for medical soundness and tested for behavioral characteristics. About forty percent of the dogs were rejected, principally for hip dysplasia, heartworm disease, and gun-shyness. These rejections occurred after initial examination or after arrival at Lackland. Hip dysplasia and heartworm disease were usually detected before shipment of the dog to Lackland, while gun-shyness and other behavioral problems were generally detected at Lackland. Dogs rejected at Lackland were returned to the owner, or were given away to individuals or medical research institutions if the owner did not want the dog. If the dog was accepted for military service, it became the property of the United States government in accordance with the procurement contract (85).

The Air Force also used mobile dog procurement teams. These teams usually consisted of nine to fourteen members, including veterinarians, veterinary technicians, dog behavioral specialists, and dog handlers. These mobile teams travelled around the country and purchased dogs "on-the-spot." The teams established testing stations,

at military installations if possible, and did the required testing, medical examination, and administration at this one site. The team's arrival in an area was preceded by an intense advertising and publicity campaign (85).

In addition to dog procurement in the continental United States, the Air Force also operated a dog procurement activity at Wiesbaden, Germany for dogs destined for European duty (85).

After entering military service, the dogs were shipped to various training centers and trained in their specialty.

Sentry Dogs

A sentry dog is "a German Shepherd trained to assist in providing tactical or non-tactical security in and about fixed installations; a powerful psychological deterrence against intruders and attack; a highly aggressive animal able to work either on- or off-leash, controlled at all times by a skillful handler; part of a physical security element (85)." Sentry dogs are rather fearsome creatures that are systematically trained to love one human master and to hate all others . They are used exclusively in a perimeter defense role, almost exclusively at night. The dog's keen senses of hearing and smell enable it to detect intruders at long distances with near perfection. The dog alerts his handler to the intruder's presence and general location, and will attack and hold the intruder on command. In Vietnam sentry dogs were generally employed to alert only and not attack, while the handler communicated the presence of the intruder to back-up security personnel.

The first Air Force sentry dog teams were initially assembled at Lackland Air Force Base and deployed on temporary duty to Tan Son Nhut, Bien Hoa, and Da Nang arriving in July 1965 as part of Project Top Dog 145. The quality performance of these dogs led to the permanent assignment of sentry dogs to United States Air Force air base defense forces. All dogs were procured through Lackland Air Force Base; most were also trained at Lackland, although dogs were also trained at the Pacific Air Force Sentry Dog Training Center at Showa, Japan and at Kadena Air Base, Okinawa. The number of Air Force sentry dogs peaked at 476 in January 1967 and were located at the following sites (44):

Bien Hoa	46
Binh Thuy	25
Cam Ranh Bay	62
Da Nang	48
Nha Trang	23
Phan Rang	66
Phu Cat	66
Pleiku	28
Tan Son Nhut	66
Tuy Hoa	46

The number of dogs gradually declined until the end of the United States involvement in the war.

Air Force sentry dogs were generally employed in two overlapping shifts per night, serving both to detect enemy intruders and to provide a psychological deterrent to intrusion. Viet Cong sappers

(engineers employed to destroy and penetrate fixed defenses) were well aware of the prowess of the sentry dogs. They attempted to avoid the dogs by lying motionless when approached by a dog and by trying to conceal their scent with garlic-like herbs (44). However, these efforts were largely fruitless. Between July 1965 and 4 December 1966, no known penetrations occurred in areas patrolled by sentry dogs. On 4 December 1966, however, a penetration occurred at Tan Son Nhut Air Base which resulted in the first Air Force sentry dog deaths in Vietnam. Three dogs were killed, and Nemo, who was mentioned previously, was wounded. The last Air Force sentry dog battle death occurred on 29 January 1969 at Phan Rang.

Air Force sentry dogs encountered some problems in Vietnam. They were very susceptible to heat, suffered sometimes from gastrointestinal upsets, were frequently victims of snakebite, broke legs and paws when jumping down from vehicles, and, early in the war, had to live in their shipping crates. Nevertheless, sentry dogs were generally recognized as the most effective means of air base perimeter defense (44).

Numerous incidents occurred at air bases in Vietnam that illustrate the method of employment and utility of sentry dogs in air base defense. In February 1966 Viet Cong attempted to infiltrate Pleiku Air Base on three occasions. They were intercepted by sentry dog teams and driven off with small arms fire. Also in February 1966, Viet Cong were driven away from Bien Hoa Air Base by Airman Second Class Ronald Rutherford and his dog Hans. In April 1966, Airman

Second Class Rick Young and his dog Cowboy helped other sentry dog teams apprehend twenty-five people on the perimeter at Tan Son Nhut Air Base (29).

The Army first introduced sentry dogs in Vietnam in September 1965. The dogs were originally organized into several military police detachments and deployed at widely scattered locations. They were later reorganized to form the 212th Military Police Company (Sentry Dog) in January 1966. The 981st Military Police Company (Sentry Dog) was activated at Fort Carson, Colorado in February 1967 and deployed to Vietnam in November 1967 (41). The 595th Military Police Company (Sentry Dog) was activated in Vietnam in January 1970. These three companies were part of the 18th Military Police Brigade. In July 1970 the three companies served in the following areas (132):

212th Military Police Company (Sentry Dog)

Location	Number of Posts	Sentry Dog Teams
Long Binh	18	46
Tay Ninh	6	15
Long Than	10	26
Saigon	1	3
Vinh Long	6	16
Soc Trang	3	8
Total	44	114

981st Military Police Company (Sentry Dog)

Location	Number of Posts	Sentry Dog Teams
Phan Rang	3	8
Cam Ranh Bay	9	23
Phu Tai	14	25
An Khe	8	21
Pleiku	20	47
Ban Me Thuot	5	13
Nha Trang	6	16
An Son	6	17
Qui Nhon	2	5
Total	73	175

595th Military Police Company (Sentry Dog)

Location	Number of Posts	Sentry Dog Teams
Da Nang	12	30

These 319 sentry dogs were posted near general storage yards, airfields, ammunition supply points, petroleum product storage areas, food storage areas, docks, and a convalescent center. Dogs and their handlers were trained at the United States Army Pacific Sentry Dog School in Okinawa (85).

Army sentry dogs generally performed well in Vietnam. They were effective against intruders, and, as with Air Force sentry dogs, served as a psychological deterrent to intrusion. Their use as an economy of force measure was emphasized in physical security programs because they could be used in lieu of men for perimeter security, thus

freeing men for other tasks (85). They encountered some of the same problems as Air Force sentry dogs: heat, spoiled food, and, sometimes, poor housing. One problem encountered with the employment of Army sentry dogs was their use in areas where strong odors, loud noises, and other distractions lessened their effectiveness (41). Strong petroleum odors in petroleum storage areas and continual noise in dockyards limited the effectiveness of sentry dogs.

Although the performance of Army sentry dogs in Vietnam was generally applauded, there is at least one dissenting voice. Colonel W. H. Brandenburg, who was the United States Army Vietnam Provost Marshal and Commander, 18th Military Police Brigade from 30 August 1968 through 22 December 1969, wrote:

> Sentry Dogs:
>
> a. The Brigade has two sentry dog companies with a third one in process of activation. Dogs are stationed at ammunition supply points, air fields, tank farms, outposts and other similar areas. The efficiency of sentry dogs is difficult to determine. Sappers have successfully attacked installations guarded by dogs, e.g., Qui Nhon Ammunition Depot, and they have been detected by dogs at others, e.g., Tay Ninh, Ban Me Thout. Although doctrine prohibits the use of dogs as deterrents, it is possible that dogs do deter attacks. Dogs are deployed in a number of locations that have never been attacked. While cause and effect cannot be established, the possibility is not unreasonable. Nevertheless, dogs are expensive.
>
> b. Veterinary care must be available. Training must be continuous. Care and grooming are extremely important, especially in the Vietnam climate. With all this attention, dogs can work only six hours out of 24. Thus his handler remains on post only six hours also, whereas the average security guard and military policeman works a 12 hour shift.
>
> c. A number of dog posts in RVN were established simply to humor senior commanders. It is a fact that good dog posts are difficult to find in RVN. Continuous

> activity at most key installations and activities creates a cacophony of sights and sounds which virtually negate a sentry dog's effectiveness (122).

Colonel Brandenburg's view is a minority opinion, but it should be noted that his comment about sentry dogs represents about one-sixth of his entire debriefing report, which, in turn, represents his feelings after a sixteen month tour in Vietnam. His comments also suggest that he is more intimately familiar with sentry dog operations than might be expected from the United States Army Vietnam Provost Marshal. Thus, his comments should not be casually disregarded.

Colonel Paul M. Timmerberg, United States Army Vietnam Provost Marshal and Commander, 18th Military Police Brigade from 15 June 1971 to 30 May 1972 had a more favorable opinion of Army sentry dogs. He said in his debriefing report:

> The employment of sentry dogs in physical security functions was highly successful and represents one of the most outstanding achievements of the military police in Vietnam. They were programmed into country during the initial phases and have been retained to the present. They have been efficient, economical, and effective in protecting property against theft and providing security against attack. They have also produced substantial savings in manpower (123).

The United States Marine Corps introducted sentry dogs to Vietnam in April 1966 (111). These dogs, as well as a unit of Navy sentry dogs, were stationed at Da Nang (98). During the Vietnam War, the Army, Air Force, Navy, and Marines all had sentry dogs located at Da Nang.

The Republic of Vietnam Armed Forces also employed sentry dogs. In 1963, for example, they had seven operational sentry dog platoons which were located at Da Nang, Pleiku, Go Vap, Thanh Tuy Ha, Saigon,

Bien Hoa, and Tan Son Nhut (73). Later in the war, during the Vietnamization period, many dogs were transferred from the United States Armed Forces to the Republic of Vietnam Armed Forces.

Sentry dogs, regardless of which service they worked for, had one serious deficiency. They were incorrigibly vicious. They attacked anything and everything except their own handler, and sometimes they even forgot to follow that rule. They attacked kennel cleaners, veterinarians, other sentry dogs, small children, and anyone else who crossed their path. They attacked steel pipes, brick walls, and concrete abutments if these inanimate objects found themselves between the sentry dog and its prey. Only one handler could control the beast, and sometimes even he had trouble doing it. When the handler was on leave or sick, some real problems arose, and retraining a sentry dog to accept a new handler was difficult, sometimes impossible. This one serious deficiency of the sentry dog led to the development of the patrol dog, a more docile creature.

Patrol Dogs

To overcome the problem presented by the temperament of sentry dogs, the Air Force began experimenting with the use of patrol dogs in 1968 (125). Four patrol dog teams were trained for the Air Force by the Metropolitan Police Department, Washington, D.C. and used on a trial basis at Andrews Air Force Base, Maryland. The initial trial was successful; so, after additional field evaluation, the first patrol dog class began at Lackland Air Force Base in August 1969 (52).

The temperament of the patrol dog is more agreeable than that of the sentry dog. The patrol dog is not a raging, snarling beast, although on command it will become extremely aggressive and will attack. It can be used in a perimeter defense role just as the sentry dog, but the patrol dog is taught tolerance of other people, animals, and things. It can be used in situations totally unsuited for the sentry dog such as controlling crowds, escorting money, searching for lost property, and tracking. A patrol dog can be worked unmuzzled and off-leash. In short, the patrol dog is a multipurpose dog, while the sentry dog is extremely specialized.

The patrol dog saw little service in Vietnam, although during this period patrol dogs were extensively employed elsewhere in the world. While Air Base Defense in the Republic of Vietnam 1961-1973 (44) does not mention patrol dogs, some Air Force sentry dogs in Vietnam were retrained as patrol dogs before being given to the Vietnamese as part of the Vietnamization program (132). The Army also made limited use of patrol dogs during the war (103,107).

Scout Dogs

A scout dog is "a German Shepherd trained to work silently either on- or off-leash, day or night, and to alert to airborne scent, to 'signal' the handler when it has picked up the presence of nearby dangerous objects or personnel, and to support maneuvering infantry elements in a wide range of tactical tasks (85)." The United States Army recognized the value of the scout dog early in the Vietnam War. As early as 1962, the Army recognized the scout dog's ability to alert

on strange personnel at ranges from twenty-five to 1,000 yards, to give patrol personnel a sense of security and confidence, to provide a psychological advantage over the enemy, and to aid in perimeter security in heavy jungle and at night (139). In addition, the Republic of Vietnam Armed Forces had five active scout dog platoons in 1963 (73).

The Army's scout dog program, which had been active during both World War II and the Korean War, was reactivated in 1965 with the establishment of the Infantry Scout Dog Training Center at Fort Benning, Georgia. From Fort Benning, dogs were airlifted directly to Vietnam (98). The dogs were organized into Infantry Platoons (Scout Dog) which consisted of three or four squads. Each platoon contained twenty-seven to thirty-six dogs, and varied in size during the war as changes were made in the Tables of Organization and Equipment under which the platoons were organized. In 1968 there were twenty Army scout dog platoons in Vietnam assigned to the following units (85):

Unit	Infantry Scout Dog Platoons
1st Infantry Divsion	35th, 41st
1st Cavalry Division (Airmobile)	25th, 34th
4th Infantry Division	33d, 40th, 50th
9th Infantry Division	43d, 45th
25th Infantry Division	38th, 44th, 46th
101st Airborne Division	42d, 47th, 58th
Americal Division	48th, 57th
173d Airborne Brigade	59th, 39th
199th Light Infantry Brigade	49th

A scout dog training detachment which maintained a pool of replacement dogs was located at Bien Hoa Air Base (98,148). The United States Marine Corps employed two scout dog platoons in the Da Nang area (74).

Dogs were generally employed as the lead elements in small infantry maneuver units, i.e., they were employed as the "point." They were also employed as flank and rear screens, in support of outposts and ambushes, as members of reconnaissance teams, and in searching hamlets (104). Scout dogs were also trained to detect trip wires, booby traps, and mines. They were usually employed with one man-scout dog team per maneuver unit, but occasionally two teams were employed with one unit. This allowed one dog to rest while the other worked. Since the dogs relied heavily on their sense of smell, the wind direction was a major determinant in choosing the proper method of dog employment (7). Some specific examples of scout dog employment illustrate how these dogs performed (20):

> On 9 August 1966, PFC Barejko and Scout Dog Vikki 2X84 of the 38th Scout Dog Platoon were on a search and destroy mission near Bao Cap when Scout Dog Vikki alerted on a booby trap from a distance of three meters. Results: One booby trap destroyed.
>
> On 14 January 1967, SP4 Peters and Scout Dog Prince 5A07 of the 39th Scout Dog Platoon were on a search and destroy operation in the Iron Triangle when Prince alerted on a tunnel at 30 meters. Results: 100 pounds of rice, four radio sets, 2,400 blasting caps, 160 pounds of explosives, 40 antitank mines and medical supplies were captured.
>
> On 28 February 1967, SP4 Quada and Scout Dog King 22X4 of the 48th Scout Dog Platoon were on a search and destroy mission near XT164978 when King alerted on enemy personnel at 125 meters. Result: documents, food, hospital supplies captured and 12 VC KIA.

> On 9 April 1967, SP4 McClellan and Scout Dog Achates 06X2 of the 44th Scout Dog Platoon were on a search and destroy operation when Achates alerted two different times at 200 meters and 300 meters. Results: the enemy detonated three claymores and three VC's were killed.

The performance of military scout dogs was generally regarded as excellent. The enemy feared and respected the scout dog, and reportedly had orders to aim for the dog first and the handler second (6). Notwithstanding this generally favorable evaluation, scout dogs did have their limitations. The dogs were very susceptible to heat and fatigue. After a period on patrol, the dogs became hot, tired, and failed to concentrate on their work. Unlike a human soldier, a scout dog could not be ordered to perform. The dog's cooperation had to be voluntary. The dogs also required a great deal of water, much more than a man. This sometimes created problems, particularly during the dry season. By far the most frequently voiced criticism of scout dogs was that they instilled a false sense of security and overconfidence in the men on patrol. Scout dogs were supposed to instill confidence, and they did, but the confidence sometimes overwhelmed the men's good judgement, making them careless. They began to feel invincible which, of course, they were not. The scout dogs were very good at detecting enemy personnel and booby traps, but they were not perfect; thus the men could ill-afford to lower their own defenses.

Tracker Dogs

A tracker dog is "a highly trained Labrador Retriever able to work silently on a 25-foot leash following (day or night) a 'ground'

scent over terrain not holding a visual sign; to 'signal' the handler when it is nearing the subject being tracked; to be an integral part of a reconnaissance element for tracking enemy movement (85)."

One of the major problems of American combat units in Vietnam was maintaining contact with the enemy. The Viet Cong had a disturbing habit of disappearing into the jungle where they could not be found. This problem was recognized by the Americans shortly after they became involved in the war. They tried to solve the problem by tracking the Viet Cong with bloodhounds (they apparently had not heard of Zachary Taylor's exploits), but the bloodhounds made so much noise thrashing about in the jungle that they were a hazard to the personnel on patrol.

The Americans knew that the British had had some success using Labrador Retrievers to track down Indonesian and Chinese communist guerrillas in Borneo, so in May 1966 they decided to begin a tracker dog program. A team of officers was sent to visit the Headquarters, British Far East Land Forces in Singapore and the British Jungle Warfare School in Johore Bahru, Malaysia. The Americans received valuable advice and information, and a joint British-American military agreement was reached which called for the use of British dogs from Malaysia and the training of American handlers at the British Jungle Warfare School. Since Britain was a signatory of the 1954 Geneva Convention which partitioned Vietnam, and Malaysia was neutral regarding the Vietnam War, the military agreement required diplomatic sanction. Agreement was reached in September 1966, and in October 1966 fourteen United States Army combat tracker teams began training in Malaysia. These combat tracker teams were subsequently deployed in

Vietnam (85). The tracker dog training mission was later transferred to Fort Gordon, Georgia (45) where some dogs were also procured locally (152).

Tracker dogs were generally employed as part of combat tracker teams which were composed of human visual trackers and canine scent trackers. The composition of these teams varied during the war as experience was gained. A six-unit team composed of four human visual trackers, one dog handler, and one dog was most commonly used (64). The handler and dog could be employed alone, but best results were obtained when the entire team was used together (104). The tracker teams could perform the following missions (85):

1. Follow a retreating enemy and re-establish contact.
2. Follow local enemy to villages or homes.
3. Follow and recover US personnel captured by the enemy.
4. Follow and recover US Army patrols or individuals who were lost or separated from their units.
5. Back-track captured enemy personnel to determine where they had been and where they hid any supplies or equipment they may have had.

In 1968 there were seven United States Army combat tracker platoons and three combat tracker detachments operating in Vietnam. Each platoon consisted of four combat tracker teams and each detachment included two combat tracker teams. This represented a reorganization of the original fourteen combat tracker teams which came from Malaysia. These combat tracker units were assigned as follows (85):

Supported Unit	Combat Tracker Unit
1st Infantry Division	61st Infantry Platoon
1st Cavalry Division (Airmobile)	62d Infantry Platoon
4th Infantry Division	64th Infantry Platoon
9th Infantry Division	65th Infantry Platoon
25th Infantry Division	66th Infantry Platoon
101st Airborne Division	557th Infantry Platoon
Americal Division	63d Infantry Platoon
173d Airborne Brigade	75th Infantry Detachment
199th Light Infantry Brigade	76th Infantry Detachment
United States Army Vietnam Special Troops	77th Infantry Detachment

In early 1969 the Royal Australian Army maintained eight tracker dogs at Nui Dat near Vung Tau (74).

Combat tracker teams were generally very effective in Vietnam. Their limitations included difficulty in tracking in heavy jungle at night, in tracking after a heavy rainfall, and in following a track more than twenty-four hours old (85). Some specific examples of combat tracker team operations will serve to illustrate their use (20):

> On 3 May 1967, when a friendly ambush was hit by a large enemy force, Combat Tracker Team No 1 was called by the 1st Bn, 27th Inf. The track was 3 1/2 hours old and made by 50 to 60 men. Visual trackers found a track which the tracker dog followed for 4,000 meters through populated areas. The VC were tracked to a boat landing where they apparently left in a sampan. Then the dog tracked two men, apparently boat guards, about 700 meters to a village where the track was lost.
>
> On 19 June 1967, Combat Tracker Team No 8 was called by "A" 1/7th Cav, 1st Cav Div to investigate tracks leading from caves. The CTT came under sniper fire as they landed by helicopter. After reaching the support platoon, the

platoon came under fire. The CTT followed approximately 8 VC's leaving the area. The visual trackers tracked for a short distance when heavy rain washed out all footprints. After about 1,000 meters, the dogs picked up the smell of the VC. The CTT came under fire while moving back to the support platoon. CTT called artillery in on enemy position.

On 23 June 1967, Combat Tracker Team No 6 was called by an element of the 9th Div to follow an enemy track. The CTT was supported by two squads from the aerial rifle platoon. The track was 12 hours old made by an estimated enemy battalion. The visual trackers identified the track and the dog followed for about 500 meters to an enemy base camp. Evasive tactics included walking along a rocky stream bed. The base camp included a school, tools, clothing, ammo, and bunkers. Artillery was called in on the base camp after the team withdrew.

Mine and Tunnel Detection Dogs

A mine and tunnel dog is "a German Shepherd trained to work silently and detect (by a combination of air and ground scents) hidden mines, booby traps, tunnels, and bunkers; and to support maneuvering infantry elements on specific tasks (85)." Breeds other than the German Shepherd were also trained for mine and tunnel detection during the Vietnam War.

During the Vietnam War, mines and booby traps were a constant menace in the field. On roads and in open areas, mechanical mine detectors were generally effective, but in the jungle these devices generally were not useful. Therefore, in May 1967 the United States Army Limited Warfare Laboratory at the Aberdeen Proving Grounds, Maryland began a study to determine if military dogs could be effectively employed to detect mines, booby traps, tripwires, and tunnels (113).

The Limited Warfare Laboratory established training procedures and demonstrated the project's technical feasibility between January and July 1968. In August 1968 the 60th Infantry Platoon (Scout Dog) (Mine/Tunnel Detector Dog) began training at Fort Gordon, Georgia, and this platoon was deployed to Vietnam in April 1969. The platoon consisted of twenty-eight dog handlers and twenty-eight dogs. The dogs were trained as either mine dogs or tunnel dogs. The mine dogs were trained to work off-leash on or near roads and trails under the command, by voice or by hand and arm signals, of their handlers. They were trained to detect mines, booby traps, and trip wires, and to alert by sitting down two feet away from these objects. The tunnel dogs were trained to detect trip wires and tunnels. They worked off-leash at distances up to thirty meters from their handlers. They were controlled by hand and arm signals and they alerted by sitting down two feet from the trip wire or tunnel entrance (40).

The 60th Infantry Platoon (Scout Dog) (Mine/Tunnel Detector Dog) was based at Cu Chi and served with the 25th Infantry Division and the Americal Division. Eighty-five percent of the patrol leaders of the supported units reported that the dogs enhanced patrol security (40). This, coupled with earlier testimonials, including testimony before the House Appropriations Committee which stated that the dog was the best way to locate Viet Cong tunnels (25), insured the continuation of the mine/tunnel detector dog program. The Infantry School at Fort Benning, Georgia was directed in July 1970 to assume responsibility for the mine/tunnel detector dog program and to improve training techniques and dog effectiveness (113).

Although the dogs in the 60th Infantry Platoon (Scout Dog) (Mine/Tunnel Detector Dog) were trained exclusively to detect mines, booby traps, tripwires, and tunnels, the dogs in the infantry scout dog platoons also received limited training in these skills (136). Therefore, discovering these devices was not the exclusive province of the mine/tunnel detector dog.

The United States Marine Corps, aware of the Army's progress in the employment of mine/booby trap detector dogs, conducted its own evaluation in 1970. The Marine Corps sent eighteen handlers and fourteen dogs to Vietnam in March 1970, and another twenty handlers and fifteen dogs in May 1970. The dogs were employed in combat operations with infantry and engineer elements of the First Marine Division and with elements of the Combined Action Forces. The evaluators concluded that mine/booby trap detector dogs were effective and suitable for Marine Corps use as a supplement to other detection and neutralization procedures (42).

The performance of sentry, scout, and tracker dogs in Vietnam was judged almost universally excellent. The mine/tunnel detector dogs received good, but somewhat less enthusiastic reviews of their effectiveness. These dogs did in fact fail to discover some mines and booby traps, and those who witnessed these misses and the resulting casualties quite naturally were less than enthusiastic about the work of these dogs. Conversely, those saved by a dog from death or maiming were understandably grateful. The criticism of dog performance was largely the result of the overconfidence often found in soldiers who were accompanied by dogs. The soldier felt that the dog was a

foolproof detection system, and, when the dog failed to perform, the soldier was naturally disillusioned. The strongest supporter of the mine/tunnel detector dog program would never have suggested that the dog was a foolproof system. Two vignettes, one of success and another of failure, illustrate the employment of mine/tunnel detector dogs:

> Dog missed a Claymore, the detonating device was approximately two (2) feet off trail, the hell box was approximately seven (7) feet off trail. Incident resulted in three (3) KIA and three (3) WIA Marines. Dog and handler were not injured, however, the dog was so frightened by the explosion that he ran away which resulted in the dog MIA (42).

> If dogs think of such things, Romper would have been thinking that her fur coat was much too hot for the 100 degree heat of the Boi Loi Woods. But Romper was thinking of other things as she padded silently under a tall bush. As the slight breeze shifted, she paused, then changed direction and moved slowly forward, testing the breeze carefully with her very pointed nose. After circling an innocuous-looking bush, she glanced back at her handler and carefully sat two feet from the mortar round a 17-year-old boy had spent 30 minutes camouflaging (113).

It is easy to see why opinions varied about the effectiveness of these dogs.

Contraband Detection Dogs

German Shepherd dogs were used in Vietnam to detect by smell contraband items, principally marijuana (105). Because the detection program was designed to stem the flow of illegal drugs to the United States, the use of dogs centered on the major airports from which servicemen departed Vietnam. Other areas could, of course, also be searched. The dogs, if properly rested to maintain their interest in their work, were a nearly foolproof detection system because packaging marijuana in a way which escaped detection by the dogs was virtually

impossible. Although these "marijuana sniffers" were a familiar sight in airports, the total number of dogs used for this purpose was very small.

Other Dogs

In 1967, the Army initiated a program at the Edgewood Arsenal, Maryland to develope an improved military dog. The program was designed to breed a superior military German Shepherd, one with improved behavioral and physical characteristics. The elimination of hip dysplasia was a paramount goal. An improved German Shepherd was bred, but none of the dogs were used in Vietnam. The program ended in 1976.

Although not military dogs per se, a large number of canines, certainly hundreds, perhaps thousands, were kept as pets by American servicemen. These servicemen, far away from home and lonely, often chose man's best friend as a companion. The presence of these pet dogs complicated animal disease control measures.

Chapter III

DISCOVERY AND CHARACTERIZATION OF CANINE EHRLICHIOSIS IN VIETNAM

General Comments

Many medical problems affected military working dogs in Vietnam, but canine ehrlichiosis most seriously jeopardized the operational efficiency of military units dependent on dogs. This chapter is a description of the discovery and characterization of canine ehrlichiosis in Vietnam. Its intent is to describe in detail the disease as it appeared in Vietnam, the establishment of its etiology, and the present knowledge of the disease.

First, the veterinary care for military working dogs in Vietnam is described. Next is a brief description of the first cases of canine ehrlichiosis in Vietnam. Since the disease was not immediately recognized as canine ehrlichiosis, these first cases prompted the military veterinary research community to begin studies to determine the etiology of the disease. This research effort and the clinical effort of veterinarians in Vietnam to control and treat the disease occurred simultaneously. The research effort which led to a definitive diagnosis is described in "Definitive Diagnosis;" the clinical effort in Vietnam is described in "The Epizootic in Vietnam."

The information presented in "First Cases in Vietnam," "Definitive Diagnosis," and "The Epizootic in Vietnam" is sketchy and sometimes incomplete when compared to our present knowledge of canine ehrlichiosis. This is a deliberate attempt to describe how events really occurred, not how they occurred in light of present knowledge.

The people involved in these events dealt with sketchy and incomplete information, so an effort has been made to re-create that atmosphere.

Today's knowledge of canine ehrlichiosis is discussed in "Description of the Disease."

Veterinary Care for Military Working Dogs

Since the epizootic of canine ehrlichiosis in Vietnam began in 1968, it is worthwhile to examine the veterinary units which provided medical care to military working dogs in Vietnam at that time. Because canine ehrlichiosis eventually became almost exclusively an Army problem, Army veterinary units will be emphasized.

In 1968 the Army had approximately fifty veterinarians in Vietnam assigned to twelve different veterinary units. These units were part of the 44th Medical Brigade and provided a variety of veterinary services including subsistence inspection, preventive medicine, zoonosis control, sanitary inspection of commercial food processing establishments, civic action projects, and medical care of military animals. Veterinarians also provided veterinary laboratory services at the 9th United States Army Medical Laboratory, Vietnam.

Most of the veterinary units provided limited medical care for military working dogs on an area basis. In the First Corps Tactical Zone[a] in the north, service was provided by the 175th Veterinary

---

[a]The Corps Tactical Zones were numbered from one to four, beginning with one in the northernmost provinces, and ending with four in the southernmost; the Second Corps Tactical Zone was further subdivided into North and South.

Detachment (Team JB, TOE 8-500G)[b] and the 504th Medical Detachment (Team IE, TOE 8-500G), both of which were located at Da Nang. In the Second Corps Tactical Zone North, the 459th Veterinary Detachment (Team IE, TOE 8-500G) was located at An Khe and the 760th Medical Detachment (Team JB-RS, TOE 18-500D) was located at Qui Nhon. In the Second Corps Tactical Zone South, the 176th Veterinary Detachment (Team JB, TOE 8-500G) and the 764th Medical Detachment (Team IE, TOE 8-500G) were both located at Cam Rahn Bay. The heaviest concentration of veterinary units was in the Third Corps Tactical Zone surrounding Saigon. The 522d Medical Detachment (Team AF, TOE 8-500G) was the headquarters element for all Army veterinary units in Vietnam and was located at Long Binh. The 245th Medical Detachment (Team JB-RS, TOE 8-500D) was also located at Long Binh. The 4th Medical Detachment (Team JB, TOE 8-500D) and the 936th Medical Detachment (Team ID, TOE 8-500D) were located in Saigon; the 75th Medical Detachment (Team JA, TOE 8-500D) was at Vung Tau. The Fourth Corps Tactical Zone had only one veterinary unit, the 359th Veterinary Detachment (Team IE, TOE 8-500G) at Dong Tam.

Complete hospital facilities were provided by the 936th Medical Detachment at Tan Son Nhut Air Base in Saigon and by the 764th Medical Detachment at Cam Ranh Bay. The 936th Medical Detachment small animal hospital eventually served as the central evacuation hospital for canine ehrlichiosis patients.

---

[b]Veterinary units were initially designated "Medical Detachments," and later designated "Veterinary Detachments." The following designations are as of 31 December 1968 and include some units which had been re-designated and some which had not.

At the end of 1968, these veterinary units were supporting 1,099 military dogs including Army scout, sentry, and tracker dogs, Marine scout and sentry dogs, Navy sentry dogs, and Australian tracker dogs. Upon request, support was also provided to dogs from the United States Air Force and from the Army of the Republic of Vietnam (5).

After canine ehrlichiosis became a serious problem in Vietnam, other veterinary personnel were utilized, principally those from the Walter Reed Army Institute of Research in Washington, D.C. These veterinarians provided some assistance in Vietnam itself, but most of their work was done in their Washington, D.C. laboratory, first to determine the cause of the disease, then to refine understanding of the disease process.

First Cases in Vietnam

In mid-September 1968 several military working dogs were presented for treatment manifesting clinical signs of unilateral or bilateral epistaxis, severe leucopenia, and a progressive anemia. The animal's condition gradually deteriorated as the anemia progressed, and death resulted. The disease was apparently identical to a disease reported in 1967 in tracker dogs imported from the British Jungle Warfare School in Malaysia. The first five deaths in 1968 were reported by the Chief, Department of Veterinary Medicine, 9th United States Army Medical Laboratory, Vietnam on 12 October 1968.

The initial cases in 1968 occurred in dogs from the 212th Military Police Company (Sentry Dog) at Long Binh, the 48th Infantry Platoon (Scout Dog) at Chu Lai, the 936th Medical Detachment at Tan

Son Nhut Air Base (a blood donor dog and two dogs being held before euthanasia), and from several units in the Pleiku area. It was observed very early that all affected dogs were either kenneled at Long Binh or Saigon, or had been exposed to other affected dogs in the Long Binh or Saigon area (77,116).

Retrospective studies indicated that this hemorrhagic disease had probably caused one death on 24 July 1968 and another on 23 August 1968. Deaths also occurred from September to December 1968 in Okinawa; all of these deaths were in dogs which had been shipped from Vietnam or which had been kenneled with them. The cause of this disease was unknown; it was therefore named idiopathic hemorrhagic syndrome (77,116).

As more information was gathered, the following more complete clinical picture emerged. The disease generally began with the sudden appearance of unilateral or bilateral epistaxis in a previously clinically normal dog. Some dogs died in as little as one day from exsanguination; about forty percent died in five days; about seventy percent died in seven days. Some animals recovered and became chronic cases. Other clinical signs included loss of weight, transient corneal opacity, loss of stamina, hindlimb weakness, vomiting, dehydration, lethargy, ecchymosis on the abdomen and between the toes, anemia, dermatitis, edema of the limbs and scrotum, and petechial hemorrhages on the penis (116).

Hematologic findings included a leucopenia with total white blood cell counts as low as $500/mm^3$. Packed cell volumes were consistently low, and often dropped precipitously from near-normal to

fifteen to twenty percent within twenty-four hours; this apparently was the result of hemorrhage. Hemoglobin was also low. Blood chemistry values were essentially normal, although in chronic and terminal cases, blood urea nitrogen and creatinine levels were elevated. Coagulation times were normal, but bleeding times were greatly prolonged. An elevated erythrocyte sedimentation rate was a frequent finding (116).

The gross pathologic features of idiopathic hemorrhagic syndrome included enlarged and hemorrhagic lymph nodes; petechial and ecchymotic hemorrhages of the parietal pleura, urinary bladder, and gastrointestinal tract; petechial hemorrhages in the prostate, testicles, kidneys, epicardium, and endocardium. Dark feces were often found in the colon, and dogs with clinical epistaxis usually had a large blood clot in the nasal cavity. The spleen and bone marrow were considered normal, while the liver was normal in size with an increased prominence in the lobular pattern. Subcutaneous edema and hemorrhage were often seen in the limbs, particularly over the joints (116).

Histologically, a plasma cell infiltration was found around blood vessels in virtually any organ, but particularly in the lymph nodes, kidneys, and meninges. Central lobular degeneration and/or necrosis was commonly found in the liver, and a decreased cell population was found in the bone marrow, particularly myeloid cells. Megakaryocytes were reduced in number or almost absent. The histologic changes were consistent with an autoimmune disease (116).

In January 1969 a review of the medical records of military working dogs revealed that clinically apparent disease was often preceded by a one to four day febrile episode which occurred about two months before the onset of acute illness. After this febrile episode, the dogs usually returned to a clinically normal state until the subsequent acute episode (116).

It was recognized early in the epizootic that idiopathic hemorrhagic syndrome seemed to occur more frequently in dogs housed in heavily tick-infested kennels. This suggested a possible tick vector (77).

By 18 March 1969 there were seventy-five canine deaths in Vietnam attributed to idiopathic hemorrhagic syndrome with at least an additional fourteen deaths in Okinawa. All dogs were screened hematologically, and an additional 210 dogs were classified as suspects, based on a total white blood cell count less than $7,000/mm^3$ and/or a packed cell volume less than forty percent. It was noted that suspects frequently later became clinical cases which then succumbed to the disease (116).

In early 1969 the cause of idiopathic hemorrhagic syndrome was unknown. The differential diagnosis included: chemical poisons; bacterial toxins; ionizing radiation; and bacterial, rickettsial, viral, and hemoprotozoan infections. Hematologic, blood chemistry, and epidemiologic studies effectively eliminated chemical poisons and bacterial toxins from consideration, and, since no source of radiant energy capable of producing this disease could be found, ionizing radiation was also elminated as a possible cause. Blood and tissue

cultures failed to consistently reveal any bacterial organism; the disease was therefore considered to be of viral, rickettsial, or hemoprotozoan origin (98). A viral infection transmitted by a tick vector and complicated by an autoimmune phenomenon was initially favored (33,86), but the need for further definitive study was clear.

Definitive Diagnosis

Determining the cause of idiopathic hemorrhagic syndrome was a lengthy, difficult task, and further refinement of the exact pathogenesis of the disease continues to the present. The research efforts which eventually resulted in a definitive diagnosis were largely conducted by the Walter Reed Army Institute of Research in conjunction with the Army veterinarians located in Vietnam.

Transmission studies were immediately initiated using tissues and whole blood from dogs with typical signs of idiopathic hemorrhagic syndrome. Beagles and other laboratory animals were inoculated with tissue suspensions and whole blood. By April 1969 a disease apparently the same as idiopathic hemorrhagic syndrome had been produced in the laboratory by the inoculation of fresh whole blood from affected dogs. Babesia organisms were identified in infected beagles. Two viruses were isolated from mice inoculated with material from affected dogs. Other laboratory studies included the following: bacterial cultures; attempts to grow an agent in various tissue culture systems; examination of engorged ticks for viral agents; examination of plasma specimens for clotting factors; serologic examination of sera from affected dogs for antibodies to numerous

rickettsial and viral agents; and detailed serum electrophoresis of sera from affected dogs. The completion of these initial studies suggested very tentatively that idiopathic hemorrhagic syndrome was produced by an infectious agent, probably a virus. The role of the Babesia organisms required further evaluation (116).

In early 1969 the term used to describe this disease changed from idiopathic hemorrhagic syndrome to tropical canine pancytopenia. This name change occurred because tropical canine pancytopenia was the term used by the British to describe an identical disease which occurred in British military dogs in Singapore as early as 1963 (133,151), and because the Labrador Retriever tracker dogs purchased from the British and brought to Vietnam in late 1966 and early 1967 were apparently infected with tropical canine pancytopenia when they arrived in Vietnam (62). During this period, the disease had acquired several other names including tracker dog disease, idiopathic epistaxis, idiopathic hemorrhagic disease, and canine hemorrhagic fever (116).

Attempts to identify the cause of tropical canine pancytopenia continued in 1969. An organism tentatively identified as Ehrlichia canis was consistently isolated from naturally occurring cases, and intracytoplasmic inclusion bodies thought to be Ehrlichia canis were found in mononuclear cells of both naturally occurring cases and in experimentally infected German Shepherds and Beagles. Both German Shepherds and Beagles became febrile and developed other typical signs of tropical canine pancytopenia including anemia, leucopenia, increased erythrocyte sedimentation rate, and severe weight loss. Only the German Shepherd, however, developed epistaxis and corneal

opacity. This suggested that the German Shepherd breed was more susceptible to the naturally occurring disease. Babesia canis was still noted in the whole blood of dogs with the naturally occurring disease, but this was generally considered to be a secondary, concurrent infection. As the researchers became convinced that Ehrlichia canis was the causative agent, the research emphasis shifted to specific studies with this organism (137).

Attempts were made to cultivate Ehrlichia canis in several in vitro and in vivo systems. These included guinea pigs, mice, hamsters, embryonated eggs, alveolar macrophage cultures, leucocyte cultures, and other tissue cultures. These attempts were all unsuccessful, and the dog remained the only system for cultivating Ehrlichia canis (137).

Preservation, chemotherapy, and vector studies were also conducted. Studies demonstrated that infective whole blood and other tissues could be preserved for long periods in the frozen state. Chemotherapy studies, particularly important since the veterinarians in Vietnam were still dealing with an epizootic, suggested that tetracycline was of value in treating tropical canine pancytopenia. This evidence confirmed the clinical observation of veterinarians in Vietnam that the administration of tetracycline was useful therapy. The vector studies during 1969 concentrated on developing a "clean" strain of Rhipicephalus sanguineus, the brown dog tick, i.e., a strain of ticks which would transmit no known canine disease (137). Establishing a "clean" tick colony was extremely laborious. It required breeding ticks through multiple generations, feeding them on

dogs at each stage of their development, and thorough examination of each dog on which the ticks were fed. Also, because the etiology of the disease was unknown, all these research efforts were carried out in a strict containment facility to prevent the potential spread of the disease to humans or other animals. The need for containment seriously complicated the research effort.

Although the cause of tropical canine pancytopenia had not yet been established with certainty, D.L. Huxsoll et al. (61) speculated in late 1969 that the cause of the disease was Ehrlichia canis.

By mid-1970 veterinary researchers at the Walter Reed Army Institute of Research had concluded that Ehrlichia canis was indeed the cause of tropical canine pancytopenia (138). This definitive diagnosis was based on the consistent recovery of Ehrlichia canis from dogs naturally affected with tropical canine pancytopenia, and on the production of an indistinguishable disease in laboratory dogs experimentally infected with Ehrlichia canis. The clinical course (146) and epizootiology (62) of the disease were described in 1970. Briefly, the clinical course of the disease was described as beginning with a five to fifteen day incubation period following initial exposure, probably exposure by a tick vector. The incubation period was followed by a two to ten day febrile phase during which pyrexia, decreased stamina, weight loss, and an abnormal hemogram were noted. The febrile period was followed by a subclinical phase of five to seventeen weeks during which the dog had an abnormal hemogram, but was clinically normal. Following the subclinical phase, about forty percent of the dogs evidenced epistaxis and succumbed to the disease

either acutely in two to five days or chronically after as long as three months. The remaining sixty percent of the dogs experienced no clinical hemorrhage but eventually succumbed to the worsening pancytopenia. This latter category of chronically pancytopenic dogs was not clinically recognized during the Vietnam epizootic.

Research efforts continued at the Walter Reed Army Institute of Research. These included continued transmission studies in cell cultures, embryonating eggs, and dogs; pathologic, chemotherapeutic, electron microscopic, and Ehrlichia canis preservation studies; and continued work on a "clean" Rhipicephalus sanguineus colony (138).

Therefore, by mid-1970, tropical canine pancytopenia, formerly idiopathic hemorrhagic syndrome, was definitively diagnosed as a highly fatal infectious disease of the dog caused by the rickettsial organism, Ehrlichia canis. Ehrlichia canis had been strongly suspected as the cause of the disease in 1969 (61), but Koch's postulates were not fully satisfied until two years after the epizootic began. This requires a discussion of efforts to clinically deal with the disease in Vietnam during this two-year period.

The Epizootic in Vietnam

As research efforts were determining the etiology of tropical canine pancytopenia, the veterinarians in Vietnam had to clinically deal with an unknown disease on a day-to-day basis. Following the first death in September 1968 from acute, fatal epistaxis in a dog from the 212th Military Police Company (Sentry Dog), deaths began occurring in dogs throughout Vietnam. Since it was recognized early that the disease was probably infectious in nature, all dogs with

epistaxis were referred after September 1968 to the 936th Medical Detachment at Tan Son Nhut Air Base for treatment (98). Only dogs requiring hospitalization for tropical canine pancytopenia were referred to the 936th. All dogs requiring hospitalization for other diseases were referred to the 764th Medical Detachment at Cam Ranh Bay. This was an attempt to prevent transmission of the disease from infected to noninfected dogs (5). Thirty-five deaths occurred by the end of 1968 (99), including dogs from the 212th Military Police Company (Sentry Dog), the Sentry Dog Training Center, the Scout Dog Training Detachment, and seven of the twenty infantry scout dog platoons (98).

Treatment of the acute disease was symptomatic and largely unsuccessful. Treatment included the use of a full range of antibiotics, sulfonamides, vitamin B-complex, vitamin B-12, vitamin C, vitamin K, calcium lactate, hematinics, corticosteroids, and whole blood transfusions (32). These treatments sometimes prolonged the course of the disease, and a few dogs were returned to duty, but most dogs eventually died despite intensive treatment.

During 1969 the epizootic continued with approximately 140 additional deaths. Deaths from tropical canine pancytopenia in 1969 were as follows (98,125)[c]:

---

[c]The reported "deaths from tropical canine pancytopenia" during this period differ slightly from one source to another, apparently because different individuals had slightly different standards for establishing a firm diagnosis. These differences are small.

Month	Number of Deaths
January	12
February	23
March	16
April	15
May	13
June	12
July	12
August	10
September	7
October	12
November	9
December	1

By the end of 1969, deaths from tropical canine pancytopenia had occurred in the 212th Military Police Company (Sentry Dog), the 981st Military Police Company (Sentry Dog), all twenty infantry scout dog platoons, two Air Force sentry dog units (Tan Son Nhut Air Base and Da Nang), Marine and Navy dogs at Da Nang, the Sentry Dog Training Center, and the Scout Dog Training Detachment (98). Efforts to control and treat the disease consisted of isolating affected dogs, instituting rigorous tick control measures, hematologic screening of all dogs, and symptomatic treatment.

In 1969 the high incidence and prolonged course of the disease caused mission failures among the military dog units. Hospitalized dogs were unavailable for duty, yet were still carried on their units' roles. Therefore, dog holding detachments were established at both the 936th and the 764th Medical Detachments, and, if a dog's hospitalization was expected to exceed fifteen days, the dog unit was permitted to requisition a new animal. This served both to isolate infected dogs and to enable the dog units to perform their missions (3).

An extensive blood testing program for all military dogs in Vietnam was conducted in 1969. From mid-January to mid-March an attempt was made to collect biweekly samples from all dogs which, based on an initial screening, had total white blood cell counts less than $7,500/mm^3$ and/or packed cell volumes less than thirty-seven percent. These blood specimens were used extensively in initial studies of the disease (98). Later in the year, a screening program was established to obtain monthly blood samples from all sentry, scout, and tracker dogs. This program was designed to detect tropical canine pancytopenia suspects (3).

During 1970 tropical canine pancytopenia continued to be the most significant health problem in military working dogs in Vietnam, but a less severe one than previously; it was not considered an emergency condition. The 936th Medical Detachment reported that 104 dogs were hospitalized for this disease in 1970, and that this represented twenty-four percent of the total number of dogs hospitalized by this unit. This was a lower percentage of total admissions than in 1969 (4). The Staff Veterinarian, United States Army, Pacific stated in September 1970 that, "Tropical Canine Pancytopenia (TCP) in Military [sic] dogs is not currently a problem (76)." Whether a problem or not, the incidence of tropical canine pancytopenia did decrease in 1970, and it is interesting to speculate why.

In late 1969 and early 1970 a standard therapeutic regimen of fourteen days administration of tetracycline was begun. The establishment of this regimen was based on clinical impressions gained in Vietnam and on a paper published in 1969 by S.A. Ewing (37) which

suggested that the tetracycline group of antibiotics might be useful in treating canine ehrlichiosis. The regimen involved the intravenous administration of 250 mg tetracycline twice daily for two days followed by the oral administration of 1,500 mg tetracycline for twelve days (144). Although highly speculative, this regimen may have accounted for the dimunition in the number of cases in 1970. The blood testing and tick control programs continued in 1970; they probably also contributed to the improved situation in 1970, but both of these programs were conducted throughout 1969 with little apparent effect. The annual report of the 936th Medical Detachment suggested that the tetracycline regimen was effective (4).

In 1971 and 1972 tropical canine pancytopenia occurred primarily as a chronic disease in Vietnam which led to debility and lost duty time, but few acute hemorrhagic deaths. The United States Army, Vietnam Staff Veterinarian, who departed Vietnam in May 1972, said that, "Possible explanations for the decline in the severity of the disease may be the widespread use of tetracycline, the early death of the most susceptible dogs, the lack of introduction of new susceptible dogs from the states, or an attenuation of the causative agent (34)." This Staff Veterinarian also pointed out that when he arrived in Vietnam in March 1971 there were 900 military dogs on duty; when he departed in May 1972 there were 150. The reduction in the number of military dogs in Vietnam was probably a major factor in reducing the visibility of the tropical canine pancytopenia problem. Some statistics will illustrate the extent of the tropical canine pancytopenia problem in 1971 and 1972.

In 1971 the incidence of tropical canine pancytopenia was seven per month per 1000 dogs with fifty-one lost duty days per month per 1000 dogs. Seven dogs died of the disease, and an additional twenty-six dogs were euthanatized because of poor duty performance resulting from the disease (90). In the first half of 1972 the incidence dropped to four per month per 1000 dogs with forty-eight lost duty days per month per 1000 dogs. Two dogs died, and one dog was euthanatized (91). Clearly, tropical canine pancytopenia had become a less severe problem, but the accuracy of these numbers must be evaluated in light of the dramatic decrease in the number of military working dogs in Vietnam.

The exact number of dogs which died of tropical canine pancytopenia is impossible to ascertain. Different veterinarians used slightly different diagnostic parameters to establish a diagnosis; dogs were stationed all over Vietnam, and in the course of business were shipped into and out of Vietnam, as well as to different locations within Vietnam; and last, but probably most important, the exigencies of war took precedence over the niceties of clinical medicine and research. None of these factors contributed to accurate bookkeeping. Reasonably accurate estimates indicate that between 200 (60) and 250 (58) dogs died during the epizootic. Some reports indicate that more than 300 dogs died (88,141). A precise death toll is of no great consequence, but it is important to recognize that tropical canine pancytopenia did much more than kill dogs. It caused a great deal of morbidity with the resulting loss of dogs which could not perform their duties. It caused a constant drain on veterinary

resources from mid-1968 until the end of the war; during some periods it completely dominated the veterinary service. It similarly preoccupied many of the veterinarians at the Walter Reed Army Institute of Research. The direct dollar cost of this disease, although unknown, was certainly considerable. Military working dogs cost several thousand dollars to purchase and train; their death or incapacity was expensive. The manpower and materiel costs were also high. People and things were constantly travelling, meetings were held, research projects were started, and pharmaceuticals and other medical supplies were consumed. The epizootic of tropical canine pancytopenia cost much more than the lives of 200 or 300 military working dogs.

Description of the Disease

History

A. Donatien and F. Lestoquard (30) first reported canine ehrlichiosis in Algeria in 1935. They referred to the disease as canine rickettsiosis and to the organism as Rickettsia canis. Ewing (37) compiled an excellent history of the disease. He reviewed cases in Southern Rhodesis (71), South Africa (97), East Africa (14,22), Lebanon (110), the French Congo (83), Uganda (15), the Belgian Congo (47), French West Africa (92), India (93), Sudan (48), and Chad (115) between 1937 and 1949. He also reported that canine ehrlichiosis continued to be a problem in Africa (17) and the Indian subcontinent (84,114) during the 1950's and early 1960's. A case of

canine ehrlichiosis was reported in Israel in 1972 (69). These early reports of the disease often referred to concomitant infection with Babesia canis (37).

Canine ehrlichiosis was first reported in the Americas in the Netherlands Antilles in 1957 (10), and the first case in the United States was reported in Oklahoma in 1963 (36). The disease was later reported from Texas in 1971 (109), Arkansas in 1971 (39), and Illinois in 1975 (131). The dog afflicted in Illinois had, however, lived the previous two years in India.

Canine ehrlichiosis, as mentioned previously, was noted in British military dogs in Singapore in the 1960's (133,151) and was named tropical canine pancytopenia because of its uncertain etiology. The 1968 outbreak of the disease in military working dogs in Vietnam was reported in several papers (61,62,63,98,146); this outbreak provided the impetus for detailed investigation of the disease and its causative agent. The work precipitated by the epizootic in Vietnam is still continuing, and has produced most of the detailed information known today about canine ehrlichiosis. The following is a review of that information, and is largely based upon a review of the disease by D.L. Huxsoll (59) in 1976.

Clinical Signs

Clinical canine ehrlichiosis manifests itself in acute and chronic forms. D.L. Huxsoll (59) reported that, "Following inoculation with infective blood, signs of acute disease appear within 7-10 days and consist of fever, serous nasal and ocular discharges, anorexia, depression, loss of weight, elevation of the erythrocyte

sedimentation rate and pancytopenia." These signs may be mild and go entirely unrecognized. In fact, recent evidence, which will be discussed in more detail later, suggests that most canine ehrlichiosis infections are mild enough to go unrecognized (78). Most dogs survive the acute phase, and then enter a chronic phase during which the dog appears normal, but infection with the ehrlichia organism persists. Many dogs experience no further disease; this condition has been referred to as mild chronic tropical canine pancytopenia (12). Dogs with the mild chronic form of the disease may be unthrifty and lethargic workers (78). Other dogs, particularly German Shepherds, develop a severe chronic (12) form of the disease typical of the epizootic which occurred in Vietnam. D.L. Huxsoll (59) described this severe chronic form as follows:

> Most dogs which develope severe chronic TCP are presented with clinical signs of hemorrhage. In many instances, a sudden onset of epistaxis is the first indication that a dog is affected as the initial acute phase has gone unnoticed. Accompanying signs include anemia; edema of limbs and scrotum; loss of weight; petechial and ecchymotic hemorrhages on the abdomen, the mucosa of the penis, the buccal cavity and conjunctiva; anorexia; dyspnea; fever; corneal opacity; lethargy; lymphadenopathy; posterior weakness; melena; and hyphema. Hematological examinations reveal a severe pancytopenia. Many of these dogs succumb as a result of hemorrhage and/or secondary infection.

Clinical Pathology

A profound balanced leucopenia (leucopenia with normal differential white blood cell count) with decreased packed cell volume, red blood cell count, and hemoglobin value is typical of clinical canine ehrlichiosis (146). Thrombocytopenia is also

present (63). Coagulation time and prothrombin time are normal, but bleeding time is prolonged (63). The erythrocyte sedimentation rate is usually elevated (121), and bilirubin values are normal (146). Blood chemistry values including alkaline phosphatase and serum glutamic oxaloacetic transaminase are usually normal although blood urea nitrogen values are significantly higher in chronic cases; total serum protein concentrations decrease in terminally ill dogs (146).

Gross and Microscopic Pathology

Hemorrhage, both gross and microscopic, is the predominant pathologic sign of tropical canine pancytopenia. Hemorrhages occur in the subcutaneous tissues, central nervous system, eyes, heart, lungs, lymph nodes, tonsils, gastrointestinal tract, kidneys, urinary bladder, and testicles. Central lobular degeneration and/or necrosis in the liver and bone marrow hypoplasia are nearly constant findings. The spleen is usually slightly enlarged, and mild hemosiderosis is often found in both the spleen and liver. Perivascular accumulations of lymphoreticular cells and plasma cells are seen in many tissues, particularly in the meninges, kidneys, and lymphopoietic tissues. This reticuloendothelial response resembles the microscopic pathology of other immunoproliferative diseases (57).

Epidemiology

Canine ehrlichiosis outbreaks have often been associated with heavy tick infestation (37,98,146,151). This clinical observation was confirmed in 1975 when M.G. Groves et. al. (51) reported that Rhipicephalus sanguineus, the brown dog tick, was capable of transmitting the agent to normal dogs. This study demonstrated

transstadial but not transovarial transmission. A later study (130) used light, fluorescent, and electron microscopic studies to demonstrate Ehrlichia canis in the midgut, hemocytes, and salivary glands of Rhipicephalus sanguineus ticks.

Since transovarial transmission of Ehrlichia canis apparently does not occur, the tick is not a likely reservoir of the disease. Chronically infected dogs as well as wild canines such as foxes, coyotes, and jackals may be reservoirs of the disease (59); this is supported by a study which reported successful transmission of the disease from experimentally infected foxes to dogs by the tick Rhipicephalus sanguineus (1).

The disease is more common in tropical areas, and a high-to-low incidence gradient appears to exist between southern and northern latitudes in the northern hemisphere (78). This gradient would presumably be reversed in the southern hemisphere, and is likely the result of increased tick populations in warmer climates. Nevertheless, infections probably can occur anywhere the vector can live (59).

Reports of canine ehrlichiosis suggest that certain breeds, particularly the German Shepherd, are more susceptible to the disease, especially the severe hemorrhagic form of the disease (59). This conclusion must be embraced cautiously since the Vietnam epizootic in military German Shepherds represents an overwhelming majority of the clinical cases ever observed.

There is no evidence to suggest transmission by contact (59).

The Causative Agent

Ehrlichia canis is a small, pleomorphic organism found in circulating leucocytes of the dog. It is a member of the tribe Ehrlichiaeae, family Rickettsiales. Other members of the genus Ehrlichia include Ehrlichia bovis, Ehrlichia ovina, Ehrlichia phagocytophilia, and Ehrlichia kurlovi. Ehrlichia canis inclusions are found in the cytoplasm of circulating leucocytes, and in the cytoplasm of mononuclear cells in impression smears prepared from lung, spleen, and kidney tissues (59). Ultrastructural studies have shown that these inclusions consist of elementary bodies bound by two trilamellar membranes and contained within membrane-lined vacuoles (56,127,128).

The study of Ehrlichia canis was initially hampered by an inability to cultivate the organism in any system except the live dog. Efforts to cultivate the organism in other laboratory species, embryonating eggs, and conventional cell cultures were unsuccessful (62,63,76). M.B.A. Nyindo et al. (100) developed a system for propagating Ehrlichia canis in monocytes harvested from the blood of dogs acutely infected with the organism. This technique improved the ability to study the organism dramatically, but still required the sequential transfer of organisms from infected to uninfected dogs, thus still requiring the use of live dogs. Infected monocytes could only be harvested from dogs in the acute phase of the disease, and the monocyte yield was limited by the amount of blood which could be safely removed from the dog.

E.H. Stephenson and J.V. Osterman (134) later developed a technique for obtaining peritoneal macrophages by repeated peritoneal lavage in dogs which had previously received the intraperitoneal administration of sterile mineral oil. These macrophages were then infected with Ehrlichia canis. This technique greatly increased the yield of mononuclear cells which could be used for study, but still required the use of live dogs.

I.E. Hemelt et al. (55) reported the serial propagation of Ehrlichia canis in canine peripheral blood monocytes. This permitted the serial passage of Ehrlichia organisms without the continual need for the laboratory dog.

There has been little effort to determine how much variability there is among various Ehrlichia canis isolates. A mildly pathogenic strain was isolated from a dog in Arkansas which produced inclusions in circulating neutrophils and eosinophils rather than lymphocytes and monocytes (39), and a later report suggested that this neutrophilic strain of Ehrlichia canis may be identical to Ehrlichia equi, the causative agent of equine ehrlichiosis (80). More likely, the different manifestations of the disease result from breed differences among dogs, not strain differences among Ehrlichia organisms (59).

Immunology

D.L. Huxsoll's review of canine ehrlichiosis (59) refers to reports of hypergammaglobulinemia (12,13,151), plasmacytosis (57,140), and persistent infections (12,38,60,121) in dogs afflicted with ehrlichiosis. These observations, coupled with others that demonstrate that antibody titers to Ehrlichia organisms rise for

months after infection (12,150), suggest that there may be an immunologic basis for tropical canine pancytopenia. D.L. Huxsoll's review also stated that W.C. Buhles, Jr. et al. (12), "Concluded that the continued increase in antibody titer and the development of hypergammaglobulinemia and plasmacytosis probably reflect persistence of the antigen and may represent a mechanism analogous to the excessive production of immunoglobulins in Aleutian disease of mink, lymphocytic choriomeningitis, African swine fever, and equine infectious anemia." P.K. Hildebrandt et al. (57) noted similar lesions in these diseases and tropical canine pancytopenia. The exact role of immunopathology in these diseases remains ill-defined, but it is interesting to observe that in early 1969, prior to the post-epizootic flurry of research, a viral infection with an autoimmune response similar to Aleutian Disease in mink was suggested as the cause of idiopathic hemorrhagic syndrome (75).

Other studies suggest that immunology has a role in the pathogenesis of tropical canine pancytopenia. R.D. Smith et al. (129) reported that an increased platelet destruction, similar to that which occurs in immunologically-mediated idiopathic thrombocytopenic purpura in man, results in the thrombocytopenia seen in tropical canine pancytopenia. I. Kakoma et al. (65) reported that lymphocytes from Ehrlichia canis infected dogs were cytotoxic for autologous monocytes, and that this monocytotoxicity was temporally related to the thrombocytopenia. This study also demonstrated T-lymphocyte activation and an apparent change in self-non-self recognition by monocytes and lymphocytes in infected dogs; these results suggest an

autoimmune phenomenon. G.E. Lewis, Jr. et al. (79) reported that anti-Ehrlichia canis antibodies apparently must react with, or opsonize, Ehrlichia canis prior to its entry into immune macrophages if these macrophages are to destroy the organism with maximum efficiency. G.E. Lewis, Jr. and M. Ristic (81) reported that maximum immunity to canine ehrlichiosis probably requires the interaction of both humoral and cellular immune components in proper sequence, i.e., probably requires both immune mononuclear phagocytic cells and Ehrlichia canis-immune serum.

I. Kakoma et al. (66) demonstrated that dogs with sera positive for anti-Ehrlichia canis humoral antibodies also inhibited platelet migration; this suggested that the pathogenesis of canine ehrlichiosis involved an immunologically-based damage to platelets.

Diagnosis

A diagnosis of ehrlichiosis is based on clinical signs, pathologic findings, serology, and organism identification. Clinical signs and pathology have previously been discussed.

Direct and indirect serologic tests are available for canine ehrlichiosis. A test by direct immunofluorescence for identifying Ehrlichia canis in buffy coat tissue smears was reported in 1971 (16). An indirect fluorescent antibody test was developed in 1972 (119); this test has been employed in the mass serologic screening of military working dogs (78).

Ehrlichia canis inclusions or morulae can be demonstrated in the cytoplasm of mononuclear cells in blood smears, and morulae can be found in impression smears of lung. A Romanovsky stain is used, and

the diagnostician should be prepared for a lengthy search, particularly in chronically ill dogs.

Treatment and Prevention

Tetracycline can be used in both treating and preventing canine ehrlichiosis. Dogs can generally be cleared of infection when treated orally with tetracycline at a dosage rate of thirty mg per pound per day in divided doses for fourteen days (2,12). Canine ehrlichiosis can be effectively prevented by the use of lower doses of tetracycline; an oral dosage of three mg per pound per day will prevent the disease (2,23).

Tick control measures are essential as are those designed to prevent the inadvertent injection of infective blood and tissue into uninfected dogs. The careful screening of blood donors is particularly important.

Chapter IV

OPERATIONAL EFFECTS OF THE DISEASE

The epizootic of canine ehrlichiosis in Vietnam adversely affected military operations. That much is made clear by a simple study of the epizootic itself. Unfortunately, it is difficult to piece together the operational details related to the disease; it is difficult to establish which units were adversely affected, and when, and how. This seems to result from a dichotomy of interest between the veterinary and the operational personnel involved in this epizootic.

A careful reading of the operational record from Vietnam reveals virtually nothing about canine ehrlichiosis. Unit histories, inspection reports, concept analysis team reports, the "operational report--lessons learned" series, and other reports written during the epizootic all say essentially the same thing: nothing. This is despite the fact that these reports frequently mention military working dogs. Why do these reports fail to mention the disease even during periods when these same units were asking for help in alleviating critical dog shortages? The answer apparently lies in the divided responsibility for care and use of the dogs: the operational or unit personnel were responible for the day-to-day care of the dogs and for the operational employment of the dogs; the veterinary personnel were responsible for the medical care of the dogs. Consequently, when the operational reports were filed, they failed to mention what seemed to belong only in the veterinarian's

bailiwick--canine ehrlichiosis. The veterinarians, on the other hand, did the very same thing in reverse. They apparently had little interest in the operational effects of the disease; their interest appeared to be limited almost exclusively to medicine.

A very careful reading of the sizable volume of veterinary literature about canine ehrlichiosis reveals virtually nothing about the impact of the disease on military operations. The veterinarians, when confronted with this disease problem, immediately launched into a detailed medical and scientific discussion of the disease. They did not record the operational effects of the disease because military operations were someone else's responsbility.

These comments are not intended to inpugn the motives of either the operational or the veterinary personnel; both groups did their respective jobs well. Nevertheless, it is unfortunate that the operational personnel seldom mentioned the disease, and the veterinary personnel seldom mentioned military operations. This complicates gaining a complete understanding of the canine ehrlichiosis epizootic in Vietnam.

Having described the dichotomy of effort between operational and veterinary personnel, the exceptions to the rule should be noted, particularly the cases where operational personnel actually did mention the disease in their reports.

The 18th Military Police Brigade reported that on 6 June 1970, 215 or fifty-one percent of its 418 sentry dogs were infected with tropical canine pancytopenia (132). The brigade also reported that the disease was complicating the retraining of dogs and handlers

because disease suspects could not be returned to the United States Army Pacific Sentry Dog School in Okinawa.

The Army Concept Team in Vietnam reported that in September and October 1969 idiopathic hemorrhagic syndrome was a problem in Vietnam with thirty-six percent of the Army sentry dogs in Vietnam classified as suspects (41). The Concept Team also reported that in late 1970 and early 1971 tropical canine pancytopenia was the "worst health problem" among mine detection dogs used in vehicle convoy operations in Vietnam (43).

Finally, the 8th Military Police Group reported that from May to October 1971 tropical canine pancytopenia was a health problem among marijuana detection dogs, and implied that the disease contributed to the dogs' inability to work for prolonged periods and their need for frequent rest periods (103). So there are some direct reports of the operational impact of canine ehrlichiosis.

Despite the paucity of reports of operational ineffectiveness directly attributed to canine ehrlichiosis, it is possible to indirectly reconstruct some of the effects of the disease. These effects include the direct loss of dogs, the costs involved in dealing with the epizootic, the strain the disease placed on limited veterinary resources, and several others. The death of a large number of military working dogs is perhaps the most obvious effect of the disease.

Canine ehrlichiosis killed 200-300 dogs in Vietnam during the course of the war. The death of this many dogs obviously had an adverse effect on military operations which required dogs.

The 212th Military Police Company (Sentry Dog) experienced thirty-seven deaths from tropical canine pancytopenia or 18.5 percent of an average population of approximately 200 dogs between August 1968 and December 1969. During this same period, the infantry scout dog platoons experienced 116 deaths from an average population of about 600 dogs (98). This many deaths clearly produced adverse effects on military operations.

The morbidity which resulted from tropical canine pancytopenia is perhaps even more important than the deaths. Units frequently had more than half their dogs classified as suspects (132,142), and many units were unable to perform their missions, particularly in 1969. This led to the establishment of two dog-holding detachments at the two veterinary hospitals in 1969. Dogs were transferred to these holding detachments and, if their hospital stay was expected to exceed fifteen days, the dog unit was permitted to requisition a replacement dog (3,96,102). The establishment of these holding detachments is in itself strong evidence that tropical canine pancytopenia was indeed a serious problem.

The morbidity and mortality both contributed to significant manpower losses in dog units. It must be recognized that when a dog is disabled, the dog's handler is also effectively disabled. If a dog dies, the dog handler must be retrained with a new dog. This is a lengthy process, which, as mentioned, was itself complicated by the epizootic. Efforts to control the disease also consumed manpower. Tick control, nursing care of sick dogs, and the periodic drawing of blood specimens from all dogs consumed a significant amount of time which could have been spent prosecuting the war.

Although the cost of the tropical canine pancytopenia epizootic is impossible to determine precisely, it surely ranged into the millions of dollars. The value of a trained military dog in 1969 was somewhere between $5,000 and $10,000; one source referred to a $6,000 price tag (95). Using a conservative $5,000 value per dog and a conservative 200 deaths, the direct cost in dogs alone was $1,000,000. To this must be added transportation, laboratory, medical care, and the very significant veterinary research costs. The Walter Reed Army Institute of Research devoted much time to this disease from late 1969 until the end of the United States involvement in the war. These efforts cost large amounts of money, and, although not directly related to the war in Vietnam, the research efforts have continued until the present day. Serologic screening of military working dogs has been periodically conducted since the end of the war, a serologic survey of all military working was conducted in 1980, and a follow-up survey is being conducted in 1981 (78). Canine ehrlichiosis has been an expensive disease.

The resources of the Army Veterinary Service in Vietnam were strained by this disease, especially in 1969. A shortage of enlisted animal specialists required the use of enlisted food inspectors to help perform the animal care mission (96). Simultaneously, the veterinary service was called upon to deal with: the clinical cases of the disease, both the early febrile and later acute disease; the dramatically increased number of involved necropsy procedures; and the geometric increase in the number of blood samples which had to be drawn. Added to these demands was the need to first establish the 936th Medical Detachment hospital as a quarantine station, and then

later to establish dog holding detachments at both the 936th and the 764th Medical Detachments. The need to establish the quarantine station and the dog holding detachments inevitably led to less efficient, though not lower quality, veterinary care; this lack of efficiency naturally increased the effective workload.

One example should serve to illustrate the tremendous workload generated in Vietnam by canine ehrlichiosis. In March 1970, the veterinary service drew blood samples from 1,148 of the 1,227 military working dogs in Vietnam (143). The dogs were located at about fifty different locations throughout Vietnam. The blood had to be drawn, transported to the 9th Medical Laboratory, and the laboratory had to perform the hematologic analysis. Each dog's medical record had to be properly annotated, a record had to be maintained for each individual sample, and, after the results were obtained, many dogs required treatment for the disease. This represented only one month's workload for blood testing alone. This blood testing was carried out monthly, and, in early 1969, suspect dogs were tested biweekly (146). This provides some measure of the workload created by the disease.

During 1969 a problem developed in evacuating dogs from dog units and veterinary clinics to the two veterinary hospitals where comprehensive veterinary care was provided. Dogs were often held too long in the veterinary clinics near the dog units rather than evacuate them to the hospitals. A firm seven day evacuation policy was established to remedy this problem, and a veterinary medical regulator was designated. This evacuation policy involved the Air Force as well as all medical units which used ground and air ambulance services (3,96,102). The evacuation policy successfully solved

the problem, but the need for such a policy was, of course, dictated by the large number of patients which required hospitalization; this, in turn, was dictated in large part by the number of dogs requiring hospitalization for tropical canine pancytopenia.

The epizootic also created some altogether new work requirements for the veterinary service. There was deep concern that the movement of both military and pet dogs from Vietnam to the United States and other countries might result in the spread of what was then a very mysterious, dreadful disease. Strict requirements for the issuance of health certificates were established which required a blood test for each dog leaving Vietnam. A normal total white blood cell count and packed cell volume were required before a health certificate could be issued. This was not a foolproof system for preventing the spread of the disease because dogs incubating the disease would not be detected (102), but this additional testing responsibility was borne by the veterinary service.

The possibility of a public relation's nightmare for the Army influenced operational decisions throughout this epizootic. It is impossible to quantify the influence of this potential nightmare, and certainly a retrospective look at the decisions made inspire confidence in the decision-making process, but public relation's aspects of this epizootic were constantly kept in mind.

Early in the epizootic, when the disease was a complete mystery, there was a perceptible fear that the United States Army had introduced a previously unknown dread disease directly into Vietnam and perhaps indirectly into Okinawa via the British-trained tracker dogs from Malaysia.

The disease also created some interesting public relation's problems as the need for military dogs declined during the Vietnamization period. Dogs, like men, became excess to military requirements during this period. The return of men to the United States easily reduced the number of men, but the solution was not so simple for dogs, principally because of tropical canine pancytopenia. If excess dogs were shipped to the United States, and the epizootic were shipped with them, woe be to the veterinarian who authorized the shipment. He would be summarily hanged by the American Kennel Club and the editor of Dog World. On the other hand, what could be done with hundreds of excess military dogs? Destroying large numbers of dogs was impossible because of humanitarian and public relation's reasons. The Army's popularity, which had already reached new lows, would be severely damaged by the image of wholesale dog destruction. Colonel Robert M. Nims, a research veterinarian at the Walter Reed Army Institute of Research, was quoted in an Army Times article in June 1970: "The disease [canine ehrlichiosis] is causing serious problems with the dog program in Vietnam, but Colonel Nims denied earlier reports in the press that 1000 dogs were going to be put to sleep because they were infected. 'This is only done in extreme cases and usually when the animal is incapacitated or suffers too much (120).'" Colonel Nims was obviously concerned that the public would conjure up visions of the wholesale slaughter of 1,000 dogs. This would disturb any veterinarian because the various humane groups are probably even more formidable than the American Kennel Club, and

certainly more formidable than the editor of Dog World. No wholesale slaughter ever took place, of course; some dogs were shipped out of Vietnam after careful blood testing; others were given to the Armed Forces of the Republic of Vietnam as part of the Vietnamization program; and others were humanely euthanatized because of chronic illness. But the concern for the welfare of these dogs was very real and continued until the end of United States involvement in the war (34)[d].

In summary, canine ehrlichiosis clearly had an operational impact on the Vietnam War. It was by no means the margin of victory or defeat, but the operational readiness of military working dog units was reduced by the disease. To the extent that military working dogs influenced the war, canine ehrlichiosis influenced the war. The disease killed and disabled many dogs; it cost a lot of money; and it strained the ability of the military veterinary service to perform its mission. It was by far the single most significant canine disease which presented itself during the war, and it dominated the animal care efforts of the veterinary service for long periods of time. Although difficult to measure precisely, the impact of this disease was very significant.

---

[d]This discussion is not intended to suggest that Army personnel, Army veterinarians in particular, were so crass and callous that they made their decisions about tropical canine pancytopenia and the fate of these dogs with one eye constantly on the newspaper. That simply was not so. The decisions about tropical canine pancytopenia were based on military requirements tempered with a reasonable dose of humanitarianism. Public relations, nevertheless, was a real factor in making these decisions, so it cannot be completely ignored.

Chapter V

IMPLICATIONS FOR THE FUTURE USE OF MILITARY WORKING DOGS

The implications of the canine ehrlichiosis epizootic in Vietnam can be grouped into two broad categories. First, there are implications for the prevention, control, and treatment of canine ehrlichiosis itself. Second, and probably more important, there are the more general implications for the health care of military working dogs; these implications are not tied to canine ehrlichiosis per se, but they suggest changes in the way military dogs are cared for and employed.

The direct implications of canine ehrlichiosis are reasonably straightforward. They include: screening prospective military dogs for the disease and rejecting or treating infected dogs; periodic serologic examination and treatment as required of dogs on active duty; rigorous tick control; evaluation of the geographic areas in which military dogs are employed to determine the disease threat; education of veterinary officers, veterinary technicians, and animal handlers about the canine ehrlichiosis problem; and further research.

The military services are probably regularly buying canine ehrlichiosis in new canine recruits. A recent serologic survey demonstrated that over fifty percent of all Department of Defense installations throughout the world which employ military working dogs have dogs that are infected with ehrlichia organisms (78). This survey, which tested all Department of Defense dogs using the indirect

fluorescent antibody test, reported that eleven percent of Army dogs and thirteen percent of Air Force dogs were infected, and that eight percent of all military working dogs were infected with ehrlichia organisms before entry into military service. These dogs generally performed well, although some are probably lethargic and slightly anemic; nevertheless, because clinical canine ehrlichiosis is a stress-related disease, they represent a biological timebomb waiting to explode if these dogs are exposed to the stress of combat conditions. Prospective military dogs should be screened using the indirect fluorescent antibody test, and rejected if infected. Alternately, successful treatment could permit acceptance of infected dogs.

Military working dogs should be serologically examined for ehrlichia organisms at least annually; infected dogs should be treated with tetracycline and then carefully monitored serologically. In endemic areas, a continuous regimen of oral tetracycline (three mg per pound per day) should be used for all dogs. This will eliminate the organism from most dogs, and continued serologic monitoring will detect any recurrences. Isolated cases in non-endemic areas, or animals with clinical disease, can be treated with a high dose regimen (thirty mg per pound per day in divided doses for fourteen days).

Serum samples can be obtained easily during the periodic physical examinations already required for military dogs. A useful secondary effect of a serologic testing program is the development of "serum banks" which can be used to evaluate the incidence of "new" dog diseases as they occur. For example, the "bank" of serum at the

Walter Reed Army Institute of Research developed because of the ehrlichiosis problem was later useful in evaluating a canine parvovirus vaccine and outbreaks of an epizootic diarrhea among military working dogs at Fort Benning and Lackland Air Force Base (78).

The need for rigorous tick control is apparent. Canine ehrlichiosis is a tickborne disease and therefore highly susceptible to tick control measures. Tick control is difficult, and 100 percent control is often impossible, particularly in tropical and semi-tropical climates, but weed control measures around kennels, construction of kennels to reduce tick infestation, strict kennel hygiene, insecticide use in kennels and on dogs, and the physical removal of ticks from dogs by dog handlers can all significantly reduce tick populations.

Information about the possible threat of ehrlichiosis should be gathered before dogs are introduced into a new geographic area. Canine ehrlichiosis has been reported in the Indian subcontinent, east Africa, and Israel, but what of other areas in the Middle East or Southeast Asia? Information should be gathered by detailed examination of local veterinary and animal husbandry publications as well as by conducting serologic surveys of local animals. This information might prevent the needless occurrence of another outbreak of canine ehrlichiosis. Prophylactic tetracycline therapy is indicated for dogs entering an endemic area.

The education of veterinary officers, veterinary technicians, and animal handlers to the danger of canine ehrlichiosis is critical. This is especially important when the low-level, subclinical disease

is considered; a German Shepherd with a nosebleed will, of course, get immediate attention, but a German Shepherd with subclinical chronic disease may perform its duties poorly for a whole military career unless the people around it are alert to the danger. Veterinarians as a group are not particularly attuned to arthropod-borne rickettsioses, and canine ehrlichiosis is an almost unknown, or at least unrecognized, clinical entity in civilian veterinary practice. When civilian veterinarians become military veterinarians, they must be trained to recognize the disease and understand its implications for the military working dog program. Veterinary officers must, in turn, train their technicians and animal handlers about canine ehrlichiosis. The animal handler will pick ticks off his dog a bit more enthusiastically if he knows specifically why he must engage in that particularly painstaking task. The closer attention paid to the dogs by handlers and veterinary personnel alike will result in the additional benefit of earlier recognition of other maladies. If the people who work directly with military dogs are not constantly reminded that an epizootic once occurred, and that it could repeat itself, time will gradually erode their awareness of a potentially catastrophic problem.

Additional research studies about canine ehrlichiosis are indicated. Though many questions remain unanswered, research efforts have slowed because canine ehrlichiosis is no longer an acute problem ("acute" is roughly defined here as dogs falling over dead, because the serologic studies previously mentioned certainly establish that ehrlichiosis remains a problem). This paucity of current research

surely reflects both a lack of research funds and the human tendency to wait until disaster strikes before trying to solve an existing problem; but, regardless, some intriguing questions about canine ehrlichiosis remain. What exactly is the immunologic component of the disease? The answer to this question could be extremely useful in explaining the mechanisms of other immunologic diseases in man and animals. Are there strain differences among Ehrlichia canis organisms? Why does the German Shepherd's nose bleed, but the Beagle's does not? If a large number of clinically normal dogs are infected with Ehrlichia canis, why do they not occasionally get sick? Or do they get sick, but veterinarians just do not recognize the disease for what it is? Does the relatively high infection rate evidenced by serologic tests represent an actual increase in the number of infected dogs, or have dogs been the unrecognized host of Ehrlichia canis for decades or centuries? This could make a great medical detective story. The answers to these questions would provide insight into canine ehrlichiosis and potentially useful information about other rickettsial diseases of man and animals.

The broader implications of the canine ehrlichiosis epizootic in Vietnam, those not related directly to ehrlichiosis, are similar and parallel to those already discussed, but wider in scope and probably more meaningful to the future employment of military working dogs. To elaborate these implications is important, because highly specialized scientists, including veterinary scientists, sometimes tend to overlook the forest in their enthusiasm for examining trees.

By far the most important implication of the epizootic for the military working dog program is an understanding of the fragility and vulnerability of canine health to "unknown" or "exotic" diseases, particularly when dogs are employed in unfamiliar environments. This epizootic occurred suddenly and unexpectedly, and other epizootics can, and likely will, occur just as suddenly and unexpectedly. The recent canine parvovirus outbreak serves to graphically illustrate this point. This demonstrates the need for planning to deal with like events in the future, and for understanding that the canine ehrlichiosis outbreak in Vietnam should not have been unexpected; the unexpected is to be expected; what at first seems bizarre is really quite common place. Veterinarians trained in the United States should not expect the canine diseases in Southeast Asia or the Middle East or Africa to be the same as those in the United States; or, if the diseases are the same or similar, he should not expect them to manifest themselves in the same way. "International disease" requires an "international mindset." Acquiring and using this mindset, preferably before dogs arrive in an operational area as well as after they arrive, will reduce the shock of similar epizootics and likely reduce their severity. Canine ehrlichiosis struck dramatically in Vietnam; other diseases will strike again in the future.

More specifically, the canine ehrlichiosis outbreak suggests the need for increased vigilance for arthropod-borne and other diseases. Babesiosis is a good example. It occurred simultaneously with ehrlichiosis in many dogs, confused the diagnostic picture, and perhaps exacerbated the disease. But there are dozens of

arthropod-borne viral, rickettsial, and protozoan diseases just waiting for the unwary dog and unwary veterinarian. This fact points up the need for ongoing international animal disease surveillance, and the special need for veterinary officers to always be familiar with the status of international animal disease. The military veterinary services have a representative to the United States Department of Agriculture's Emergency Animal Disease Program; information prepared by this representative should continually flow to military veterinarians. Special emphasis should be placed on areas where military dogs are employed or where they might be employed. In this regard, special emphasis should be placed on seemingly benign diseases which may become serious in a high-stress combat environment.

The canine ehrlichiosis outbreak in Vietnam, and the veterinary research prompted by the outbreak, indicate that the medical examination of prospective military dogs should be broadened. Since a large number of prospective dogs are infected with ehrlichiosis, serologic screening for ehrlichiosis is clearly indicated and should be followed by the rejection (or, conceivably, treatment followed by intense serologic monitoring) of infected dogs. But is examination for ehrlichiosis enough? How about babesiosis? Should prospective dogs be cultured for salmonellosis? This is not meant to imply that babesiosis or salmonellosis are necessarily of great concern, but that the method of pre-induction examination of military working dogs should be reevaluated and changed as required. The military veterinary services should do so.

Vector and reservior control should be emphasized any time and any place military dogs are used. The need for tick control was clearly shown by the ehrlichiosis epizootic, but the implication is much wider. Mosquitoes, ticks, mites, chiggers, bugs, flies, rats, mice, birds, toads, mammals, reptiles, and others can all serve as vectors or reservoirs of disease. The useful methods for controlling these vectors and reservoirs are limited only by the imagination, but the critical need for effective vector and reservoir control must be emphasized and reemphasized. Again, prior knowledge of the disease vectors and reservoirs likely to be troublesome in a particular area would be useful and might prevent disease. Vector and reservoir surveillance should be an integral part of the international disease surveillance effort, and medical entomologists should be actively involved in this surveillance effort.

The method of housing military dogs, particularly in the field, should be carefully examined. The field environment does not lend itself to luxurious housing for dogs, but, within operational constraints, dogs should be housed to exclude vectors, prevent direct contact between dogs, and eliminate animal wastes sanitarily. Although highly speculative, the ehrlichiosis problem in Vietnam might have been reduced by the field housing of dogs to reduce tick exposure.

The method, frequency, and recording of the periodic physical examinations of military dogs should be reevaluated. The canine ehrlichiosis epizootic demonstrated that some additional

information, notably hematologic information, should be routinely obtained during periodic physical examinations. Currently, a physical examination is required at both origin and destination each time a dog moves from one location to another, and at least one examination is required every six months. These requirements also existed during the Vietnam War, so a dog present for duty in Vietnam was examined several times: upon arrival at Lackland Air Force Base, upon departure from Lackland Air Force Base, probably upon arrival at an intermediate training site (depending on the type of dog), upon departure from the intermediate training site, upon arrival in Vietnam, perhaps during the conduct of semiannual physical examinations, and at any time the dog was reportedly ill. Despite all these physical examinations, the initial hematologic screening of dogs in Vietnam prompted by the epizootic of idiopathic hemorrhagic syndrome revealed a very large number of clinically normal, but anemic dogs. Although it is possible that all these dogs became anemic after arriving in Vietnam, it is more likely that at least some were anemic upon arrival. Nonetheless, the numerous physical examinations of these dogs did not reveal anemia. This indicates the specific need for routine hematologic examination during physical examination, and the general need for a careful review of physical examination procedures. The standardized and meticulous recording of examination results is also essential. A team of veterinary officers intimately familiar with military

working dogs should evaluate the present program for the periodic physical examination of military working dogs, and make appropriate changes to the program.

Veterinarians must establish and enforce strict movement control on all dogs, particularly in unusual environments. Dogs from one geographic area should contact those from another only when dictated by operational requirements. Strict quarantine rules and in-depth rules for the pre-shipment health examination and certification of military dogs should be established and enforced when operationally feasible. The severity of the canine ehrlichiosis epizootic, for example, might have been reduced if rules like these had been established and enforced before the epizootic began.

Veterinarians, veterinary technicians, and animal handlers should exercise increased vigilance when their dogs are exposed to strange environments. This is not to suggest that these groups were inattentive to their dogs during the Vietnam War, only that their degree of vigilance was dictated by the health care environment which existed in the United States, not by the environment in Vietnam. If nobody is looking for an "exotic" disease, chances are that nobody will find one until a catastrophe occurs. Animal handlers should be taught to report the slightest abnormality in their dogs to the veterinary technician, who should be trained to meaningfully report these problems to the veterinary officer and refer patients to him as required. The veterinary officer should also be more vigilant: making as many on-site kennel visits as

possible, developing a close working relationship with everyone involved in the military working dog program, educating others about the dangers to canine health and how to avoid them, and naturally, practicing skillful canine medicine. In short, the veterinary officer should assume a very active role in the care of military dogs; he should not passively wait for the sick dog to be presented for treatment; he should actively be promoting good canine health care.

The need to train veterinary officers, veterinary technicians, and animal handlers about the dangers to canine health is closely related to the need for increased vigilance. This training requirement was discussed with specific regard to canine ehrlichiosis, but the requirement is much broader. The standard curricula of military service schools for veterinary officers, veterinary technicians, and animal handlers should include a block of instruction about "exotic" animal diseases and the demand for increased vigilance to prevent their possibly catastrophic effect on military working dogs. This would not serve to make the students experts about foreign or "exotic" animal diseases, but to alert them to possible problems and make them aware of the resources available to deal with "exotic" canine diseases, resources like the United States Department of Agriculture's Emergency Animal Disease Program and the Walter Reed Army Institute of Research. One major educational goal should be to change the mindset of the students from a national focus to an international one.

The need for additional medical research to elucidate disease problems related to the military working dog is obvious. Canine ehrlichiosis is itself an intriguing problem, but the scope of studies should be much broader. Further investigation of the roles of immunology and stress in canine disease should be fruitful, and useful information about disease in man and other animals would likely result. It is sad that research efforts tend to post-date rather than pre-date the occurrence of disease problems. To some extent, this is the inevitable result of an inability to predict the future, but some problems can be anticipated and intelligently prepared for with research projects. This is especially true if research efforts are guided by analyses of particular geographic areas and an understanding of the canine diseases likely to occur there.

These analyses and research efforts should not necessarily be limited to "test-tube" research. The implications are broader, and may include political, social, and economic dimensions. For example, are there countries in the Middle East that prohibit the entry of dogs that have been vaccinated with modified-live-virus rabies vaccines? Probably not, but, if so, it would be nice to know that fact before modified-live-virus vaccinated dogs have been deployed from the United States, and are being inspected by local health authorities on an airport tarmac in some Middle Eastern country. Prior knowledge would permit the shipment of dogs vaccinated with killed-virus vaccines. The next logical question, of course, would be, "Are there strains of rabies virus in the

Middle East against which killed-virus vaccines from the United States are not effective protection?" Again, probably not, but, if so, the research community could, if given notice, respond to the demand for a new vaccine. Another hypothetical question is: "Are there societies in the Middle East which for cultural or religious reasons would resent or even violently oppose the use of dogs in a security role (remember the objection of our own Congress to Zachary Taylor's use of bloodhounds to track Indians)?" It would be wise to answer this question before rather than after dogs were deployed. The point here has nothing at all to do with rabies or Middle Eastern culture and religion; it has to do with the need for prior planning before dogs are deployed into an operational area.

This prior planning requires the collection, storage, and retrieval of large amounts of information. The computer provides an extremely useful tool in storing and retrieving this information, and, as part of this study, for example, a computer printout of all canine ehrlichiosis cases from Southeast Asia was obtained from the Armed Forces Institute of Pathology. The information was derived from the Registry of Veterinary Pathology sponsored by the American Veterinary Medical Association. The Registry is designed for use principally by veterinary pathologists and includes a great deal of useful disease information.

The purpose of obtaining the Registry printout was to obtain specific information about exactly where and when dogs died of canine ehrlichiosis in Vietnam. The printout was rather disappointing because the "where" and "when" were not specific

enough. For example, all dogs which died of canine ehrlichiosis in Vietnam were grouped under the geographic heading "Indochina and Malay Peninsula, Farimer, India (includes Vietnam)." The contributor of the accession to the Registry is also listed, and, using this additional classification, the reader can generally narrow the broader classification to simply "Vietnam" (although this would be a dangerous conclusion for many contributors, since they receive pathology materials from several countries). In any case, knowing that the case occurred in Vietnam is of limited value. Where in Vietnam did it occur? Similarly, the Registry indicates only the year in which the case occurred. Again, this information is of limited value. When exactly during the year did the case occur? The Registry is designed, of course, principally for veterinary pathologists, not for veterinary epidemiologists, but the addition of a very small amount of information (perhaps two or three words per accession) would permit the reader to pinpoint exactly where the case occurred. This very small additional investment in time, effort, and computer storage space would have made this study, and others like it, much more complete and valuable.

The public relations aspects of the canine ehrlichiosis epizootic have previously been mentioned, but some additional discussion is warranted. Fortunately, the ehrlichiosis problem never caused the military services any serious embarrassment in Vietnam, but the unrealized potential for embarrassment was always there. This may at first seem irrelevant to the conduct of war, but it is in fact extremely relevant.

Warfare is not simply the clash of armed forces on battlefields. Warfare is conflict among societies which pits the entire social, political, economic, psychologic, and military fabric of one society against another. In some cases, the results of the actual armed conflict may be foreordained by other factors (there are those, for example, who contend, justifiably perhaps, that the outcome of World War II was never really in question after American industry entered the war). Armies must reflect the values of the societies they represent, and, if they do not, they will not win wars. The Vietnam War graphically illustrates this point.

B. H. Liddell Hart said that, "On (moral factors) conste rns the issue of war and battle. In the history of war they form the more constant factors, changing only in degree, whereas the physical factors are different in almost every war and every military situation." Hart quotes Napoleon's dictum that "the moral is to the physical as three to one," and says that "in most campaigns the dislocation of the enemy's psychological and physical balance has been the vital prelude to a successful attempt at his overthrow (82)." So there is much more to war than fighting battles. What has this to do with disease in military dogs?

American society is, for better or worse, full of animal lovers, more specifically, dog lovers. If the military forces of the United States send dogs into battle, those dogs had better be well cared for. Society will demand nothing less. News of dogs dying wholesale from dread foreign diseases will not sit well with the American public, so it behooves the military services to

carefully plan for the well-being of their canine belligerents. The canine ehrlichiosis epizootic apparently did not contribute to the ill-feelings generated in American society by the Vietnam War, but the potential for unfavorable public reaction in future wars will remain.

Chapter VI

SUMMARY AND CONCLUSION

Dogs have served with soldiers in war throughout recorded history. The Vietnam War saw several thousand canines serving as sentries, scouts, trackers, and mine detectors. These dogs served the American military well, and, unfortunately, about 250 of them lost their lives in an epizootic of canine ehrlichiosis (tropical canine pancytopenia).

The epizootic began in mid-1968 with the sudden onset of a then unknown, highly fatal disease characterized by acute epistaxis, severe anemia, and death. The veterinarians in Vietnam and the military veterinary medical research community, especially the Walter Reed Army Institute of Research, responded to the challenge, identified the disease, and brought it under control. Sadly, the efforts to identify and control the disease required about two years during which most of the 250 deaths occurred. These veterinarians should be applauded because canine ehrlichiosis was, until that time, an extremely obscure disease, so obscure that it could aptly be called unknown. Had the world's veterinarians been asked in 1967 to list the most dangerous canine diseases that might occur in Vietnam, canine ehrlichiosis surely would not have been listed at all. The disease was just that mysterious. The exigencies of war and the long distance between Vietnam and the medical research base in Washington, D.C. also complicated the attempts to precisely pin down the cause of the

epizootic. If the military veterinary services had not attacked the problem as vigorously and competently as they did, the cause of the epizootic could very well still be unknown.

The ehrlichiosis epizootic caused the death or disability of hundreds of military working dogs in Vietnam. From mid-1968 until the end of the United States involvement in the war, but especially through the end of 1969, the epizootic constantly reduced the overall effectiveness of military dog units. The effect of canine fatalities is obvious, but less obvious are the deleterious effects of quarantines, the constant need for physical examination and treatment of dogs, and the less than optimal performance of those dogs able to work, but not able to work at peak efficiency.

The epizootic cost large amounts of money, certainly hundreds of thousands of dollars, probably millions. It was costly in manpower as well; the epizootic strained the manpower resources of the veterinary service in Vietnam, and idled many dog handlers for long periods. Consequently, canine ehrlichiosis was undoubtedly the single most serious obstacle to the effective employment of military working dogs during the Vietnam War. Hopefully, some lessons have been learned and past mistakes will not be repeated.

The canine ehrlichiosis epizootic and the fact that Ehrlichia canis organisms still infect many military working dogs illustrate the need for continued concern with this disease. Specifically, prospective military dogs should be serologically screened for ehrlichia organisms before purchase, and dogs on active duty should be

periodically tested and treated as required. Rigorous tick control must be emphasized, the disease threat should be evaluated before dogs are introduced into an area of operation, and veterinary officers, veterinary technicians, and animal handlers should constantly be alert to the threat of this disease.

More generally, this epizootic demonstrates the susceptibility of canine health to unexpected disease, particularly when dogs are exposed to unusual environments. Arthropod-borne disease is a special hazard, and a high-stress environment increases the disease risk. Before dogs are deployed in a new location, the disease risk must be evaluated and plans prepared for controlling likely disease problems. Veterinarians must think in international terms; their awareness of potential problems is critical.

Developing this awareness requires information, and information can be obtained in advance only by the collection of worldwide veterinary intelligence. The veterinarian should have an increased role in medical intelligence gathering, and the United States Army Veterinary Corps should train officers in foreign animal disease surveillance and medical intelligence gathering. These specialists can be trained in both civilian and military schools, and they can serve as conduits of information to the other officers in the Veterinary Corps. The dissemination of foreign animal disease information is paramount, and would pay a large bonus if the United States were confronted with a foreign animal disease on its own soil.

Another lesson of the ehrlichiosis outbreak was that veterinary command and control should be highly centralized in a theater of

operations. This centralization, present in Vietnam, assured a prompt response to the epizootic, while a decentralized command and control structure might have resulted in considerable lost time and more dead dogs. The size of the veterinary service is small enough to permit highly centralized control, therefore centralized control should be the rule in employing veterinary resources. This centralization will also facilitate accomplishing the food inspection mission.

The dichotomy of interests and reporting between the operational personnel involved with military dogs in Vietnam and the veterinary personnel has already been mentioned. The operational personnel generally did not mention the disease in their reports because they considered it a medical matter, while the veterinary personnel did not mention the disease's effects on military operations because they considered that an operational matter. This dichotomy seriously inhibited this study's ability to outline the exact operational impact of canine ehrlichiosis. In the future, an attempt should be made to integrate the medical and operational effects of disease when disease problems are reported. This could be done by operational personnel, veterinary personnel, or military historical units.

A comprehensive history of the military veterinarian's role during the Vietman War should be written. A comprehensive history would be an invaluable tool for future military veterinarians.

The military veterinary services have recently been under severe attack by those in the Department of Defense and elsewhere who feel that military veterinarians are an anachronism in a modern military force. The United States Air Force Veterinary Service became a

casualty of this attack in March 1980, and the United States Army Veterinary Corps was wounded by severe manpower limitations with additional manpower cuts planned in the future. Without becoming embroiled in the controversy about the need for military veterinarians, or expanding this study beyond its scope, it can safely be stated that the outbreak of canine ehrlichiosis in Vietnam graphically demonstrates the requirement for military veterinarians. Had there been no military veterinarians, a serious problem would probably have been catastrophic. Dogs would have died wholesale, military dog operations would likely have ceased altogether, and a storm of public outrage might well have fueled an already smoldering public discontent over the conduct of the war. Those critical of the military veterinarian should think about that, and military veterinarians should not hesitate to point with pride to their role in the epizootic of canine ehrlichiosis.

BIBLIOGRAPHY

1. Amyx, H. L., and D. L. Huxsoll. 1973. "Red and gray foxes - potential reservoir hosts for Ehrlichia canis." Journal of Wildlife Diseases. 9:47-50.

2. Amyx, H. L., D. L. Huxsoll, D. C. Zieler, and P. K. Hildebrandt. 1971. "Therapeutic and prophylactic value of tetracycline in dogs infected with the agent of tropical canine pancytopenia." Journal of the American Veterinary Medical Assocciation. 159:1428-1432.

3. Army medical department activities report-1969 (RCS MED 41 (R4)). Office of the Surgeon General, United States Army, Vietnam, APO San Francisco 96375. In possession of Colonel Leland B. Carter (United States Army-Retired), 21 Lakeside Drive, Little Rock, Arkansas.

4. Army medical department activities report-1970 (RCS MED 41 (R4)). Department of the Army, 936th Veterinary Detachment (ID) (Small Animal Hospital), APO San Francisco 96384. In possession of Colonel Leland B. Carter.

5. Army medical service activities report - 1968 (RCS-MED 41 (R4)). Department of the Army, Headquarters, 522d Medical Detachment (Veterinary Professional Service). In possession of Colonel Leland B. Carter.

6. "The Army's four-footed sentries." February 1967. Army Digest. 22:16-19.

7. Bair, A. H., Jr., and J. S. Mendez. November-December 1966. "Four footed radar." Infantry. 56:37-40.

8. Baker, P. S. 1933. Animal war heroes. A. & C. Black Ltd., London.

9. Bennett, F. C. May-June 1963. "Alert dogs." Infantry. 53:44-46.

10. Bool, P. H., and P. Sutmoller. 1957. "Ehrlichia canis infections in dogs on Aruba (Netherlands Antilles)." Journal of the American Veterinary Medical Association. 130:418-420.

11. Bradshaw, H. D. December 1964. "Teufelhund." Marine Corps Gazette. 48:37-40.

12. Buhles, W. C., Jr., D. L. Huxsoll, and M. Ristic. 1974. "Tropical canine pancytopenia: clincal, hematologic, serologic response of dogs to Ehrlichia canis infection, tetracycline therapy, and challenge inoculation." Journal of Infectious Diseases. 130:357-367.

13. Burghen, G. A., W. R. Beisel, J. S. Walker, R. M. Nims, D. L. Huxsoll, and P. K. Hildebrandt. 1971. "Development of hypergammaglobulinemia in tropical canine pancytopenia." American Journal of Veterinary Research. 32:749-756.

14. Carmichael, J. 1939. "Rickettsia in dogs." Annual Report of the Veterinary Department, Uganda Protectorate. pp. 19-20.

15. Carmichael, J., and R. N. T. Fiennes. 1942. "Rickettsia infection of dogs." Veterinary Record. 54:3-4.

16. Carter, G. B., J. Seamer, and T. Snape. 1971. "Diagnosis of tropical canine pancytopaenia (Ehrlichia canis infection) by immunofluorescence." Research in Veterinary Science. 12:318-322.

17. Cassard, H. 1957. "Traitement de la rickettsiose canine par l' aureomycine." Revue d' Elevage et de Medecine Veterinaire des Pays Tropicaux. 10:369-370.

18. Caygill, H. W. February 1962. "Zach Taylor and his hounds of war." National Guardsman. 16:12-13.

19. Clapper, P. R. February 1961. "Hound the enemy." Marine Corps Gazette. 48:37-40.

20. Combat lessons bulletin number 17. 12 August 1967. Headquarters, United States Army Vietnam, APO San Francisco 96307. Available from Combined Arms Research Library, United States Army Command and General Staff College, Fort Leavenworth, Kansas.

21. Conference on research to expand the usefulness of the military working dog (18-20 March 1970), Lackland Air Force Base, Texas. November 1970. Air Force Office of Scientific Research, Arlington, Virginia. Report No. AFOSR-70-2368TR. Available from Defense Technical Information Center, Alexandria, Virginia. Report No. AD 716392.

22. Danks, W. B. C. 1937. "Rickettsia infection of the dog." Annual Report of the Veterinary Department, Kenya. pp. 64-66.

23. Davidson, D. E., Jr., G. S. Dill, Jr., M. Tingpalapong, S. Premabutra, P. L. Nguen, E. H. Stephenson, and M. Ristic. 1975. "Canine ehrlichiosis (tropical canine pancytopenia) in Thailand." Southeast Asian Journal of Tropical Medicine and Public Health. 6:540-543.

24. Deringer, C. H., Jr. October-November 1958. "The infantry goes to the dogs." Infantry. 48:57-62.

25. "Dog declared 'best device' to find charlie's tunnels." 26 June 1968. Air Force Times. 28:51.

26. "Dog paratroopers." October 1955. Military Review. 35:73.

27. Dogs and national defense. 1958. Department of the Army, Office of the Quartermaster General, Washington, D.C.

28. "Dogs go airborne." 6 October 1980. Army Times. 41:2+.

29. "Dogs thwart Viet Cong." 22 June 1966. Air Force Times. 26:14.

30. Donatien, A., and F. Lestoquard. 1935. "Existence en Algerie d'une Rickettsia du chien." Bulletin de la Societe de Pathologie Exotique. 28:418-419.

31. Drachlis, D. B. January 1977. "No bark, no bite, no bones." Airman. 21:10-14.

32. Draft Army medical service activities report, 936th Veterinary Detachment, 1968. In possession of Colonel Leland B. Carter.

33. Draft report, Historical chronology of IHS. 10 March 1969. Division of Veterinary Medicine, Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C. Available from Biomedical Service Corps, Air Force Medical Service Center, Brooks Air Force Base, Texas.

34. End of tour report: COL George E. Ritter, USARV Staff Veterinarian, period March 1971 through May 1972. 10 May 1972. In possession of Colonel Leland B. Carter.

35. Estrada, M. 30 July 1969. "Sentry dogs retrain for patrol concept." Air Force Times. 29:14.

36. Ewing, S. A. 1963. "Observations on leukocytic inclusion bodies from dogs infected with Babesia canis." Journal of the American Veterinary Medical Association. 143:503-506.

37. Ewing, S. A. 1969. "Canine ehrlichiosis." Advances in Veterinary Science and Comparative Medicine. 13:331-353.

38. Ewing, S. A., and R. G. Buckner. 1965. "Manifestations of babesiosis, ehrlichiosis, and combined infections in the dog." American Journal of Veterinary Research. 26:815-828.

39. Ewing, S. A., W. R. Roberson, R. G. Buckner, and C. S. Hayat. 1971. "A new strain of Ehrlichia canis." Journal of the American Veterinary Medical Association. 159:1771-1774.

40. Final report-60th Infantry Platoon (Scout Dog) (Mine/Tunnel Detector Dog). December 1969. Department of the Army, Army Concept Team in Vietnam, APO San Francisco 96384. Available from Defense Technical Information Center. Report No. AD 869383. NOFORN.

41. Final report: sentry dog utilization in military police operations. ACTIV Project No. ACG-71F. 10 May 1970. Department of the Army, Army Concept Team in Vietnam, APO San Francisco 96384. Available from Combined Arms Research Library.

42. Final report of USMC project 90-69-01, dog detection of mines/booby traps. 7 May 1971. United States Marine Corps, Marine Corps Development and Education Command, Quantico, Virginia. Available from Combined Arms Research Library.

43. Final report: vehicle convoy operations in the Republic of Vietnam. ACTIV Project No. ACG-78E. 30 September 1971. Department of the Army, Army Concept Team in Vietnam, APO San Francisco 96384. Available from Combined Arms Research Library.

44. Fox, R. P. 1979. Air base defense in the Republic of Vietnam, 1961-1973. Office of Air Force History, Washington, D.C.

45. Gable, T. P., and J. W. Brown. September-October 1969. "Combat trackers." Infantry. 59:32-33.

46. George, J. A. October 1967. "They work the night beat." Airman. 11:44-47.

47. Gillain, J. 1942. "Rickettsia canis infection in the Belgian Congo." Bulletin Agricole du Congo Belge. 33:106-107.

48. Girard, H., and R. Rousselot. 1947. "Les rickettsioses animales au Soudan." Encyclopedie Veterinaire. 4:403-418.

49. Glines, C. V. October 1962. "Sentry duty is for the dogs." Air Force and Space Digest. 45:61-62+.

50. Going, C. G. 1944. Dogs at War. The Macmillan Co., New York.

51. Groves, M. G., G. L. Dennis, H. L. Amyx, and D. L. Huxsoll. 1975. "Transmission of Ehrlichia canis to dogs by ticks (Rhipicephalus sanguineus)." American Journal of Veterinary Research. 36:937-940.

52 Guimond, G. A. June 1971. "Dogs with a bit of boom." Airman. 15:44-50.

53. Hake, J. April 1979. "Dogs that serve." Soldiers. 34:6-9.

54. Hayes, D. R. Fall 1961. "Dogs in survival operations." Canadian Army Journal. 15:6-12.

55. Hemelt, I. E., G. E. Lewis, Jr., D. L. Huxsoll, and E. H. Stephenson. 1980. "Serial propagation of Ehrlichia canis in primary canine peripheral blood monocyte cultures." Cornell Veterinarian. 70:37-42.

56. Hildebrandt, P. K., J. D. Conroy, A. E. McKee, M. B. A. Nyindo, and D. L. Huxsoll. 1973. "Ultrastructure of Ehrlichia canis." Infection and Immunity. 7:265-271.

57. Hildebrandt, P. K., D. L. Huxsoll, J. S. Walker, R. M. Nims, R. Taylor, and M. Andrews. 1973. "Pathology of canine ehrlichiosis (tropical canine pancytopenia)." American Journal of Veterinary Research. 34:1309-1320.

58. Hogge, A. Undated. Vietnam veterinary activities proposed narrative. In possession of Colonel Leland B. Carter.

59. Huxsoll, D. L. 1976. "Canine ehrlichiosis (tropical canine pancytopenia): a review." Veterinary Parasitology. 2:49-60.

60. Huxsoll, D. L., H. L. Amyx, I. E. Hemelt, P. K. Hildebrandt, R. M. Nims, and W. S. Gochenour, Jr. 1972. "Laboratory studies of tropical canine pancytopenia." Experimental Parasitology. 31:53-59.

61. Huxsoll, D. L., P. K. Hildebrandt, and R. M. Nims. 1969. "Ehrlichia canis - The causative agent of a haemorrhagic disease of dogs?" Veterinary Record. 85:587.

62. Huxsoll, D. L., P. K. Hildebrandt, R. M. Nims, H. L. Amyx, and J. A. Ferguson. 1970. "Epizootiology of tropical canine pancytopenia." Journal of Wildlife Diseases. 6:220-225.

63. Huxsoll, D. L., P. K. Hildebrandt, R. M. Nims, and J. S. Walker. 1970. "Tropical canine pancytopenia." Journal of the American Veterinary Medical Association. 157:1627-1632.

64. "Is the Army going to the dogs?" February 1969. Army Digest. 24:49-53.

65. Kakoma, I., C. A. Carson, M. Ristic, D. L. Huxsoll, E. H. Stephenson, and M. B. A. Nyindo. 1977. "Autologous lymphocyte-mediated cytotoxicity against monocytes in canine ehrlichiosis." American Journal of Veterinary Research. 38:1557-1559.

66. Kakoma, I., C. A. Carson, M. Ristic, E. M. Stephenson, P. K. Hildebrandt, and D. L. Huxsoll. 1978. "Platelet migration inhibition as an indicator of immunologically mediated target cell injury in canine ehrlichiosis." Infection and Immunity. 20:242-247.

67. Kane, J. P. November 1949. "Animal power in modern warfare." Canadian Army Journal. 3:19-23.

68. Kelly, C. B. March 1969. "New uses for a mobile biological detection device." Data on Defense and Civil Systems. 14:34-36.

69. Klopfer, U., and T. A. Nobel. 1972. "Canine ehrlichiasis (tropical canine pancytopenia) in Israel." Refuah Veterinarian. 29:24-28.

70. Kulp, J. C., Jr. May-June 1963. "War dogs return to duty." Review. 42:48-49+.

71. Lawrence, D. A. 1938. "Rickettsiosis in a dog." Journal of the South African Veterinary Medical Association. 9:175-178.

72. Lessons from the war of Indochina, Vol III. (Enseignement de la guerre d'Indochine, fasicule III). 1957. Battelle Memorial Institute, Columbus, Ohio. NOFORN.

73. Lessons learned number 33: utilization of military dogs. 29 October 1963. Headquarters, U.S. Army Section, Military Assistance Advisory Group, Vietnam, APO 143, San Francisco, California. Available from Defense Technical Information Center. Report No. AD 385112.

74. Letter, 4 February 1969, Arthur L. Hogge, Jr., Colonel, VC, USARV Staff Veterinarian to Colonel Robert M. Nims, VC, Deputy Director, Office of the Institute of Research, Walter Reed Army Medical Center, Washington, D.C. In possession of Colonel Leland B. Carter.

75. Letter, 4 February 1969, Rodney F. Taylor, CPT, VC, Commanding Officer, 936th Veterinary Detachment (ID) to USARV Veterinarian, 44th Med Bde, APO SF 96384. In possession of Colonel Leland B. Carter.

76. Letter, 17 September 1970, Guy C. Moran, Colonel, VC, Staff Veterinarian, United States Army, Pacific to Brigadier General Wilson M. Osteen, VC, Office of the Surgeon General, Department of the Army, Forrestal Building, Washington, D.C. In possession of Colonel Leland B. Carter.

77. Letter, Subject: Resume of idiopathic hemorrhagic syndrome, 6 December 1968, Rodney F. Taylor, Captain, VC, Commander, 936th Veterinary Detachment to Staff Veterinarian, 7th Air Force, APO SF 96307. In possession of Colonel Leland B. Carter.

78. Letter, Subject: Serodiagnosis of Ehrlichia and Babesia in military working dogs, 28 November 1980, Thomas J. Keefe, COL, VC, Chief, Veterinary Laboratory Service, Brooke Army Medical Center, Fort Sam Houston, Texas to [Distribution List]. Available from Veterinary Laboratory Service, Brooke Army Medical Center, Fort Sam Houston, Texas.

79. Lewis, G. E., Jr., S. L. Hill, and M. Ristic. 1978. "Effect of canine immune serum on the growth of Ehrlichia canis within nonimmune canine macrophages." American Journal of Veterinary Research. 39:71-76.

80. Lewis, G. E., Jr., D. L. Huxsoll, M. Ristic, and A. J. Johnson. 1975. "Experimentally induced infection of dogs, cats, and nonhuman primates with Ehrlichia equi, etiologic agent of equine ehrlichiosis." American Journal of Veterinary Research. 36:85-88.

81. Lewis, G. E., Jr., and M. Ristic. 1978. "Effect of canine immune macrophages and canine immune serum on the growth of Ehrlichia canis." American Journal of Veterinary Research. 39:77-82.

82. Liddell Hart, B. H. 1967. Strategy. The New American Library, Inc., New York.

83. Malbrant, R. 1939. "Rickettsiose canine au Congo Francais." Bulletin de la Societe de Pathologie Exotique. 32:908-913.

84. McGaughey, C. A., P. Seneviratna, and S. Mahalingam. 1962. "Rickettsiosis of dogs in Ceylon." Ceylon Veterinary Journal. 10:82-87.

85. McIntosh, A. K., and C. L. Westbrook. June 1968. A review of the military dog program. CORG Memorandum CORG-M-353. Prepared by Technical Operations, Incorporated, Combat Operations Research Group under DA Contract No. DAAG-05-67-C-0547 for Headquarters, United States Army Combat Developments Command, Fort Belvoir, Virginia. Available from Combined Arms Research Library. NOFORN.

86. Memo for record, Subject: Meeting on ideopathic [sic] hemorrhagic disease. 10 March 1969. Donald W. Ringley, Colonel, USAF, VC, Veterinary Service, Office of the Surgeon General. Available from Biomedical Service Corps.

87. Merillat, L. A., and D. M. Campbell. 1935. Veterinary military history of the United States (2 vols). Veterinary Magazine Corp., Chicago.

88. "Military dogs in Indochina tropical disease infected." 25 June 1973. Omaha World-Herald.

89. Miller, E. B. 1961. United States Army Veterinary Service in World War II. Department of the Army, Office of the Surgeon General, Washington, D.C.

90. Morbidity and mortality military dogs 1971. In possession of Colonel Leland B. Carter.

91. Morbidity and mortality military dogs 1 Jan 72 - 1 Jul 72. In possession of Colonel Leland B. Carter.

92. Mornet, M. P. 1942. "Existence de 'Rickettsia canis' au Niger." Bulletin des Services Zootechniques. 3:219-220.

93. Mudaliar, S. V. 1944. "Canine rickettsiosis in S. India. Preliminary note." Indian Veterinary Journal. 20:163-164.

94. Myers, L. J. May 1976. "Mondo cane." Soldiers. 31:13-16.

95. "Mystery ailment killing Army's war dogs in Vietnam." 19 May 1969. Cincinnati Enquirer.

96. Neel, S. 1973. Vietnam studies: medical support of the U.S. Army in Vietnam 1965-1970. Department of the Army, Washington, D.C.

97. Neitz, W. O., and A. D. Thomas. 1938. "Rickettsiosis in the dog." Journal of the South African Veterinary Medical Association. 9:166-174.

98. Nims, R. M., J. A. Ferguson, J. L. Walker, P. K. Hildebrandt, D. L. Huxsoll, M. J. Reardon, J. E. Varley, G. J. Kolaja, W. T. Watson, E. L. Shroyer, P. A. Elwell, and G. W. Vacura. 1971. "Epizootiology of tropical canine pancytopenia in Southeast Asia." Journal of the American Veterinary Medical Association. 158:53-63.

99. Nims, R. M., D. L. Huxsoll, P. K. Hildebrandt, and J. S. Walker. June 1970. "Investigation of a new disease in military dogs." Proceedings, Army Science Conference, 16-19 June 1979, Vol III. United States Military Academy, West Point, New York.

100. Nyindo, M. B. A., M. Ristic, D. L. Huxsoll, and A. R. Smith. 1971. "Tropical canine pancytopenia: in vitro cultivation of the causative agent - Ehrlichia canis." American Journal of Veterinary Research. 32:1651-1658.

101. O'Doherty, J. K. December 1959. "Security is going to the dogs." Airman. 3:8-11.

102. Operational report - lessons learned, Headquarters, 44th Medical Brigade, period ending 31 January 1970. 17 June 1970. Department of the Army, Office of the Adjutant General, Washington, D.C. Available from Combined Arms Research Library. NOFORN.

103. Operational reports-lessons learned, Headquarters, 8th Military Police Group, 720th Military Police Battalion, period ending 31 October 1971. 10 May 1972. Department of the Army, Office of the Adjutant General, Washington, D.C. Available from Defense Technical Information Center. Report No. AD 522874.

104. Operations report-lessons learned 1-68: summary of lessons learned. 1 February 1968. Department of the Army, Office of the Adjutant General, Washington, D.C. Available from Combined Arms Research Library.

105. Palmer, B. 1 October 1969. "'Marijuana sniffers' test mail." Air Force Times. 30:15.

106. "The parapooches." 19 November 1965. Life. 59:105-106.

107. "Patrol dogs on trial in Vietnam." 20 January 1971. Army Times. 31:8.

108. "Patrol dogs rated 'superior' by SAC." 26 March 1969. Air Force Times. 29:4.

109. Pierce, K. R. 1971. "Ehrlichia canis: a cause of pancytopenia in dogs in Texas." Southwestern Veterinarian. 24:263-267.

110. Pigoury, L., and M. Bernard. 1939. "Existence de Rickettsia canis dans le procheorient." Bulletin de la Societe de Pathologie Exotique. 32:19.

111. Professional knowledge gained from operational experience in Vietnam, 1967. 2 May 1968. Department of the Navy, Headquarters, United States Marine Corps, Washington, D.C. Available from Combined Arms Research Library.

112. "Pythons, ponies, puppies--the peculiar pets of PACAF." January 1970. Air Force and Space Digest. 53:58-61.

113. Quinn, W. L., Jr. July-August 1971. "Dogs in countermine warfare." Infantry. 61:16-18.

114. Raghavachari, K., and A. M. K. Reddy. 1958. "Rickettsia canis in Hyderabad." Indian Veterinary Journal. 35:63-68.

115. Receveur, P., and G. Hugaud. 1949. "Existence de Rickettsia canis au Tchad." Revue d' Elevage et de Medecine Veterinaire des Pays Tropicaux. 3:45.

116. Report on idiopathic hemorrhagic syndrome of canines, 23 April 1969. Division of Veterinary Medicine, Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C. Available from Biomedical Service Corps.

117. Richardson, E. H. 1910. War, police, and watch dogs. William Blackwood and Sons, London.

118. Richardson, E. H. 1920. British war dogs, their training and psychology. Skeffington & Son, Ltd., London.

119. Ristic, M., D. L. Huxsoll, R. M. Weisiger, P. K. Hildebrandt, and M. B. A. Nyindo. 1972. "Serological diagnosis of tropical canine pancytopenia by indirect immunofluorescence." Infection and Immunity. 6:226-231.

120. Romer, J. 3 June 1970. "Vets fairly certain, ticks killing war dogs." Army Times. 30:22.

121. Seamer, J., and T. Snape. 1972. "Ehrlichia canis and tropical canine pancytopenia." Research in Veterinary Science. 13:307-314.

122. Senior officer debriefing report: COL W. H. Brandenburg, USARV Provost Marshal and CO, 18th Military Police Brigade, Period 30 Aug 68 through 22 Dec 69. 26 January 1970. Department of the Army, Office of the Adjutant General, Washington, D.C. Available from Defense Technical Information Center. Report No. AD 507208.

123. Senior officer debriefing report: Paul M. Timmerberg, Commander, 18th MP Brigade and Provost Marshal, Vietnam, 15 June 71-30 May 72. 6 December 1972. Department of the Army, Office of the Adjutant General, Washington, D.C. Available from Defense Technical Information Center. Report No. AD 523511.

124. "Sentry dogs: big help in Vietnam War." 8 November 1965. U.S. News and World Report. 59:14.

125. "Sentry dogs may be trained for broader 'patrol' duties." 26 June 1968. Air Force Times. 28:68.

126. Shough, B. July 1963. "Soldier dogs." The Army Quarterly and Defence Journal. 86:182-183.

127. Simpson, C. F. 1972. "Structure of Ehrlichia canis in blood monocytes of a dog." American Journal of Veterinary Research. 33:2451-2454.

128. Simpson, C. F. 1974. "Relationship of Ehrlichia canis - infected mononuclear cells to blood vessels of lungs." Infection and Immunity. 10:590-596.

129. Smith, R. D., M. Ristic, D. L. Huxsoll, and R. A. Baylor. 1975. "Platelet kinetics in canine ehrlichiosis: evidence for increased platelet destruction as the cause of thrombocytopenia." Infection and Immunity. 11:1216-1221.

130. Smith, R. D., D. M. Sells, E. H. Stephenson, M. Ristic, and D. L. Huxsoll. 1976. "Development of Ehrlichia canis, causative agent of canine ehrlichiosis, in the tick Rhipicephalus sanguineus and its differentiation from a symbiotic rickettsia." American Journal of Veterinary Research. 37:119-126.

131. Smith, R. D., E. Small, R. Weisiger, C. S. Byerly, and M. Ristic. 1975. "Isolation in Illinois of a foreign strain of Ehrlichia canis, the causative agent of canine ehrlichiosis (tropical canine pancytopenia)." Journal of the American Veterinary Medical Association. 166:172-174.

132. Special operational report-lessons learned. 10 July 1970. Department of the Army, Headquarters, 18th Military Police Brigade, APO San Francisco 96491. Available from United States Army Military History Institute, Carlisle Barracks, Pennsylvania. NOFORN.

133. Spence, J. B., C. H. Giam, and J. H. Theis. 1967. "A new canine disease syndrome." Veterinary Record. 81:328-329.

134. Stephenson, E. H., and J. V. Osterman. 1977. "Canine peritoneal macrophages: cultivation and infection with Ehrlichia canis." American Journal of Veterinary Research. 38:1815-1819.

135. St. Hill Bourne, D. 1947. They also serve. Winchester Publications Limited, London.

136. Study and evaluation of countermine activities (SECMA), volume 7 of 7, booby trap countermeasures. 26 September 1968. Department of the Army, Army Concept Team in Vietnam, APO San Francisco 96384. Available from Combined Arms Research Library.

137. Tropical canine pancytopenia, progress report, 1 July-31 December 1969. Division of Veterinary Medicine, Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C. Available from Biomedical Service Corps.

138. Tropical canine pancytopenia, progress report, 1 January-30 June 1970. Division of Veterinary Medicine, Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C. Available from Biomedical Service Corps. ORCON.

139. "Use of dogs in counter-insurgency operations." March 1962. Headquarters, United States Army Special Warfare School, Fort Bragg, North Carolina. Available from Combined Arms Research Library.

140. Van Dijk, J. E. 1971. "Studies on Ehrlichia canis." Zentralblatt fur Veterinarmedizin. 18:787-803.

141. "Veterinarians foil deadly dog disease." June 1980. HSC Mercury. (Official newspaper of United States Army Health Services Command, Fort Sam Houston, Texas.)

142. "Veterinary newsnotes Vietnam." (Extract) February 1969. In possession of Colonel Leland B. Carter.

143. "Veterinary newsnotes Vietnam." April 1970. In possession of Colonel Leland B. Carter.

144. "Veterinary newsnotes Vietnam." May-June 1970. In possession of Colonel Leland B. Carter.

145. "Vignettes from Vietnam." July 1966. Airman. 10:29-31.

146. Walker, J. S., J. D. Rundquist, R. Taylor, B. L. Wilson, M. R. Andrews, J. Barck, A. L. Hogge, Jr., D. L. Huxsoll, P. K. Hildebrandt, and R. M. Nims. 1970. "Clinical and clinicopathologic findings in tropical canine pancytopenia." Journal of the American Veterinary Medical Association. 157:43-55.

147. "War dogs." July 1953. Military Review. 33:57-62.

148. "War dogs: not all vicious." 9 October 1968. Army Times. 29:4.

149. Watson, H. O. 1943. Trooper, U.S. Army dog. Riverside Press, Cambridge.

150. Weisiger, R. M., M. Ristic, and D. L. Huxsoll. 1975. "Kinetics of antibody response to Ehrlichia canis assayed by the indirect fluorescent antibody method." American Journal of Veterinary Research. 36:689-694.

151. Wilkins, J. H., R. S. T. Bowden, and G. T. Wilkinson. 1967. "A new canine disease syndrome." Veterinary Record. 81:57-58.

152. Working papers. Unpublished. Undated. In possession of Lieutenant Colonel James R. Heil, 216 Augur Avenue, Fort Leavenworth, Kansas.

153. Young, T. 1944. Dogs for democracy. Bernard Ackerman, Inc., New York.

INITIAL DISTRIBUTION LIST

1. LTC James E. Cantrell
   U.S. Army Command and General Staff College
   Fort Leavenworth, Kansas 66027

2. Combined Arms Research Library
   U.S. Army Command and General Staff College
   Fort Leavenworth, Kansas 66027

3. Defense Technical Information Center
   Cameron Station
   Alexandria, Virginia 22314

4. LTC James R. Heil
   216 Augur Avenue
   Fort Leavenworth, Kansas 66027

5. COL David L. Huxsoll
   U.S. Army Medical Research and Development Command
   Ft. Detrick, Maryland 21701

6. COL Allen W. Jones
   102 North Ryan Street
   Auburn, Alabama 36830

SUSPENSE: ~~18~~ 24 April 1996

ATZL-SWD-GD

8 April 1996

MEMORANDUM FOR DLRO

SUBJECT: Request for Review of Limited Distribution Document

1. During the years 1981 and 1982, TRADOC restricted the release of all unclassified MMAS theses to U.S. Government agencies only, based on the assertion that these contained proprietary information. Beginning in 1983, this policy was altered, to the effect that, since then, such theses have been reviewed at the time of publication for possible restriction because of sensitive, although not classified, contents. Theses not so judged are declared releasable without restriction. This policy also calls for the review of 1981 and 1982 theses, when requested, according to the following guidance.

2. Guidance developed by CGSC and TRADOC for controlling the release of restricted past MMAS theses provides that requests for theses and, as necessary, the theses themselves, be reviewed by the department(s) with best expertise to recommend release, or non-release in the case of theses bearing sensitive but not classified material. The reviewer's recommendation will be forwarded through this office and the CARL Classification Branch before being referred back to DEPMSEC and TRADOC. In cases where the author and/or members of the original thesis research committee are assigned to CAC/CGSC, review priority will be first to the author, then to the committee chairman, and then to other resident faculty committee members. In cases where neither the author nor his thesis research committee members are currently assigned to CAC/CGSC, the assigned officer with best comparable expertise, in the judgment of his or her department director, will be the reviewer.

3. Because of the topic area of this thesis, request your department conduct the review. Suspense on this action is 18 April 96. The thesis currently requested is identified as follows and is located in the Combined Arms Research Library, 3rd Floor.

Title: Military Working Dogs and Canine Ehrlichiosis (Tropical Canine Pancytopenia) in the Vietnam War

Publication Date: June 1981 Author: MAJ William J. Kelch

Research Committee: LTC James, Heil, LTC James Cantrell, COL David Huxsoll, and COL Allen Jones

5. After review, the requested thesis must be assigned one of seven possible "Distribution Statements," A through F and X. Criteria for assigning each Distribution Statement are provided at enclosure 2. When the requested review is complete, please indicate its conclusion by the following:

ATZL-SWD-GD
SUBJECT: Request for Review of Limited Distribution Document

a. Advise the DGDP of the review conclusion by completing the bottom of this memo and returning it with enclosures.

b. Provide a copy of the memorandum to CARL (ATTN: Documents Services).

Philip J. Brookes

1 Encl

PHILIP J. BROOKES
Director
Graduate Degree Programs

ATZL-SWD- (ATZL-SWD-GD/8 April 96) (385) 1st End 4 / 22 / 96
SUBJECT: Military Working Dogs and Canine Ehrlichiosis (Tropical Canine Pancytopenia) in the Vietnam War ADB 061 165 L

Department of Resources and Logistics

FOR Director, Graduate Degree Programs

1. Recommend that this document _____ be / ~~not be~~ _____ released in accordance with Distribution Statement ____A____. Reason: All references cited in this document, originally with limitations on distribution, have been subsequently reclassified for unlimited distribution. This document does not appear to contain proprietary technical information. Technical references cited are published in the professional literature.

2. POC is: MAJ Ken Russell, DLRO 4-3743

CF: CARL