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A REPORT TO CONGRESS

INEQUITIES IN TREATMENT OF VIETNAM VETERANS

THE EXCLUSION OF THAILAND VETERANS

Presented by
Thailand Vietnam Vets for Equity in Treatment

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INTENT AND PURPOSE

It is the intent and purpose of this report to bring attention to an injustice being experienced by a select group of Vietnam Veterans, those who served in Thailand. While they earned both Vietnam Service and Vietnam Campaign Medals, they have been denied care and recognition equal to that given to veterans who served in Vietnam, Cambodia, and Laos. The names of those who died in Thailand, while earning the Vietnam service medals, have not been included on the Vietnam Veterans' Memorial. Men and women sent to Thailand were exposed to hazardous defoliation chemicals and insecticides just as those in Vietnam were, but their claims for compensation have been consistently denied.

It is not the intent of this document to pass judgment on, or question the policies that resulted in our involvement in Southeast Asia, nor on tactical decisions to use defoliants in the Vietnam War Theater of Operations.

BACKGROUND

In 1961, while the United States' involvement in South Vietnam was still at the advisory level, preparations were being made for the inevitable expanded war that was to come, not in South Vietnam, but Thailand. With long time ties of friendship to the U.S., Thailand offered a strategic location that would enable the U.S. to conduct direct air reconnaissance and tactical operations against North Vietnam and its infiltration routes to the south through neighboring Laos and Cambodia.

The first U.S. Air Force operations commenced from Takhli Royal Thai Air Force Base (RTAFB) in early 1961 with rotational detachment of F-100 Super Sabers from the 27th Tactical Fighter Wing (TFW), Cannon AFB, New Mexico. In April of that year, the 45th Tactical Reconnaissance Wing (TRW) flying RF101-Cs began reconnaissance flights over Laos launched from Don Muang RTAFB outside of Bangkok. An Air Force advance team arrived at Korat RTAFB in 1962 to begin preparing for the buildup to support the squadrons and manning that would reach a sustained level of 3,500 personnel. Tactical operations began at Nakhom Phanom (NKP) in 1963, Ubon and Udorn in 1964. Construction to prepare U-Tapao Royal Thai Naval Air Base (RTNAB) for arrival of USAF personnel and aircraft began in 1965. Tactical air operations began flying missions over the Southeast Asian skies from six bases in Thailand prior to the August 7, 1964 passage of Joint Resolution of Congress, H.J. RES 1145, Gulf of Tonkin Resolution. Construction on the seventh base commenced shortly thereafter in 1965.[1] The bases remained active up through the fall of Saigon on April 30, 1975.

It cannot be denied that Thailand was a significant part of the Vietnam War Theater of Operations. U.S. air bases in Thailand were among the earliest to be established for war operations in Southeast Asia and remained a vital part of the U.S. military objectives in Southeast Asia through the entirety of the conflict. Through the fifteen

[1] Thailand Base Histories, The Thailand, Laos, Cambodia Brotherhood, http://www.tlc-brotherhood.org/ , downloaded April 16, 2005

years of presence in Thailand, the U.S. launched tactical combat operations against North Vietnam, Pathet Lao, and Cambodian Khmer forces. These operations included Operation Rolling Thunder (bombing of North Vietnam), Operation Ranch Hand defoliation missions, Operation Linebacker I and II, bombing of North Vietnam infiltration routes through Laos and Cambodia, known as the Ho Chi Minh Trail and Plain of Jars in Laos. Air reconnaissance and air rescue and recovery missions were also launched from installations in Thailand.

Assets deployed to Thailand for these missions included F100 Super Sabers in the early years to F105 Thunderchiefs, F4-C though E Phantoms, F111s, B-52 Stratofortresses, KC-135 Refueling Tankers, C-130, AC-130 Spectre Gun Ships, C-141, C-123, Ranch Hand UC-123, EC-121, EC-47, RB 66, OV10 Bronco, and the full spectrum of helicopters. The list is by no means totally inclusive.

Those who served in Thailand were subjected to insurgent sapper attacks, sniper fire, and perimeter penetrations, and they were exposed to hazardous defoliant chemicals and insecticides. Casualties, including loss of life, occurred through the entire span of U.S. presence. Rightfully, those who served in Thailand earned both the Vietnam Service Medal (VSM) and Vietnam Campaign Medal (VCM). Yet the families of those who lost their lives while serving in Thailand have never seen the recognition by this nation of the sacrifice of their loved one. Their names are not included with those memorialized on the Vietnam Veterans Memorial in Washington, DC.

Executive Order No. 11216, signed by President Johnson on April 24, 1965, designated Vietnam and adjacent coastal waters in or over which U.S. forces operated as a combat zone.[2] As hostilities spread, the zone was expanded to include Laos and Cambodia; however, that expansion never included Thailand even though hostilities spilled across its borders as insurgents conducted sapper attacks

[2] Information obtained from the Website The Vietnam Veterans Memorial at http://thewall-usa.com/information/, April 23, 2005

against U.S. bases, personnel, and assets. Korat, NKP, Ubon, and U-Tapao experienced attacks and perimeter penetrations that resulted in U.S. Airmen being wounded, and Communist insurgents being killed, wounded, or captured.

The Executive Order established a mind set that those who served in Thailand were not a part of the war, and this mindset has followed Vietnam Veterans who served in Thailand up to this day. Veterans who served in Thailand and have the same medical complications from chemical exposure as their counter parts who were in Vietnam have are categorically denied compensation. The response to their claims has constantly been "You did not serve in Vietnam; therefore, you were not exposed and are not eligible." The Act, as amended, states:

> "SEC. 2 PRESUMPTION OF SERVICE CONNECTION FOR DISEASES ASSOCIATED WITH EXPOSURE TO CERTAIN HERBICIDE AGENTS.
>
> (a) IN GENERAL. - (1) Chapter II of title 88, United States Code, is amended by adding at the end of subchapter II the following new section:
>
> " 316. Presumptions of service connection for disease associated with exposure to certain herbicide agents.
>
> "(a)(1) For the purposes of section 310 of this title, and subject to section 313 of this title –
>
> "(A) a disease specified in paragraph (2) of this subsection becoming manifest as specified in that paragraph in a veteran who, **during active military, naval, or air service, served in the Republic of Vietnam during the Vietnam era;…"** [emphasis added]

The words "…served in the Republic of Vietnam…" or "in-country" have been like a dividing wall creating two classes of veterans who served in the same war. The mortar that continues to hold the wall together is a mixture of official Government treatment of Veterans with Thailand service, and veterans themselves.

On March 11, 1968, a low order detonation of Mark-117 750 lb. bombs in a storage revetment at Korat's Munitions Storage Area took the lives munitions maintenance specialists A1C James W. Reese and A1C Frank A. Uhlic, Jr. who were working in

the revetment. Air Force Security Policeman A1C James E. Francis who entered the burning revetment of bombs in an attempt to rescue the two men was also killed. Were it not for the war in Vietnam, those men would not have been there and would be alive today, but their names are not among those honored on the Vietnam Veteran's Memorial. If, on the other hand, a similar incident occurred on an aircraft carrier whose air wing was conducting operations over North Vietnam, the names of those lost would be on the Wall. Other than geographical location there would be no difference between the two incidents. The bombs in both cases were slated for targets in North Vietnam.

In writing a segment for the history of the Vietnam Security Police Association, David Adams, described what it is to be a Vietnam Veteran who served in Thailand in his short essay, "Thailand - The Difference of A Line," which is provided as Exhibit 1 to this report.

It is time that the geographical inequities between veterans of the Vietnam War are brought to an end. This is not a case of veterans believing they are owed something because of their service. We believe we speak for the overwhelming majority of veterans that we consider our service the minimum dues to be paid for the freedom we enjoy in this nation. We do believe, however, that this nation has an obligation to assist those men and woman who have been injured or had their health permanently damaged as a direct result of their service. The cost of taking care of those harmed in the defense of this nation is as much a part of the cost of war as are weapons, munitions, and equipment.

The following is the evidence of the exposure to hazardous chemicals by those who served this nation during the Vietnam War in Thailand, but for a geographical line on the map are denied equal treatment by this nation.

HAZARDOUS CHEMICAL EXPOSURE

DEFOLIANT EXPOSURE:

Young soldiers and airman in their late teens and early twenties seeing trucks with large tanks spraying the foliage around the base perimeter and other sensitive base areas thought nothing of the consequences that spraying would have on their health as they watched thick foliage die in a matter of days. It never occurred to them that the early evening fogging of mosquitoes would damage their central nervous system. Now, as veterans in middle age, they have come to realize the effects of those chemicals sprayed in their work and living areas so many years ago. Like a time bomb with a very long fuse, the effect of chemicals such as dioxins and Malathion take time to affect the human body. It takes many years for ailments such as Chloracne, Non-Hodgkin's Lymphoma, Soft tissue sarcoma, Hodgkin's Disease, Porphyria Cutanea Tarda (PCX), Multiple Myeloma, respiratory cancers (including cancers of the lung, larynx, trachea and bronchus), prostate cancer, peripheral neuropathy (acute or sub acute), and Type 2 Diabetes (Diabetes mellitus) to show up. This delay disguises their source, making it difficult to prove that the chemicals they were exposed to while serving this nation in the armed forces is the cause of their deteriorated health.

The delayed effects of chemical exposure is one of the reasons it took nearly twenty (20) years after the purported last Ranch Hand spray missions were made for the U.S. Government to recognize the harm those chemicals did and for Congress to pass the Agent Orange Act in 1991 (“Act”). Because the use of Agent Orange is seldom thought of in a context other than spraying enemy areas by Operation Ranch Hand, the Act has geographically restricted compensation to those who were in Vietnam.

The Government’s contention that Agent Orange was not sprayed in Thailand has resulted in continued denials of hundreds of legitimate claims made to the Veterans Administration by veterans who faithfully served in Thailand and other Pacific Rim countries. There are more than 200 cases that have been brought before the Board of Veterans’ Appeals by Vietnam Veterans who served in Thailand. This is a small portion

of the total number of filed claims, as most veterans do not pursue the effort that far. Unless the veterans have records proving they had been in Vietnam, the VA has held that there could not have been exposure. In spite of the large number of claims, neither the Department of Veteran's Affairs, nor any other agency has made an effort to investigate the allegations of Agent Orange use in Thailand and other locations outside of Vietnam.

U.S. Air Force documentation such as the letter quoted below is evidence that Ranch Hand operations were not restricted to Vietnam. U.S. Air Force Colonel John W. Pauly, Commander of the 315th Special Operations Wing (formerly known as the Air Commando Wing), Pacific Air Force (PACAF), states in his letter of commendation dated 9 Jan 1969:

> "To: 12th Sp Ops Sq (c)
>
> 1. I am very pleased to forward the attached letter praising Lt. Colonel David E. Stockton and his flight for their special operation conducted from Udorn RTAFB from 29 Dec 68 Through 2 Jan 69.
>
> 2. This highly professional performance has efficiently contributed to the Air Force mission in SEA, and it has added another page in the book of air doctrine which the Ranch Hands are writing so splendidly.
>
> 3. Please convey my personal appreciation to Lt. Colonel Stockton and the other members of the flight for this fine performance of duty.
>
> John W. Pauly, Colonel, USAF
> Commander"

A copy of the Col. Pauly letter and two related letters of commendation are provided as Exhibit 2.

There are two significant references in Col. Pauly's letter. In paragraph 1 he clarifies that the special operations were conducted from Udorn RTAFB (Royal Thai Air Force Base). In paragraph 2 he states the efficiency of the operations contributed to the Air Force Mission in SEA (Southeast Asia). During the Vietnam War the acronym "SEA" was used when referring to actions taken within the theater of operations, which

included Vietnam, Cambodia, Laos, and Thailand. When making reference to operations restricted to Vietnam the acronym used was RVN for Republic of Vietnam. Clearly Col. Pauly's letter refers to operations being conducted from Thailand and not restricted to Vietnam, but rather the theater of operations.

Udorn RTAFB was not the only location of the 315th Special Ops Wing. In a memorandum dated 24 February 1967, Col. Russell A. Downey recorded discussions he and Col. Mosely had with Col. Froehlich (Col. Pauly's predecessor), Commander of the 315th ACW (later renamed Special Operations Wing) regarding the possibility of re-outfitting C-123 aircraft located in Thailand to help spray for mosquitoes in South Vietnam. Col. Froehlich told Cols. Downey and Mosely that the 506th Composite Air Commando Squadron located at Nakhom Phanom, Thailand had six aircraft and 9 crews that could be setup for insecticide spraying.[3] The memo, while in poor condition, is provided as Exhibit 3. The reference to Nakhom Phanom (NKP) is in the fifth line of Paragraph 3. USAF Letters of Commendation and Col. Downey's memo verify that Ranch Hand operations were conducted from Udorn and NKP.

While the memo quotes Col. Froehlich as saying the planes could be set up for spraying, it does not mean that the C-123s were not already set up for herbicide spraying. There is a significant difference in the effects of herbicide vs. insecticide on equipment. When Thailand had made a request through the U.S. State Department for help with a locust infestation, an aircraft that had been spraying Agent Orange in Vietnam has to be re-outfitted to spray insecticide.

> *"Workers had stripped "Patches"* [UC-123 named "Patches" took more enemy fire and hits than any other UC-123] *of all camouflage paint and coated it with an alodine compound to guard against the insecticide's corrosive effects.*[4] (see Exhibit 5, note 5, page 124)

[3] Colonel Russell A. Downey Memorandum dated 24 February 1967

[4] The Air Force and Herbicides in Southeast Asia 1961-1971, by Major William A. Buckingham, Jr., Office if Air Force History United States Air Force, Washington, D.C. 1982, page 58

The first uses of defoliants in Thailand did not begin with Ranch Hand operations by the 315th Air Commando Wing in December 1968. According to a report prepared for the National Academy of Sciences by the Institute of Medicine (IOM) titled Veterans and Agent Orange: Health Effects of Herbicides Used in Vietnam (1994), the earliest recorded use of defoliants involving the U.S. was the testing of "Agent Pink" in a 1953-1965 defoliation program in Thailand.[5] The report also refers to additional testing that was conducted in Thailand during 1964-1965 to evaluate the effectiveness of aerial applications of various formulations of 2,4-D and 2,4,5-T (the combined herbicides that constituted the most common form of Agent Orange) and other chemicals in the defoliation of jungle vegetation representative of Southeast Asia.[6] (References provided as Exhibit 4, see note 1 and 2).

The IOM report is supported by Agent Orange historian Maj. William A. Buckingham who wrote a detailed history of the use of herbicides in Southeast Asia that is titled The Air Force and Herbicides in Southeast Asia 1961-1971, and was published by the Office of Air Force History, United States Air Force. Once again, attention is drawn to the use of Southeast Asia as opposed to Vietnam. The report states that in August of 1962, the Defense Department was considering use of herbicide spraying for crop destruction in Phu Yen Province to deny the enemy food sources. Dr. Harold Brown, the Director of Defense Research and Engineering, recommended that testing of the concept should first be done either in Vietnam or Thailand, if possible, before actual air operations begin in Phu Yen.[7] (see Exhibit 5, note 1, page 73).

Maj. Buckingham noted in his report:

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[5] Veterans and Agent Orange: Health Effects of Herbicides Used in Vietnam (1994), copyright 1994, 2000 The National Academy Of Sciences, page 90 (located at http://books.nap.edu/books/0309048877/html/90.html)

[6] Ibid, page 26, (located at http://books.nap.edu/books/0309048877/html/26.html)

[7] The Air Force and Herbicides in Southeast Asia 1961-1971, by Major William A. Buckingham, Jr., Office if Air Force History United States Air Force, Washington, D.C. 1982, page 73

> *"Evidently around April 1962 President Kennedy approved an additional operational herbicide test along seven kilometers of road in South Vietnam. However, he rescinded this authorization on May 2, 1962 before Ranch Hand had flown any mission and stated that Thailand would be a better place for such a test."*[8] (see Exhibit 5, note 4, page 58)

Both the National Academy of Sciences and the Office of Air Force History, United States Air Force, in two unrelated historical studies, have stated that testing of defoliants in Thailand was conducted from the periods of 1953 through 1965. Therefore, there can be no doubt that defoliants utilized in Vietnam were used in Thailand. While neither report makes any statements as to specific locations where the testing was conducted, one can surmise that if the U.S. military is going to test materials in a foreign country that it intends to use on enemy locations, the testing is going to be done in areas where the environment, public knowledge, access, and viewing is controlled by the Department of Defense. Given there was a build up of U.S. operations on Thai military installations beginning in 1961, it is only logical that the testing of defoliants would be conducted on those installations**.** A two-fold purpose could be achieved in the testing on Thai bases coming online for U.S tactical use. The chemical's effectiveness could be determined in a like environment and under the control of the U.S. Also the perimeters of sensitive military areas to be used by the U.S. for tactical operations would be brought up to U.S. security standards by removing tropical growth, providing a clearing to enable security forces to see anyone breaching the perimeter. The theory that the testing in Thailand was performed on Thai bases is demonstrated below in Table I, Timeline Of US Key Events and Documented Use Of Agent Orange In Thailand.

[8] Ibid

TABLE I

Timeline Of Key Events and Documented Use Of Agent Orange In Thailand

EVENT	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
Early Testing of Defoliant In Thailand (Earliest Reported Date 1953)																
Testing of 2,4-D and 2,4,5-T In Thailand																
U.S. Begins Operations at Don Muang RTAFB, Bangkok																
USAF Arrives at Takhli RTAFB																
USAF Advance Team Arrives at Korat RTAFB																
USAF Arrives at Nakhom Phanom (NKP) RTAFB																
8th Tactical Fighter Wing Assigned to Ubon RTAFB																
333rd Squadron formed at Udorn RTAFB																
Construction Began at U-Tapao RTNAB																
Eye Witness Account of Finding Agent Orange Barrels at Takhli																
Earliest Eye Witness Account of Defoliated Perimeter at Korat MSA																
Earliest Reference to the Presence of the 315th SOW (NKP)																
Deployment of Military Working Dogs to Thailand																
Letters of Commendation to Members of the 315th at Udorn																
Phase II of Defoliation at Thai Bases following attacks at Ubon																
End of Operation Ranch Hand																
U.S. Operations Cease at Takhli RTAFB																
U.S. Resumes Operations at Takhli RTAFB in Support of Linebacker																
Eye Witness Account of Seeing Empty Agent Orange Barrels at Takhli																
U.S. Withdrawal from Vietnam																
Fall of Saigon																
Sentry and Patrol Dogs Killed and Necropsies Performed																
U.S. Closes Operations at Thailand Air Bases and Installations																

As is shown in the timeline, the testing documented by the Institute of Medicine and Maj. Buckingham ran concurrent to the build up of U.S. operations on Thai air bases. However, the application of Agent Orange in Thailand did not end with the conclusion of the testing discussed in the two documents. Following a July 1969 sapper attack on Ubon, a renewed defoliation effort got underway on Thailand bases in 1969 and 1970. Those who were stationed at the bases and remote sites were eyewitnesses to the eradication of jungle growth on and around their facilities.

Just as Ranch Hand operations were not restricted to Vietnam, the use of Agent Orange was not restricted to Operation Ranch Hand. In his report, The History of Agent Orange Use In Vietnam: An Historical Overview From The Veterans Perspective, presented to the United States – Vietnam Scientific Conference on Human Health and Environmental Effects of Agent Orange/Dioxins in March 2002, the author, Paul L. Sutton, notes that Agent Orange was used to clear perimeters both outside and inside military installations. Mr. Sutton states:

"The use of herbicides was not confined to the jungles. It was widely used to suppress vegetation around the perimeters of military bases and, in many instances, the interiors of those bases."[9] (Exhibit 6)

Mr. Sutton's presentation is not the only documented reference to the use of Agent Orange directly on military bases. Maj. Buckingham stated in his history of the Air Force and Herbicides in Southeast Asia:

> *"General Harkins [Gen. Paul D. Harkins, predecessor to Gen. William Westmoreland] indicated that officials of the South Vietnamese government were pleased with the defoliation results they had seen so*

[9] The History of Agent Orange Use In Vietnam An Historical Overview from The Veteran's Perspective, Summary DIOX2002-16, page 7, presented to the United States – Vietnam Scientific Conference on Human Health and Environmental Effects of Agent Orange/Dioxins, March 3-6, 2002, by Paul L. Sutton, National Chairman, Agent Orange/Dioxin Committee, Vietnam Veterans of America, Inc.

far, and they had demonstrated their continuing interest by submitting requests for further missions. As he had said in his operational evaluation of the earlier missions, the American commander noted that herbicides had proven to be successful in clearing vegetation around military installations and mangrove areas."[10] (see Exhibit 5, note 2, page 58)

Buckingham noted further that the Military Assistance Command Vietnam (MACV) appointed a team, headed by Lt. Col. Peter G. Olenchuk, to conduct an evaluation of all 1963 herbicide operations. The Olenchuk Report rated the military worth of defoliation and crop destruction as high. Buckingham stated:

"The team found the improved visibility had eased the problem of providing security in defoliated areas, had made aerial surveillance much more effective, and had enabled ground security forces to be reduced. Defoliation had also created an increased field of fire for troops on the ground…"[11] (see Exhibit 5,note 3, page 88).

With public sentiment toward the War declining after the1968 Tet Offensive, non-conventional tactics being employed came under public scrutiny and criticism, including the use of herbicides as the conflict entered the 1970s. Secretary of State William Rogers believed their continued use in Southeast Asia was a potential threat to the President's foreign policy objectives. In August 1970 three members of the U.S. Senate Foreign Relations Committee who were key to the success of President Nixon's foreign policy initiatives in the Senate; Clifford Case, John Cooper, and Jacob Javits, had voted for a measure cutting off funding for herbicide use in crop destruction. Sec. Rogers sought to persuade President Nixon to announce a decision to immediately stop all uses of herbicides in any form in Vietnam. Secretary

[10] The Air Force and Herbicides in Southeast Asia 1961-1971, by Major William A. Buckingham, Jr., Office if Air Force History United States Air Force, Washington, D.C. 1982, page 58

[11] Ibid, page 88

of Defense Melvin Laird disagreed with Secretary Rogers that all uses should immediately stop. Sec. Laird believed herbicides were essential around firebases, other installations, and lines of communications to improve security as the U.S. was drawing down its troop strength.[12] Sec. Laird's view carried the day, but following discussions with his Assistant Secretary of Defense for International Security Affairs, G. Warren Nutter, Sec. Laird attempted to gain more control over the used of herbicides in Southeast Asia. Maj. Buckingham stated in his history:

> *"Laird adopted the ISA advice and on March 18, 1971, requested the Chairman of the JCS to insure that any proposal for U.S. herbicide operations in Laos, Cambodia, or Thailand be submitted to Laird for his approval."*[13]

The inclusion of Thailand in Sec. Laird's memo certainly implies herbicides had been used and were available in Thailand (see Exhibit 5, note 6).

Eyewitness accounts of defoliation installations in Thailand are consistent with the documentation cited above. Air Force Security Police have testified to the creation of "kill zones" on their bases. The kill zones were wide cleared areas on the base perimeter that attacking sappers would have to cross in open sight under a clear field of fire by the ground security forces. Photographs taken by personnel at the time of their tours that show the effectiveness of defoliation are provided below along with eyewitness accounts.

[12] Ibid, page 177

[13] Ibid, page 178

KORAT RTAFB:

"I was stationed at Korat, Thailand, from December 1966 to December 1967. I was assigned to the 388th MMS. Working both on base and at the Munitions Storage Area located off base. I observed barren land, through out the base complex and at least 500 ft. passed the perimeter. No vegetation was visible. During monsoon season, the ground was covered in boot swallowing mud, necessitating the need to use the boardwalks." – Dennis Oliver 1966 -1967

"For quite some time I have experienced a lot of pain and stiffness in my bodies soft tissues (muscles). Only recently (the last few years) have I complained to any doctors. When I do, they all ask the same question: "Were you exposed to Agent Orange, or any other chemicals." The only ones I can think of are Agent Orange and Malathion, in which we would periodically immerse our dogs to kill tick, and was sprayed out on the perimeter to kill mosquitoes." – James Stastny 1970 -1971

"The areas I remember the most of not having foliage grow were the perimeter of the base and the perimeter of the bomb dump [MSA]. *Other areas that were not growing back were areas on the flight line and around it. In the entire 19 months I was there, no vegetation grew back in these areas that I patrolled. Areas directly beyond the fence line that may not have been necessary to be sprayed with a defoliant were excessively vegetated as would be expected in that type of climate."* – Mike Balash 1970 -1972

"In late January or early February after spending a few nights in the MSA I was posted on perimeter posts in the heavy foliage area that paralleled the 06 end of the runway. I was surprised how in a matter of only a few days the foliage was dying and an odor hung in the air. There was no doubt that the interior foliage had been sprayed with a chemical as the odor distinctly that of a strong chemical mixed with a petroleum product. Within a week or two of my first seeing the growth dying equipment had been moved in to remove the dead foliage. " – David Adams 1969 -1970

"I saw the area sprayed behind the engine test cell when we were placing trip flares in a wooded area and in a area that the Japanese built barracks in World War 2. The bomb dump in side and the perimeter when sprayed with something as grass never grew there." – John Powell, 1968-1969

"I was stationed at Korat AFB Thailand from March 1969 thru March 1970. During this period of time, the Munitions "Storage Area (MSA), located approximate 5 to 7 miles from the base, never had foliage for 100 feet, both outside and inside, the perimeter fence. The inside was defoliated for over a 100 plus feet from the fence up to, but did not include, the bomb revetments since the grass/foliage was

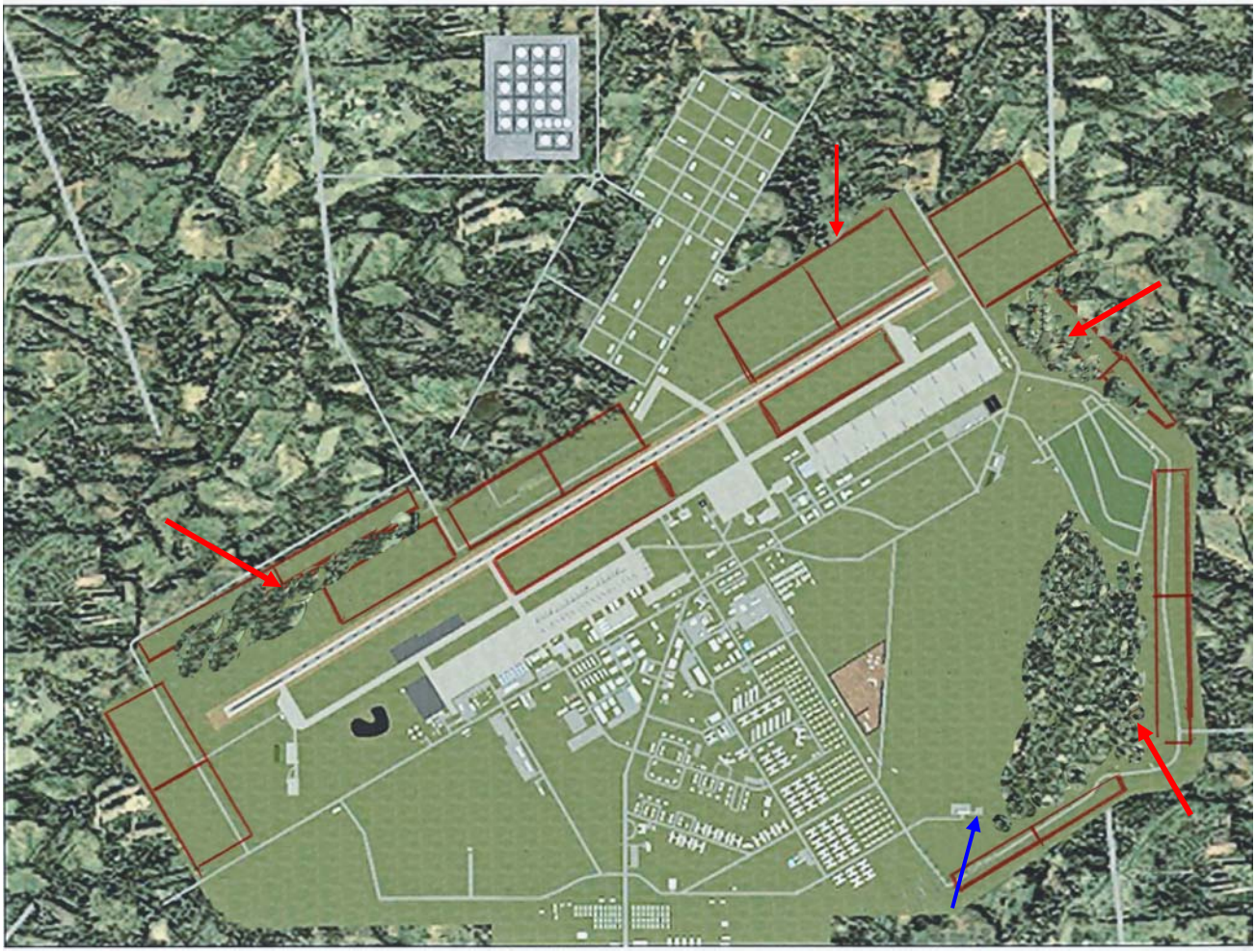
necessary to prevent soil erosion of the revetments. One night I watched a pair of tigers stroll casually along the perimeter fence. The earth was so void of foliage, I could later easily follow their tracks in the dirt. On several occasions during the course of my tour, I observed the paths left in the dirt made by snakes that had previously crawled through the area. In short, one could observe anything large or small, walking or crawling, for approximately a 100 feet beyond the perimeter fence and even farther inside the fence. Though this site was located in a tropical jungle where foliage grew at an incredible rate, this area was perpetually barren turf! It was consistently either mud or dust." – Terry Strickland 1969-1970

The map on the following page was created by David Adams using a flight simulator aerial map of Korat RTAFB and inserting foliage where it appeared and where defoliation took place.

KORAT RTAFB

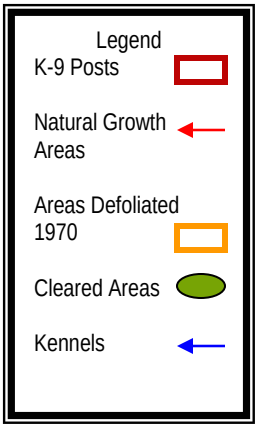
1969 – 1972

1969

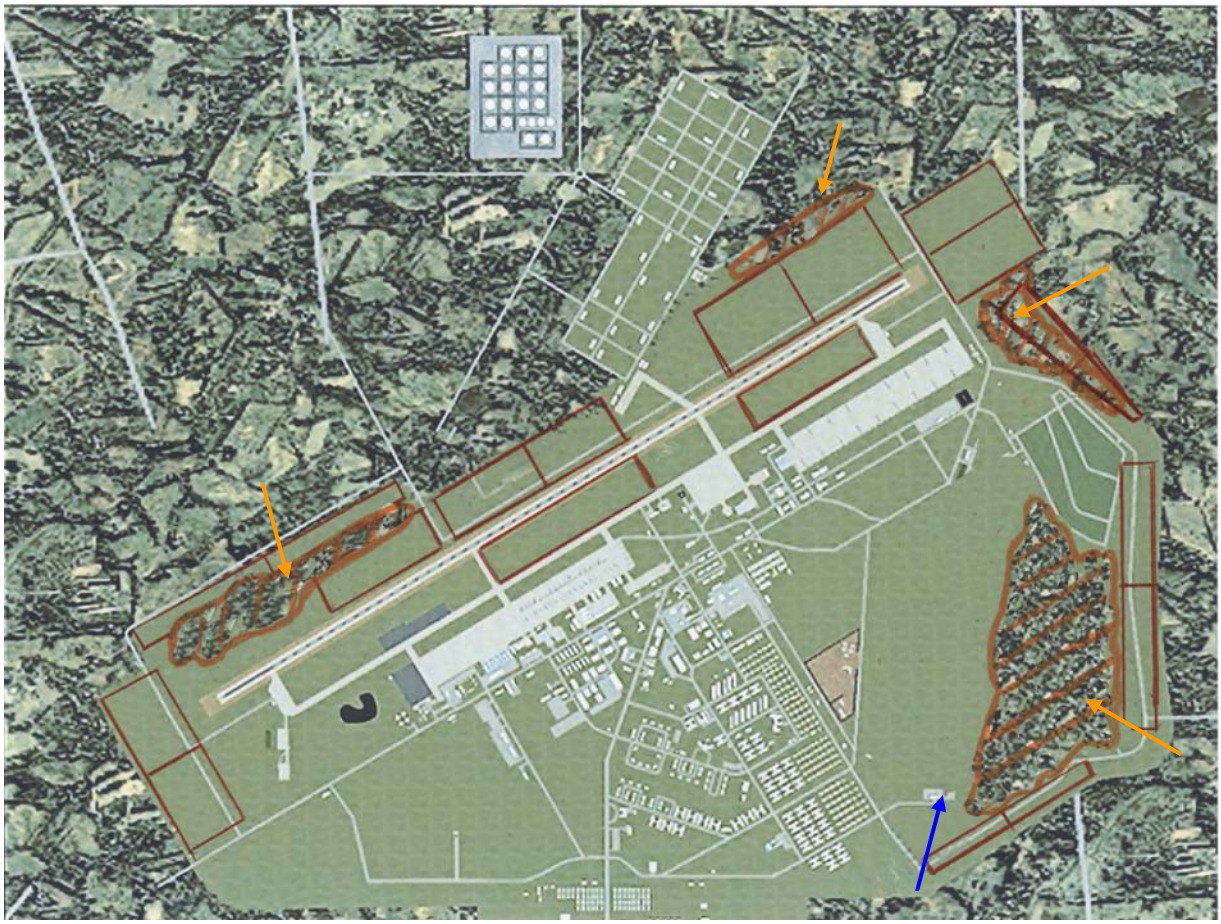


1969 Showing natural growth areas inside of the perimeter along K-9 Posts

The above map represents the appearance of Korat RTAFB Thailand in 1969. The K-9 posts are outlined in red. As can be seen on several posts there was dense stands of foliage inside the perimeter as well as the outside. The K-9 posts were virtually sandwiched between the foliage and the perimeter fence. The location of the Kennels is shown with a Blue arrow.



1970



In the early months (the dry months) of 1970, a major effort of defoliating the perimeter of the air base began. The areas outlined in orange are the areas that were defoliated through the use of ground spraying from trucks with spray tanks. Within a few weeks the dense foliage was dying and then equipment was used to clear the dead brush, trees, and flora.

1972

By 1972, the perimeter remained free of foliage and the Munitions Storage Area had been relocated from the off-base area to an on base facility in what had once been a densely foliated area.

Korat MSA

photo by David Adams 9/70

The above photo was taken in September 1970 of the Korat RTAFB Munitions Storage Area. The photo was taken from a 60 ft. high guard tower with Kodachrome 64 transparency film. Due to its slow speed the photo was taken at F1.4 with a timed exposure of 1 minute using available light. The photo shows the area that was cleared between the jungle to the right, and perimeter fence to the left. While not covered with dense foliage, the clearing appears to have grass or similar ground cover growing, but it is an illusion created by the lighting reflecting off the lush foliage of the jungle and the long time exposure. What appears to be grass was actually dead.

The same photo, but with the color removed converting it to black and white is on the following page. No other changes, such as contrast, burning, or dodging were made to the photo.

With the color removed an interesting thing happens. The lush green jungle, which is very much alive, becomes black. If the cleared area was indeed green it to should have become black or at least a very dark gray like the plants in the jungle, but the cleared area was not green. It was dead, which becomes obvious in the black and white version.

The cleared area that surrounded the MSA perimeter is a prime example of defoliation giving ground troops an “increased field of fire” that was discussed previously on page 14. The long period of time with no sign of plant growth that has been attested to is a classic example of Agent Orange defoliation.

The date of the transparency is also worthy of note. It was taken in September 1970, which is the heaviest month of the monsoon season in central Thailand. Kodak, who maintained a patent on the processing for Kodachrome transparency film, processed the original slide, and the slide remains in the original cardboard mount with Kodak’s date stamp of “Sept 70.” The photographer is willing to provide the original slide as proof of the date of the photo.

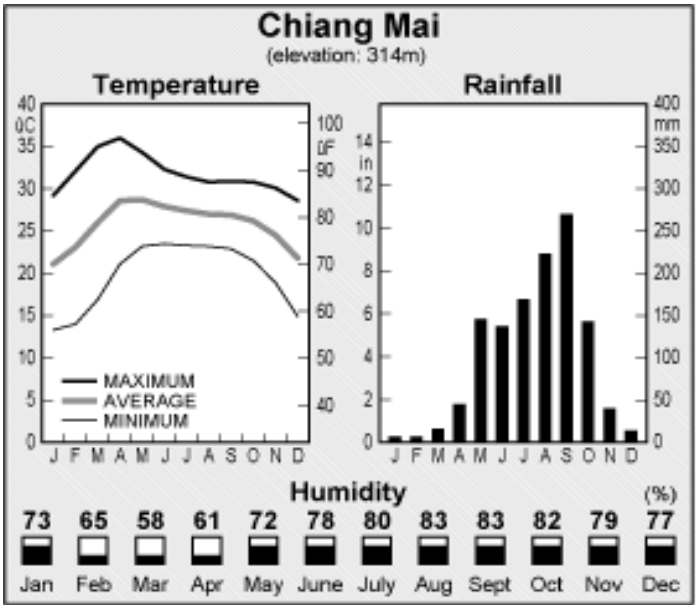
The weather trends for Thailand have been obtained from On-samui.com, a Thailand information site found at http://www.on-samui.com/info-Thailand/climate.html. The site shows average monthly temperatures and rainfall for Thailand's three main regions. The regions are denoted as Chiang Mai in the north and Bangkok central. The southern region is listed as Phuket, but to the best of our knowledge there were no installations there.

Table II below clearly shows that September is the month in both regions with the highest average rainfall. Based on the average rainfall, the photo above was taken during the wettest time of the year, yet surrounding jungle did not encroach on the clearing, nor was there any mowing, cutting, or other maintenance of the clearing. Nothing grew there.

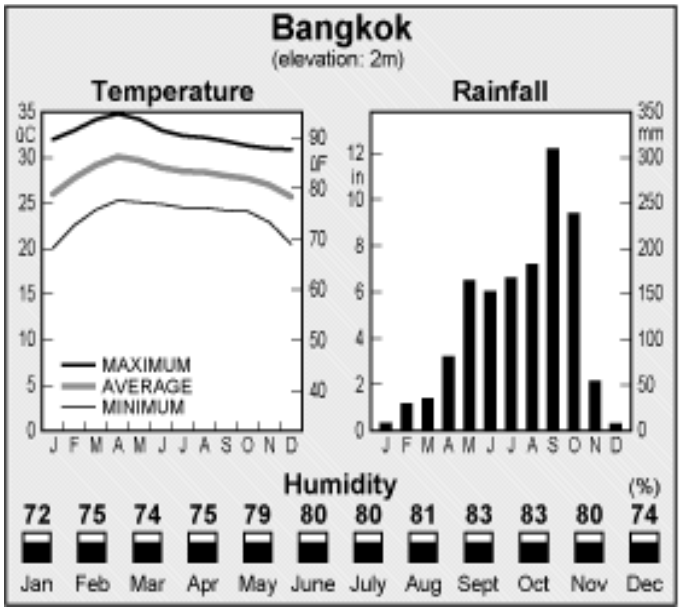
TABLE II

AVERAGE RAIN FALL FOR NORTH AND CENTRAL REGIONS OF THILAND

NORTH THAILAND



CENTRAL THAILAND



Any botanist will tell you that in such an environment the only way (other than herbicide) a permanent clearing like the one in the photo above could be maintained would be if it was bulldozed regularly, had heavy traffic, or was on pure white sand

with no nutrients. Otherwise it should have rapid regeneration of weedy plants and juveniles of the surrounding trees & shrubs. Any veteran who worked in the MSA will testify that there was no bulldozing, and with the exception of an occasional ox cart there was no traffic, and the ground was certainly not white sand.

Korat Kennel Area

Photo by John Homa

The above photo shows the area in front of the 388th Security Police Squadron K-9 Section Kennels taken in 1969. The area remained barren year round through the closure of the kennels in 1976. By comparing the barren area in the foreground where men are grooming their dogs to that in the distant background it is easy to tell that the bareness is unnatural.

Below is the same area, but taken a year later. Not only has the foliage not grown back, it has decreased

Photo provided by Bruce Spear

NKP

"The whole perimeter at NKP looked like it had been defoliated. Also in between the main runway and the taxiway always looked like the perimeter after the defoliations.

While stationed TDY at Korat RTAFB-Thailand I saw the perimeter and it looked like what our perimeter at NKP looked like after defoliation." – David Wharton, 1974-1975

"We used a chemical spray during road construction to clear foliage so that we could build culverts for roads near Sakon Nakhon. When my platoon was TDY to NKP we had to build perimeter fences and the Air Force provided the spray material to remove the foliage so that the fences could be built. Chemicals were stored in containers with orange stripes and we mixed the chemical with diesel fuel and loaded the mixture into a large tank mounted trailer that was pulled by an air compressor truck to spray the materials. This would have occurred from June 1967 to November 1968. There was another chemical spray that was used by GIs and locals hired by the military to spray around all of the buildings, hooches and all other facilities. I am not sure what the spray contained, however, it is possible it was Malathion." - Sidney Chancellor, 1967-1969

“During my first tour I frequently flew missions targeted to fly air cover for 123’s dropping Agent Orange. Also we flew missions to check the results, many times flying low over the drop area.

During my second tour as a FAC at NKP many times I flew missions over defoliated areas. I also crash landed an O-2 in Laos.” - Peter Lappin, Cam Ranh Bay, South Vietnam 1965 –1966 and NKP Thailand 1967 - 1968

NKP taken in 1960s

Photos by Al Budington

Below is a photo of the NKP perimeter as it appeared in 1971

Photo by Philip Carroll

Compare the area in the left of the photo to the right of the road. If the area had been clear-cut there would be evidence of cutting such as stumps or disturbance to the topsoil from cutting and removal equipment. This is typical of defoliation by chemicals

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TAKHLI

"Around the Bomb Dump and the Base Perimeter there were many areas that vegetation did not grow. These areas were where the K-9 units patrolled. At the CE compound they stored Pallets with 55 gal drums with orange stripes on them. Just before we closed the base these barrels disappeared." – Marty McCauley 1973-1974

"I was assigned duties in a base warehouse processing equipment and supplies. We had received an item of equipment that was classified and was required to be covered, but was not. I searched for the cover and under it were 40 barrels with green tops and white numbers 2,4,5-T. Over the course of my tour I witnessed additional barrels of 2,4,5-T process through the warehouse as well as barrels with the numbers 2,4,5-D or O. They also had white destination labels signifying they were for the 315th A/C Sq." – James Trapp 1966 - 1967

UBON

“After a sapper attack in July 1969, all foliage around the base, in front of perimeter and behind perimeter, was either cut or sprayed. New fences were put up (concertina wire) and machine gun bunkers installed. Foliage was kept short from that point on, just don’t know if it was sprayed or cut. I do know that there was an area, as you look down the runway, at the end and to the right that was used for dumping contaminated fuels and chemicals. My Sentry Dog, Duke 56M9, was confined to the kennels for a week, because of reaction to chemicals in that area, on the pads of his feet. I had to use another dog (Bullet) for that period of time.” – Timothy Potter 1969 - 1970

“There was no vegetation growing anywhere on the base and the trees that were on both the bases were dead. I also remember seeing the Air America people on our base at NKP in their denim type flight suits. On both bases there was mostly sand and very little grass growing. I always thought that was strange considering off basis there were trees and grass every where. The only place where I remember grass was around the base chapel at Ubon Royal Thai Air Base.” - Rodger Fausey Ubon 1968 – 1969, and NKP 1969 - 1970

UDORN

“Spraying the perimeter with a device with a 55 gal drums attached. Some had an orange stripe, some had also a purple or red stripe Also worked on C-123 A/C that had been using A/O in Ranch Hand” – David Fredrickson 1970-1971

“When we landed we thought it was a desert. No sign of green and the ground look like it was dead. Kicked up a lot of dust when we stopped.

They had a lot of different barrels with different color rings painted around them. There were hundreds of them. We use to watch them load these barrels at night and put them on aircraft at night and some during the day.” - Stephen Pippenger 1968 - 1969

Photos of Udorn from http://www.geocities.com/seavet72/FL/fl-aerial.htm

U-TAPAO

"While stationed at U-Tapao, I was quartered in what was called the Mod Barracks, which were a pre-fabricated, 2 story structure. In an area, between the Barracks and the Barbed Wire fence line and the fence line and the Jungle was just a barren dirt area, very unusual.

The areas surrounding the B-52 parking areas, spot V-1 and along J row towards the runway were barren and empty also." – John Provost – 1969 - 1967

"During my year as a sentry dog handler 1969/1970, much of the defenses along the perimeter road area were upgraded. The perimeter was widened. Areas of trees and brush along the perimeter road were removed to do this. I was on the perimeter only during the night. I didn't see what base engineers did during the day." – John Krammer 1969 - 1970

Photo above and below provided by John Provost

U-Tapao Perimeter Photos below by John Homa

REMOTE SITES

“I and Thai soldiers and others were hand spraying to clear the radar site on top of the mountain. We also drank the water ate and showered in the water from the Mekong river.

Where I was they were aerial spraying as well. I could see the Ho-Chi men trail, which was always sprayed.” – Christopher Milgo Phu-Mu, 1965-1967

Photo of Phu-Mu

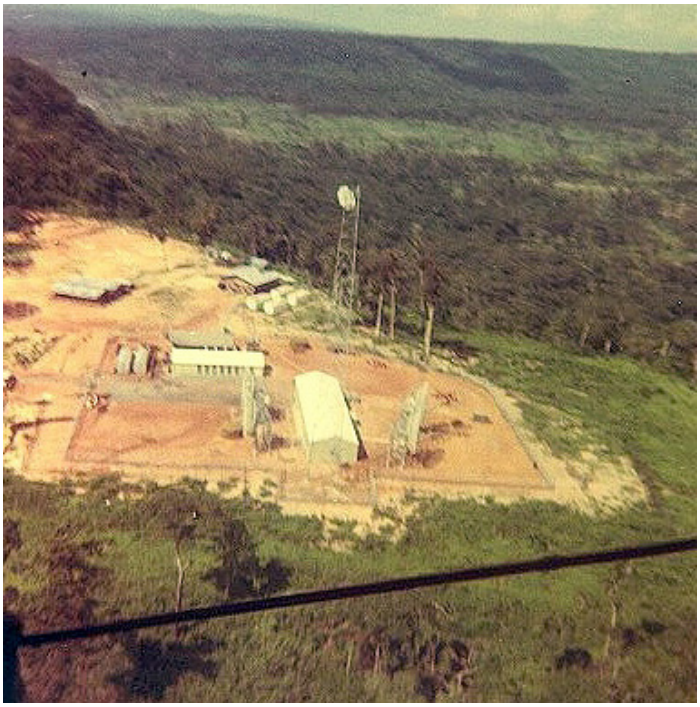
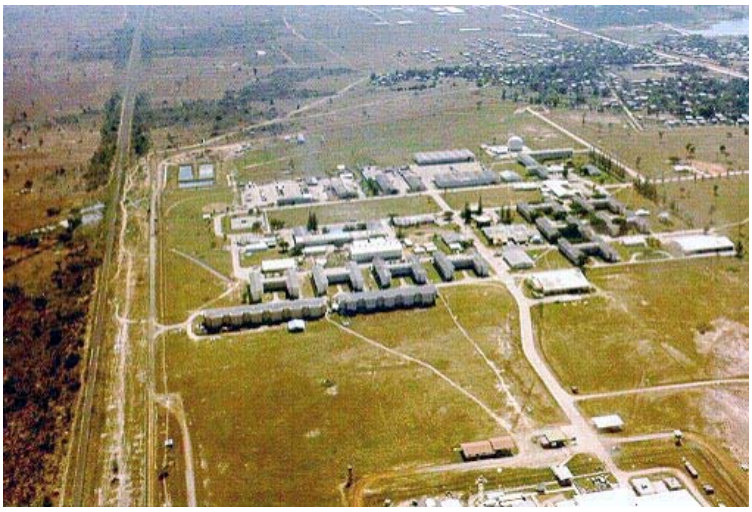
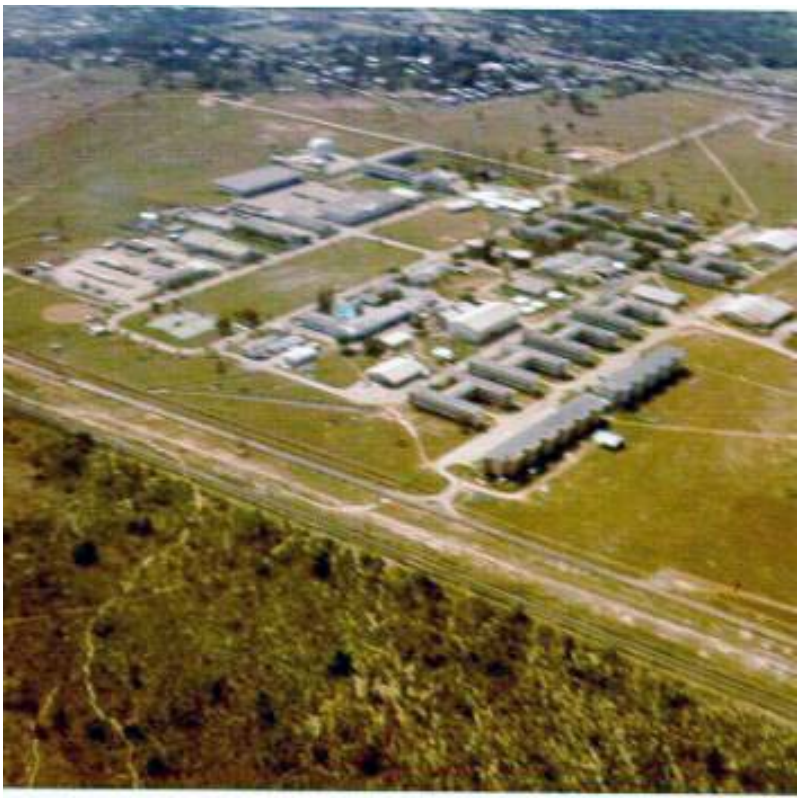


Photo by Bob Potter 1969

Photos below of Ramasun Station by Joseph R. Birdsall





Samaesan

Photo by Bob Potter

In order to obtain eyewitness accounts and other evidence, we sent a survey to Vietnam Veterans who served in Thailand, as well as made it available to veterans through Internet postings. Below are highlights of a few of those surveys that were returned by base. Exhibit 7 provides a copy of the survey and the information we received back.

INSECTICIDE EXPOSURE

Mosquitoes carrying malaria was a constant problem throughout the Pacific Rim. Also parasites such as fleas and disease carrying ticks posed health risks to Military Working Dogs (MWD) and their handlers. The chemical of choice was, and still is, Malathion. There is not a base in SEA and other areas such as the Philippine Islands (PI) where mosquito abatement did not occur. The frequency of fogging depended on the severity of the problem, but any veteran who has served in tropical climates has been exposed to Malathion.

In the case of MWD handlers, the exposure was particularly severe. Depending on the prevalence of parasites in a given location, the dogs were routinely dipped in a solution of water and %5 Malathion. The process involved lowering the dog into a large tub with the solution reaching a level midway up the dogs torso then the handler would reach into the solution, pulling the dog's legs out from under it so the dog rolled completely submerged through the solution. Then the handler lifted the dog out of the solution, walked the dog around the exercise yard while the dog shook the solution off its coat. Needless to say, the handler was as soaked with the Malathion solution as the dog was. Few handlers forget the burning sensation wherever the solution came into contact with their skin, especially on their arms, which were submerged with the dog.

The frequency of the dipping varied from once every other month at Korat RTAFB, to twice a month at Clark AFB in the Philippine Islands. The infestation of parasites was such a significant problem at Clark that the use of Malathion went beyond dipping. Handlers led dogs through a footbath at entrance to kennels, so there was a daily exposure to freshly mixed Malathion. Cathy Moore, one of the first female MWD handlers in the Air Force, was stationed at Clark and stated:

> *"During my 1976-78 tour at Clark Air Base, Philippines, we K-9 handlers were ordered by the base veterinarian to walk our dogs through Malathion foot baths upon returning each time the dogs were taken out of the kennels. These footbaths were placed at all of the kennel gates. There were 130 dogs during my time there. A short tour at Clark during that time was 15 months; an accompanied tour was 24 months. Since most handlers were young pipeline students on their first tours, most were single and rotated through in 15 months. We were exposed to Malathion on an almost daily basis.*
>
> *I never thought about Malathion exposure causing some of my medical problems until a recent visit to my pain management specialist. I have 4 herniated discs associated with degenerative disc disease in my lower spine that severely limits my mobility and is slowly crippling me. Two years ago, I began experiencing further problems wherein I no longer had leg muscle strength to kneel or stoop and raise myself back up into a standing position. After my doctor performed my physical evaluation, his first question was had I ever been exposed to chemicals while in the military! I told him about the*

Malathion exposure. He said that I had symptoms of chemical exposure and recommended further testing." – Cathy Moore, Clark AFB 1976 - 1978

Roger Marion, a U.S. Army MP Sentry Dog Handler who was stationed at Long Binh, South Vietnam had a similar experience. He stated in a returned survey:

"This may sound strange, but I have been misdiagnosed by doctors since the 70's. I used and was exposed to Malathion in Vietnam; we used it to dip the dogs in to kill insects and other critters. We dipped the dogs every six weeks. I usually helped with all the dogs and we had about sixty dogs in the company. Shortly after using Malathion in Vietnam I began to experience periods of "lack of air'. Then I stated clearing my throat all the time, later I began to have trouble swallowing. I went to the 24th Evac hospital and the tech there said I just had sinus drainage, he did not know what he was looking at, and was wrong. This scenario continued after Vietnam and with several doctors. I was prescribed everything you can imagine, nothing worked.

Only recently did my family physician, who is new to me said he wanted me checked further, so I went to the VA and to make this story shorter, I had an upper GI. The test that I had at the VA was a simple upper GI. In my case the test revealed that my larynx was not closing properly.

The results revealed Dysphagia, which is a swallowing disorder. It is a neurological or a nerve motor problem. I met with several doctors and nurses at the VA about my problem, and when we talked about what the cause could be, when I mentioned Malathion they sat up in their chairs. In their words, without a doubt the symptoms I have experienced since Vietnam could have been caused by regular Malathion exposure." – Roger Marion Long Binh, RVN 1971-1972

Malathion is one of the hazardous chemicals listed in the Agent Orange Act of 1991 as warranting compensation, but the VA gives little or no attention to it. The biggest problem, however, is the Act is restricted to a veteran being present in Vietnam.

While veterans serving this nation in locations other than Vietnam were exposed to the same chemical, and sometimes in higher doses, they are legally blocked from the compensation those serving in Vietnam receive. Malathion needs to be given the same level of attention that Agent Orange has received. Those whose career specialty codes were that of MWD handlers should be advised of their exposure and

given check-ups by the VA due to excessive exposure from dipping their dogs. The full extent of health risks to dog handlers is included in the following section.

Dog Dipping Korat RTAFB

Photo by John Homa

PATHOLOGY EVIDENCE

In time of war pathology studies are not conducted on soldiers who die. The cause is obvious and the focus of those who process the remains is to prepare them for transport back to their families as quickly as possible. Up until March 1979 that was not true for Military Working Dogs (MWD). Prior to that point all dogs who died serving in the U.S. Military, regardless of the cause of death, were required to be given a full detailed necropsy (autopsy).[14] Nearly 4,000 MWD were deployed to Southeast Asia during the War, serving with all branches of the military service. The Air Force deployed more than five hundred MWD to their seven bases in Thailand serving with their Security Police units as sentry dogs patrolling the base perimeter during the hours of darkness. The purpose of conducting the necropsies was to have available scientific data of the effect of environment, food, medicine and other living conditions on the dogs and subsequently the personnel that worked with them. The necropsy reports hold invaluable information as to what health hazards troops who served in the same area were exposed to. As noted in Rachel's Environmental and Health Weekly, dogs are good predictors as to how environmental conditions can affect human beings.

> *"Dogs have often served as sentinels of human disease. Back in 1938, the well-known researcher W.C. Hueper showed that beta-naphthylamine caused bladder cancer in dogs. In 1954, researchers showed that another industrial chemical, 4-aminodiphenyl, produced bladder cancer in dogs."*[15]
> (Copy included as Exhibit 8, see note 1)

[14] Military Medicine, Volume 159, Number 11, November 1994, Howard M. Hayes, DVM, Robert E. Tarone, PhD, Harold W. Casey, DVM PhD, Paul B, Jennings, Jr., VMD MSc, Paul K. Hildebrandt, DVM, Michael J. Reardon, DVM MS, page 673

[15] The Dogs Of War, Rachel's Environment & Health Weekly #436, April 6, 1995, Environmental Research Foundation, by Rachel Clark

The only dogs in Southeast Asia that escaped necropsy were those that were lost on the battlefield and unable to be recovered, those who were killed in action and because of the remote location were too decomposed when arriving at location with a military veterinarian, and those dogs transferred to the South Vietnamese or Thai forces when the United States withdrew from those countries. The necropsy for Air Force canine Brutus X321, who was euthanized at U-Tapao RTNAB due to severe hip displasia, is provided as Exhibit 9 providing the reader with a sense of the detailed extent of a necropsy report.

In the early to mid 1990s, a team of veterinarians and scientists conducted a series of studies of some 1,600 necropsy reports of dogs that served in Vietnam and made comparisons to necropsies of dogs with no service in Southeast Asia. The findings were striking. The dogs that served in Vietnam had nearly a two time higher incidence of testicular cancer over their counterparts with no service in Vietnam. The validity of correlating the necropsy records with health hazards that veterans were exposed to was born out in the study reported in the November 1994 Military Medicine. It was found the incidence of cancer in dogs was also true for veterans that both had service in Vietnam. The report states:

> *"We then evaluated Vietnam military service as a risk factor for testicular cancer among human cancer patients treated at three Washington, D.C. area hospitals from January 1976 to June 1981. We found a significant, 2-fold increased risk of testicular cancer associated with service in Vietnam, and as in the MWD study, a greater increase in risk was seen in younger patients."*[16]

[16] Military Medicine, Volume 159, Number 11, November 1994, "U.S. Military Working Dogs With Vietnam Service: Definition and Characteristics of the Cohort," by Dr. Howard M. Hayes, DVM; Robert E. Tarone, PhD; Harold W. Casey, DVM, PhD; Paul B. Jennings, Jr. VMD MSc; Paul K. Hildebrandt, DVM; and Michael J. Reardon, DVM, MS, page 669

Such studies have provided valuable information on the impact the environmental conditions in Vietnam had on the troops and dogs that served there. There can be no question that the necropsy reports and histopathological examination records of the MWD that were deployed to Thailand would reveal significant information as to hazardous chemicals that veterans were exposed to during their war service in Thailand. Copies of three of the reports are provided as Exhibit 10.

Such studies, however, have not been made of the records of the Thailand dogs. Because of the intent for future scientific study, the specifications for the necropsy are very detailed and required not only notations of findings, but also that a histopathological examination be made on tissue sets of the dogs. These reports, including tissue samples, were sent to the Armed Forces Institute of Pathology in Washington, D.C. As stated in the report, the necropsy records have been recorded on microfilm and are still available at the AFIP.

We know that the dogs that served in Thailand were destroyed when the U.S. closed its operations and withdrew in 1975 through 1976. A member of the 388th Security Police Squadron, K-9 Section at Korat RTAFB that was assigned to assist the veterinarian close the kennels has related the story of the closure.

> In Thailand the U.S. was closing operations on systematic method with the northern bases closest to the Laotian and Cambodian boarders closing first. Often dogs at the bases closed first were moved to those installations scheduled to close last, thus keeping assets and resources available if needed to defend against aggression during the withdrawal. As one of the last bases to close, Korat, which had operated with approximately 80 to 90 dogs since their deployment in 1968, had a little over 100 dogs at its kennels when operations there came to an end. The process of closing a K-9 unit in Southeast Asia is no better exemplified than the closure of the 388th SPS K-9 Section at Korat. James Hazelton was one of a couple dog handlers designated to assist Veterinarian Dr. Wilson put down the dogs, conduct the required necropsy on each dog, and close the kennels. Mr. Hazelton shared the following story of this dark and bitter end to the K-9 story in Thailand.

When perimeter security was turned over to the Thai military the K-9 handlers kenneled their dogs for the last time and were moved to the former Base Officers Quarters located near the center of the base waiting air transport to the U.S. Dr. Wilson with the aid of Hazelton and another couple handlers began the gut wrenching process of putting the dogs down.

The handlers would bring a dog in and Dr. Wilson would administer the lethal injection of Sodium Pentothal, referred to by handlers as “The Big Green Needle.” Five or six dogs would be killed, then they began the process of conducting the necropsy on an assembly line bases. Due to the detailed requirements of the necropsy it took the remainder of the day to complete them for the five or six dogs that had been killed. With the findings recorded and fluid and tissue samples taken, the dogs were then placed in a common grave. At the end of the first day having no appetite to take in the evening meal, Dr. Wilson took his aids to the officers club to dull their senses from the days grizzly task.

Returning the next morning to continue the their assigned duty they found the grave that was to be the dogs final resting place had been opened during the night and the carcasses taken. The Korat kennels sat within 100 yards of the perimeter with a small village within a few hundred yards of the fence. With little or no perimeter security it was easy for the locals to breach the fence and remove the dogs from their grave to take back to their village where they were eaten. The team proceeded through the same process as the day before, destroying another five dogs, completing the necropsies, and placing the animals in the common grave. On the following morning they found the graves had once again been raided. The closing team attempted to thwart the grave robbers by digging false graves, but it was pointless. The locals knew exactly which one held the dogs. This process continued each day for four weeks until 100 plus dogs had been destroyed and necropsies completed. Were it not for the necropsy requirements the destruction of the dogs would have not taken more that perhaps three days.

Of the more than 500 Military Working Dogs that were deployed to Thailand two were killed in action, two were wounded in action and returned to duty. Two were killed by their handlers, who were court marshaled and discharged for their actions. Five returned to the U.S., three were transferred to other Pacific Rim installations, and approximately four were turned over to the Thai military. The rest were destroyed. The listing of the MWD provided at Exhibit 11 does not include the dogs that were turned over to the Thai Forces, nor four puppies that

were born of an Air Force Sentry Dog breed prior to her deployment to Thailand. The dogs were U.S. gifts to the Thai Royal Family. The U.S. does not have necropsy reports on those dogs.

This bitter end to the Military Working Dog History in Southeast Asia has been shared here to emphasis not only the duration that the necropsy requirements added to the process of shutting down the kennels, but also to provide the public with an awareness of an ending to military operations that must never be allowed to happen again. The Thailand story was a repeat of what had happened in South Vietnam three years earlier. The dogs who served selflessly in Southeast Asia for eleven years from 1965 through 1976 are credited with saving American lives that number in the tens of thousands, yet in the end they were simply written off the books as excess equipment and destroyed. Given the number of chemical exposure claims that the Vietnam Veterans who served in Thailand have filed, to not look at the invaluable information that those dogs gave in going to their graves would be nothing short of a travesty.

We recognize that such a study would cost taxpayers money. However, the Congress of the United States recently took time and expended taxpayer's money to investigate the voluntary use of performance enhancing chemicals by professional athletes. It would be a sad commentary on the priorities of this nation if the Congress could not make a similar effort to investigate the hazardous chemicals that those who put their lives on the line in defense of this nation were exposed to. The men and women who stood in harms way did so being paid far less in one year than what many professional players get paid for playing one nine inning game of baseball.

SUMMARY

We veterans, and our families, are grateful for the time that, you, our elected representatives, have taken to review our concerns and grievance. We request and would welcome an opportunity to discuss these issues with you in a formal hearing. There is no doubt in the mind of any Vietnam Veteran who served in Thailand that we were exposed to the same defoliants and insecticides that our bothers an sisters in Vietnam were. We saw the foliage die and never grow back. We saw the barrels of with orange, blue, and white stripes that gave those chemical agents their names. We believe the evidence we have presented is compelling enough to warrant further investigation, if not recognition our exposure.

There is today, debate being raised as to what the responsibility is to our returning veterans, especially those who fought in a war that ended 30 years ago. While this government may argue what is owed a veteran in terms of health care, one thing cannot be debated. That is the service and war connection of damaged health caused by the exposure of defoliants and insecticides in the performance of one's duty. There is no difference between the wounds received by troops from friendly fire, and permanently damaged health from exposure to chemicals used in the conduct of war.

We recognize that the Department of Defense has for the last 30 years denied that Agent Orange was used in Thailand, but then it also denied it was used in Korea. In November 2004, after a story became public, the Pentagon admitted that our troops in Korea were indeed exposed to Agent Orange. At minimum the credibility to the denials has to be seriously questioned, particularly given the evidence and overwhelming number of veterans who remember seeing their bases defoliated. The documentation, testimony, and photographs presented here, along with the willingness of veterans to testify to what they saw, and the

records available in the Armed Forces Institute of Pathology should provide more than conclusive evidence of what our troops were exposed to in Thailand.

Whether or not this Government decides that compensation is owed those who faithfully served our nation is a political decision. Regardless of that decision, the Government of the United States cannot escape its moral obligation to inform those who in its service were exposed to hazardous chemicals, and what those chemicals and health risks are. Denial only serves to hinder the veteran and his medical practitioners from proper diagnosis and treatment, no matter who pays for it. The testimonies of Cathy Moore and Roger Marion on pages 37 and 38 are clear examples of why it is important to inform veterans what they may have been exposed to and the potential health hazards.

In recent months, the United States brought legal action against the W.R. Grace corporation for exposing workers and citizens in Montana to vermiculite and asbestos. The charges include conspiracy to hide from the people the dangers to their health. If those who served in Thailand during the Vietnam War were exposed to hazardous chemicals and the Department of Defense continues to deny such exposure, we must ask what is the difference between what the Defense Department has done and what W.R. Grace is accused of doing in Montana?

If the Committee on Veteran's Affairs questions the true impact that hazardous chemicals have had on the physical and mental state of veterans, we suggest you not ask the veterans to come before you to tell you. Instead ask their spouses what the impact of war is. Listen to their heartbreak of seeing their love one's health deteriorate. Listen to the nightmare of living with someone with mysterious mental disorders and behaviors. Hear about the financial hardships, bankruptcies, and loss of homes. Talk instead to the ones whose war began when their loved one came home. It is a war that will never end.

The Vietnam War may be old history, and one this nation hungers to put behind us, but let us remember that we are talking about taking care of the men and women who stood in harms way for this nation when it was not popular to do so. Men and women who put off going to college, delayed marriages and growing a family, and left loved ones behind to serve this nation first while others stayed safe under deferments. The men and women who were exposed to hazardous chemicals chose to serve when others were burning draft cards and running to Canada. That is something that should never be forgotten or put behind us, and until **all** of those who died, were injured, or have fallen ill from their service are taken care of, regardless of what part of the theater of operations they served in, Vietnam will continue to haunt us.

EXHIBITS

EXHIBIT 1

Thailand - The Difference of A Line

THAILAND
The Difference of A Line
By David Adams

We were young, eager, and proud as we boarded the flights that would carry us to Southeast Asia, to a mystical land we had only read stories about. We were going to have the opportunity to put our training to use and perhaps experience the ultimate test. We wondered if challenged would we have the courage to make a stand against an attacking foe? Like our fathers before us, it was our turn to defend freedom. We grew from young boys waiting and expecting to have the same opportunity they had, and now that time had arrived. As our plane winged its way to our destination we crossed over the southern end of South Vietnam, the Delta, and Cam Ranh Bay. We looked out the windows at the land we had been seeing on the news through most of our high school years. The Stars and Stripes painted on the plane's tail filled us with pride in all that the flag stood for. We were certain of our nation's cause to spare a people from the oppression of Communism.

We performed our duty, went where we were told, and stood the line of defense in harm's way. Those of us who returned home in a seat on the freedom bird rather than in its cargo hold found, like our brothers and sisters coming home from Vietnam, that the homecoming our fathers earned was not to be our experience. The welcome mat had been removed and was replaced with anger, taunting, and hurled accusations. The uniform we so proudly wore was spit on. Young people who themselves had avoided service could not separate the returning warriors from the policies made by the politicians and supported by the nation that sent us to the battlefields. We were sent with an instilled sense of duty and a license to destroy the enemy, but somewhere between our departure and our return, the license was revoked.

Those of us who were sent to Thailand came home to a war we could not have fathomed. We were "Vietnam Veterans" drawing the distain of those who opposed the war and disgust of those who were its proponents. We were war mongers to some and the generation that lost a war to the others.

Reaching out to our brothers who served in Vietnam, thinking they would understand, we received instead the worse rebuff of all.

"You were in Vietnam?" we would ask.

"Yes, you?"

"Yes I was Air Force Security Police in Thailand, ," we would proudly reply.

"Oh, you weren't in-country," the Nam veteran would say in a trailing voice as he turned and walked away.

We quickly learned we were not the same as other vets. Instead we were second class citizens. So, it was easier to keep the memories of our service to ourselves rather than feel the scorn of those who opposed the war, the disgust of those who saw us as losers. Being discounted by those who were "in-country" made us to feel our service did not warrant the pride we had felt.

Finally, the great healing Wall was built to bring our nation back together, to let us remember those we lost realize the true cost of the war. It is a fitting memorial for those who came home in the cargo hold, or never came home at all. We summoned our courage to face the shiny black granite to look at the names and into the Wall's great depth as if we could see our brothers and sisters again. We reached out to touch them, feeling the coldness of the black granite. Then we looked for the names of those who were there with us guarding the base, the planes, and bombs bound for the Ho Chi Minh Trail, the Red River Valley, and Hanoi.

Where is James Francis? Surely he must be here. He died trying to save the lives of two men in a burning bomb revetment. He pulled them out, but could not get them far enough away before the bombs, that were supposed to blow up in Hanoi, exploded killing him and those he tried to save. Where are the rest? They all died earning the Vietnam Service and Vietnam Campaign Medals. Certainly they're here with the others who gave all they had to give. Then the reality set in. They died west of a geographical line on a map which determined that the sacrifice of one's life meant much less there than that of those who perished on the other side. Just a simple line really, but what a difference a line can make.

Like water poured on sun-parched soil that spreads unstoppably into every crack, one lie leads to another in order to sustain the ones told before it. When the war was over, those who were not included in the "total" troop strength could not possibly be counted among the losses of the war. So we found it was true: the first casualty of war is truth, and our honor became its victim. Our brothers who died in Thailand were not to be included in that final body count. Well, yes it was a half truth because the question, "what about those who were in Thailand," was not asked. But then, anything less than full truth is in reality a lie, and once told, the lie must be perpetuated. It was a true case of stolen valor, stolen by those who sent us to war.

Years later when we became ill with diabetes II, testicular cancer, prostrate cancer, Hodgkins, Non-Hodgkins lymphoma, a lose of strength in our muscles, unexplained chronic pain, and worst of all, our children born with terrible birth defects, we wondered why. There was no family history. Then it occurred to us. We remember how we saw the perimeter of our bases defoliated. Why didn't it seem strange to us at the time that in a tropical climate nothing grew in those barren areas along the perimeter where we stood watch, not even during the monsoons. We had been exposed to Agent Orange no different than those in Vietnam were. In filing our claims with the VA, the agency charged with providing our nation's compassion and care to its veterans, we found the lies had beaten us there. "We never sprayed Agent Orange in Thailand, and since you did not serve in Vietnam, you do not qualify for compensation." Again we were victim of the line on the map. Again we were told, "You and your service do not count."

It is said that time heals all wounds, but that is as big a misconception as the age old saying, "sticks and stones may break my bones, but names will never hurt me." Names do hurt, a hurt that is as deep as an ocean and lasts, as the river is long. The only thing time does allow us is to reunite with our band of brothers, supporting and reassuring one another in our shared knowledge of reality. It helps us understand that in the end, what others may think of our service to our nation is not important. Rather, we reassure one another that the truth lies in our own heart and soul, that we served with honor, and in so doing, we will truly "*Take Care of Our Own.*"

EXHIBIT 2

USAF Letters of Commendation

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 315TH SPECIAL OPERATIONS WING (PACAF)
APO SAN FRANCISCO 96321

REPLY TO
ATTN OF: C

9 Jan 1969

SUBJECT: Letter of Commendation

TO: 12th Sp Ops Sq (C)

1. I am very pleased to forward the attached letter praising Lt Colonel David E. Stockton and his flight for their special operation conducted from Udorn RTAFB from 29 Dec 68 through 2 Jan 69.

2. This highly professional performance has efficiently contributed to the Air Force mission in SEA, and it has added another page in the book of air doctrine which the Ranch Hands are writing so splendidly.

3. Please convey my personal appreciation to Lt Colonel Stockton and the other members of the flight for this fine performance of duty.

John W. Pauly

JOHN W. PAULY, Colonel, USAF
Commander

1 Atch
432TFW (C) Ltr,
dtd 3 Jan 69

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 432ND TACTICAL RECONNAISSANCE WING (PACAF)
APO SAN FRANCISCO 96237

REPLY TO
ATTN OF: C

3 Jan 1969

SUBJECT: Letter of Commendation

TO: 315 Air Commando Wing (C)
APO 96321

1. Lt Colonel David E. Stockton, FR52210, commanded a flight from the 12th Special Operations Squadron which operated from Udorn RTAFB during the period 29 Dec 68 through 2 Jan 69. I am extremely impressed with the professionalism displayed by Lt Colonel Stockton and his men in the conduct of their special mission. Lt Colonel Stockton exhibited outstanding leadership and the missions were throughly planned and effectively executed. The "Ranch Hands" functioned as a smooth, completely integreated team manifesting cooperation and an esprit de corps which was noted by all who worked with them. The expert management of all necessary equipment and the professional flying ability demonstrated by these men contributed immeasurable to the highly successful completion of their mission.

2. I wish to express my appreciation and gratitude to Lt Colonel Stockton and his men for "a job well done". Your expert performance of duty has inspired all of us.

Wendell L Bevan Jr

WENDELL L. BEVAN, JR, Colonel, USAF
Commander

Cy: 3 TFW (C)
APO 96227

DEPARTMENT OF THE AIR FORCE
12TH SPECIAL OPERATIONS SQUADRON (PACAF)
APO SAN FRANCISCO 96227

REPLY TO
ATTN OF: C

13 January 1969

SUBJECT: Letter of Commendation

TO: Airman First Class Patrick S. Courneyer

1. I think you all must know my sincere pleasure in forwarding the attached letters to you.

2. Your efforts, bravery, and superior performance have covered the Ranch with glory.

3. A copy of this letter will remain on file at my office and appropriate remarks will be included in your next OER or APR as appropriate.

REX K. STONER JR., Lt Colonel, USAF
Commander

2 Atch
1. Ltr, 432TFW(C), 3 Jan 69
2. Ltr, 315SOW(C), 9 Jan 69

EXHIBIT 3

Col. Russell A. Downey Memorandum

DPL-A
DO-X

UNITED STATES MILITA[redacted]
Office [redacted]
APO S[redacted]

MACJOIA 24 February 1967

MEMORANDUM FOR GENERAL MOMYER

SUBJECT: Spray Aircraft for Mosquito Control

1. Colonel Mosely, MACV-J3 (Mosquito Project Officer), called our office this morning requesting assistance on information that we may have regarding spray equipped C-123 aircraft stationed in Thailand.

2. It seems that General Westmoreland has tasked the MACV staff with the responsibility for equipping a spray type airplane to be used in South Vietnam for mosquito control.

3. Colonel Mosely and I contacted Colonel Froehlick, Commander 315th ACW for information concerning the spray equipped C-123's in Thailand and to solicit his ideas and recommendation for establishing such a mosquito control program in South Vietnam. Colonel Froehlick stated that the 606 Composite ACS located at Nakhon Phanom, Thailand has six of these aircraft and nine crews and that they could be readily equipped with wing booms and tanks if the decision was made to select one of these aircraft to fill the requirement. However, Colonel Froehlick and Colonel Mosely both concur that with the arrival of the eighteenth C-123 RANCH HAND equipped aircraft this month, that the shortage of herbicide chemical in country could allow the use of a RANCH HAND airplane for mosquito control on a short-time basis to meet the 1 March date established by General Westmoreland, or until such time as the contract for additional herbicide delivery to South Vietnam could be effected.

4. Based on the above information MACV will propose to 7th AF that a 12th ACS RANCH HAND airplane be configured for mosquito control beginning 1 Mar 67. It is further proposed that the selected aircraft be painted a distinctive color (possibly a loud yellow) and that

(20)

Those the Jets flew in support of
Spray missions - from Thailand
Came back to base Contaminated

MACJOIA
Subject: Spray Aircraft for Mosquito Control

leaflets be dropped simultaneously with each mosquito spray operation telling the Vietnamese people that this airplane is a good bird and that it will kill the harmful mosquito. It was also proposed that every effort be made to condition the Vietnamese people of this program by leaflet or any other means available prior to flying an aircraft into a selected area.

5. Recommendation: That a 7th AF RANCH HAND aircraft allocation for purpose outlined above be favorably considered upon receipt of official requirement.

RUSSELL A. DOWNEY
Colonel, USAF
Assistant Deputy Commander
for Air Operations

I will take a look at it and get this to you for advance copy

EXHIBIT 4

National Academy of Sciences Report: Veterans and Agent Orange: Health Effects of Herbicides Used in Vietnam (1994)

two to four weeks (Darrow et al., 1969). The remainder was used in defoliation or sprayed around base perimeters, being delivered by helicopters or ground vehicles with sprayers attached to them (Young et al., 1978).

Agents Pink and Green were used in small quantities; however, official records of herbicide sprays during the early years of the program (1962-1964), when these two herbicides were used, are incomplete. Young and colleagues (1978) reported the use of 122,792 gallons of Agent Pink, a 60:40 mixture of the *n*-butyl ester and isobutyl ester of 2,4,5-T. Pink had been previously tested in the 1953-1964 defoliation program in Thailand (U.S. Army, 1965). Agent Green was a single-component formulation of the *n*-butyl ester of 2,4,5-T. Slightly more than 8,000 gallons of Agent Green was sprayed, primarily in defoliation missions (Young et al., 1978).

In January 1965, two additional herbicides, code named Orange and White, were introduced into the herbicide program. Agent Orange, a 1:1 mixture of 2,4-D and the *n*-butyl ester of 2,4,5-T, accounted for approximately 61 percent of the recorded herbicide use. Orange was the general-purpose herbicide for defoliation and crop destruction, with leaf fall in three to six weeks and control persisting for seven to twelve months. According to military estimates of herbicide use, 90 percent of Agent Orange was used in Ranch Hand forest defoliation missions; 8 percent was used in Ranch Hand crop destruction missions; and 2 percent was sprayed from the ground around base perimeters and cache sites, waterways, and communication lines (NAS, 1974). Mangrove forests were especially sensitive to the effects of Agent Orange—a single application killed them (NAS, 1974). Annual crops were killed rapidly by one application of Agent Orange; root and tuber crops, and perennial and woody tropical crops such as jackfruit, papaya, and mango, were also susceptible to Agent Orange (Young et al., 1978).

Orange II was introduced later in the program. It differed from the original Agent Orange in that the *n*-butyl ester of 2,4,5-T was replaced by the isooctyl ester; however their herbicidal effects were similar. According to procurement records, less than 10 percent of the total Agent Orange used was Orange II (Craig, 1975).

White was the code name for Tordon 101, a liquid mixture of 2,4-D and picloram. Approximately 5.25 million gallons of Agent White was dispensed during Ranch Hand operations. More than 95 percent of Agent White was applied in defoliation missions (NAS, 1974; Young and Reggiani, 1988). Because of the persistence of Agent White in soil, it was not recommended for use on crops, but was most often used in areas where longer persistence rather than immediate defoliation was desired, such as inland forests. White was effective principally on broadleaf herbaceous and woody plants. The herbicide's action on woody plants was usually slow, however, and full defoliation did not normally occur for several months (Young and Reggiani, 1988).

New York, demonstrated the long-term effectiveness of aerially dispensed herbicides in improving visibility for military operations (Buckingham, 1982). An improvised helicopter spray system delivered a 1:1 mixture of 2,4-D and 2,4,5-T over a 4-square-mile area at a quantity of one-half gallon per acre. Evaluation of the effectiveness of the defoliants on vegetation was made one year later and again in October 1962. In 1960, no signs of regrowth had occurred in the sprayed area. Upon reexamination in 1962, it was observed that maple trees, which had been predominant in the area, appeared to be dead. Sprouting had occurred in some other species of trees, and one species appeared to have recovered from the chemicals' effects. In general, trees throughout the area had been killed, and visibility had been improved nearly 100 percent (Warren, 1968). Additional field tests in the Florida Everglades and Puerto Rico demonstrated the chemicals' defoliant activity (MRI, 1967).

By 1960, the U.S. Army had tested numerous herbicides and aerial delivery techniques (MRI, 1967). With the anticipated intensified involvement of U.S. military advisory forces in Vietnam, the large-scale use of herbicides was pursued. In 1961, the U.S. Department of Defense conducted the first operational field tests in Vietnam of 2,4-D and 2,4,5-T, the major herbicides to be disseminated in Vietnam over the next 10 years. The primary purpose of the early missions was to test the soundness of the defoliation concept as well as to measure optimum chemical concentrations and methods of delivery (Collins, 1967; Warren, 1968). Results of these early defoliation tests were mixed, and military authorities urged continued testing and evaluation of the herbicides in Vietnam (Buckingham, 1982).

A test program was conducted in Thailand during 1964-1965 to evaluate the effectiveness of aerial applications of various formulations of 2,4-D, 2,4,5-T, and other chemicals in the defoliation of jungle vegetation representative of Southeast Asia on several 10-acre plots. Aerial spray treatments were applied at rates of 0.5 to 3.0 gallons per acre, and at two- to three-month intervals, to determine minimal effective rates and proper season of application. Defoliation effectiveness was measured in terms of rate, volume, canopy penetration, vegetation response, and season of application. Results of the test program showed that (1) 2,4-D and 2,4,5-T were effective for long-term defoliation, with more complete defoliation and longer duration of effective defoliation at higher rates of application; (2) best results were achieved during the rainy or growing season; (3) defoliation responses were influenced more by rate than by volume of chemical applied; (4) woody species varied in the duration and degree of defoliation; and (5) complete defoliation of all species in mixed forest types was not achieved (Warren, 1968).

EXHIBIT 5

The Air Force and Herbicides in Southeast Asia 1961-1971,

by Major William A. Buckingham, Jr.

OPERATION RANCH HAND

The Air Force and Herbicides in Southeast Asia 1961–1971

WILLIAM A. BUCKINGHAM, JR.

OFFICE OF AIR FORCE HISTORY
UNITED STATES AIR FORCE
WASHINGTON, D.C. 1982

would consume the 112,000 gallons of defoliant currently remaining in South Vietnam.*

A similar recommendation from General LeMay, having just concluded a visit to South Vietnam, supported Delmore's idea. Hetherington warned TAC that if spray operations did resume, Ranch Hand might not leave Southeast Asia until July, and he advised a delay in executing OPORD 49-62.[32] One day later, PACAF recommended to CINCPAC that two spray-equipped C-123s remain in South Vietnam at least until they had disposed of all herbicides then in the country and that the other two Ranch Hand aircraft be swapped for cargo versions.[33] TAC ordered the deployment of the four cargo C-123s halted on April 25, leaving them at Luke AFB awaiting further orders.[34]

CINCPAC approved the PACAF proposal to swap only two of the Ranch Hand planes, and two C-123s departed Luke for Southeast Asia on April 28 while the other two planes returned to Pope.[35] In early May, one of the Ranch Hand C-123s returned to the United States by the Pacific route while another, under the command of Capt. Charles F. Hagerty, flew to Iran and Afghanistan to spray locusts. This aircraft returned to the United States on June 10, 1962 by way of Europe, thereby completing the first "around-the-world" flight by a C-123.[36]

On June 13, 1962 another package of proposed spray missions left Saigon on its journey up the chain of command. General Harkins indicated that officials of the South Vietnamese government were pleased with the defoliation results they had seen so far, and they had demonstrated their continuing interest by submitting requests for further missions. As he had said in his operational evaluation of the earlier missions, the American commander noted that herbicides had proven to be successful in clearing vegetation around military installations and in mangrove areas. Therefore, his proposal for renewed operational use concentrated on clearing an area surrounding the air base at Bien Hoa and improving security along roads, rivers, and canals in mangrove areas. In total, he nominated six targets totaling 15,486 acres for spraying, an effort which would consume 46,458 gallons of herbicide. The acreage, however, was later reduced around Bien Hoa from 786 to only 160 acres. Harkins said that Vietnamese helicopters would spray near Bien Hoa, but that Ranch Hand C-123s would handle the other five targets.[37]

Admiral Felt's response to the MACV proposal came within 72 hours. He readily endorsed the operation around Bien Hoa, but he sent the other targets back to Saigon for more justification. He requested information on

*Evidently around April 1962 President Kennedy approved an additional operational herbicide test along seven kilometers of road in South Vietnam. However, he rescinded this authorization on May 2, 1962 before Ranch Hand had flown any missions and stated that Thailand would be a better place for such a test. See Michael V. Forrestal, Memorandum of the President's Instructions at the Laos/Vietnam Briefing, May 2, 1962.

While the State Department mulled over a final position on the issue, officials in the Department of Defense moved with greater haste. On August 4, Dr. Harold Brown, the Director of Defense Research and Engineering, while taking no position on the political or operational advisability of crop destruction, said that there was a substantial probability that the operation in Phu Yen Province would fail unless additional technical expertise entered into its planning and execution. Dr. Brown recommended that if the program were approved, General Delmore and a small staff of Army, Air Force, and Agriculture Department personnel should go to Vietnam to assist General Harkins in the technical aspects of the operation. Dr. Brown also expressed his technical concern over the "first-of-its-kind" character of the Phu Yen spraying which would be part of a larger military operation and would take place before testing the chemicals, personnel, spray equipment, and tactics in a controlled area. He said that such a test should take place in Vietnam or Thailand if possible before the operation in Phu Yen.[14]

At the recommendation of William P. Bundy and the ISA staff, Secretary McNamara on August 8, 1962, signed a memorandum to President Kennedy which incorporated the Joint Chiefs' position in favor of crop destruction. Basically, he repeated the arguments for the Phu Yen operation originated by Saigon planners. He also noted that herbicide spraying would be closely coordinated with the Hai Yen II clear-and-hold operation then in progress, and that this would be the first time since the successful campaign of the British in Malaya that a strategic hamlet program had been combined with complementary food denial operations. McNamara promptly pointed out that there was ample precedent for destroying crops in South Vietnam—both government and Viet Cong forces had been burning fields routinely for a number of years. He noted that a helicopter could destroy an acre of crops in about five seconds, and as a result the Defense Department's position paralleled the South Vietnamese view that herbicides were merely a more efficient way of accomplishing a familiar end. The only possible negative aspect acknowledged in the memorandum was the psychological and propaganda fallout from crop spraying, and Secretary McNamara cited Ambassador Nolting's estimate that such reaction would be relatively negligible.[15]

Meanwhile, the State Department was pressured for its official position. On August 8, 1962, Ambassador Nolting again emphasized in a message to Washington that time was becoming a crucial factor. He warned that if the operations did not begin in the next few weeks, many of the crops would be too mature to be seriously affected. In this event, he said, the crop destruction operations might bring propaganda disadvantages with no offsetting military or psychological gains.[16] Admiral Felt dispatched an additional plea on August 21.[17] On the same date, Ambassador Nolting informed the State Department that South Vietnamese Secretary of State Thuan had formally requested 5,000 gallons of chemicals for crop destruction, and Nolting said that it was becoming increasingly urgent to receive a decision on this proposed "trial run."[18]

VI. Ranch Hand's Mission Expands and Becomes Routine

Ranch Hand's three spray planes had flown their last herbicide mission in December 1962, prior to the issuance of the May 7, 1963, guidelines. The South Vietnamese dry season and the confusion over high-level policy limited Ranch Hand's activities during the intervening five months to assignments not related to the spray work for which the unit had come to Vietnam. In this interim period, they flew transport, navigational aid testing, and radar target missions. The transport flights were in support of the Mule Train logistics mission and included the delivery of cargo, munitions, and personnel. Ranch Hand aircraft and crews also participated in some combat parachute drops. Two of the unit's C-123s had special radio gear installed to test the British-designed Tactical Air Positioning System (TAPS), and they flew a total of 65 sorties in support of the TAPS testing program. As part of an effort to develop a ground controlled intercept (GCI) capability in South Vietnam, Ranch Hand crews and aircraft flew simulated hostile aerial penetration flights during this period. They generally flew at low level and provided excellent GCI practice to both ground radar operators and U.S. and Vietnamese pilots.[1]

Ranch Hand finally got back into the spray business in June 1963, when the unit began applying herbicides along 46 kilometers of canals on the Ca Mau peninsula. Eight sorties, dispensing 7,200 gallons of chemicals, were flown in this region of IV Corps between June 6 and 9. Only light enemy ground fire harassed the crews over these targets, with no damage to Ranch Hand's C-123s. The unit flew spray missions again in July, this time along a power line extending from Da Lat to Bien Hoa. From July 3 through 27, Ranch Hand sprayed 10,722 gallons of herbicide during 19 sorties along 58 kilometers of the transmission line right-of-way. Because the line traversed mountainous terrain, Ranch Hand crews first surveyed its entire length to determine which portions were suitable for spraying by their C-123s, and which would have to be covered by slower, more maneuverable VNAF helicopters. Ranch Hand sprayed this series of targets without incident, except for delays because of adverse weather conditions.[2]

In August 1963, Thailand requested Ranch Hand's aerial spray services through the U.S. State Department. This neighboring Southeast Asian country was suffering widespread and serious crop damage from locusts. One Ranch Hand aircraft and crew flew to Thailand on August 30 to coordinate the requested insect eradication project. On the following day, they flew the first of 17 insecticide missions which continued until September 16.

A second Ranch Hand aircraft arrived to help on September 8. Thai officials considered Ranch Hand's work, which demonstrated the unit's diversified aerial spray capabilities, extremely successful.[3]

The May 7 message from the Secretary of State required that a full report and evaluation of all 1963 herbicide operations to date be sent to Washington by the first week in July. Because Ranch Hand had not resumed spraying until June and because the crop destruction spraying in 1963 had been very limited, American officials asked for and received authorization to move the due date back to October 1.[4]

On September 4, 1963, MACV appointed a team to conduct this evaluation and prepare a report. U.S. Army Lt. Col. Peter G. Olenchuk headed the team. He was assisted by Army Lt. Col. Oran K. Henderson, Air Force Maj. Wayne E. Davis, and Mr. Robert T. Burke of the Political Section of the American Embassy in Saigon. This team of Americans had the mission of evaluating the technical adequacy, military worth, psychological and civil affairs aspects, policy, and procedures of herbicide operations which had taken place in South Vietnam since September 1962. They selected this broader base period covering ten defoliation and two crop destruction targets to provide a sufficient amount of data for evaluation.

Using C-123 aircraft, team members and their assistants flew over all sections of the defoliated targets under study at 75 to 150 feet in order to assess vertical and horizontal visibility in the defoliated strips in comparison with contiguous unsprayed areas. At least five observers rated each target on standardized forms, and they tested inter-observer reliability by overflying non-defoliated areas, obtaining close correlation of observer visibility estimates. The team estimated the average vertical and horizontal visiblity over non-sprayed areas adjoining the nine defoliated targets as 40% and 30%, respectively. However, over the defoliated areas, average vertical visibility had improved to 80%, and horizontal visibility had increased to 75%. They found no major technical deficiencies in the Ranch Hand spray equipment or aircraft, but they did note that the effectiveness of the spray was sometimes degraded by the inherent inability of the C-123s to follow precisely the sharply twisting and turning paths of roads, rivers, canals, and the power line. Although they did not personally inspect the crop destruction targets, they noted that conclusive reports indicated that except perhaps for some root crops, the sprayed fields had been 100% destroyed.

The Olenchuk Report rated the military worth of defoliation and crop destruction as high. The team found that improved visibility had eased the problem of providing security in defoliated areas, had made aerial surveillance much more effective, and had enabled ground security forces to be reduced.* Defoliation had also created an increased field of fire for

*This latter result would have been a questionable benefit in the eyes of some critics of U.S.-GVN counterinsurgency strategy because it reduced the government presence on the ground in contested areas and increased Saigon's reliance on remote technological means of control.

Zone D began in August. In August and September, UC-123s flew many missions over the Iron Triangle. On October 31, 1966, a Ranch Hand aircraft crashed in the Iron Triangle and, although the plane was totally destroyed, the crew was rescued. Spraying in War Zone C got underway in early September and continued for the remainder of the year. August also saw the start of activity in the Mekong Delta region of IV Corps. Many smaller defoliation targets along roads were sprayed from time to time. By the end of the year, herbicide operations were routinely taking place in all regions of South Vietnam.

Hostile fire was present over most targets, but Ranch Hand's increasing level of operations made fighter cover difficult to obtain during part of the period from September through November 1966. Lack of fighter escort caused cancellation of some missions, especially in III and IV Corps. In August, Ranch Hand received three new spray planes, and four more were added in September bringing the total number of UC-123s available to fourteen. Ranch Hand crews, eager to accomplish as much as possible with the new aircraft, occasionally tried to do too much. Clear weather in the area just south of the Demilitarized Zone (DMZ) in September 1966 allowed Ranch Hand to fly as many as four sorties per aircraft per day. Predictably, the herbicide supply ran low and the planes fell behind on their maintenance schedules. These circumstances forced the crews to stretch out their operations so that maintenance and supply could catch up.

The last quarter of 1966 saw further expansion of the Ranch Hand mission and the unit's establishment as a separate squadron. On October 15, the Special Aerial Spray Flight of the 309th Air Commando Squadron was discontinued and the 12th Air Commando Squadron (ACS) came into being, retaining the code name Ranch Hand which had been applied to USAF herbicide activities in Southeast Asia since 1961. Lt. Col. Robert Dennis was the first commander of the 12th ACS which became a permanent part of the 315th Air Commando Wing (ACW), Troop Carrier. On December 1, the 12th ACS moved its base of operations from Tan Son Nhut to Bien Hoa.

Prior to its redesignation, Ranch Hand took on a secondary mission, spraying insecticide to control malaria carrying mosquitos. This public health mission continued even after herbicide operations ceased in 1971. Employing "Patches," the UC-123 used against locusts in 1962, a test program began in Bangkok, Thailand, on October 14, 1966. Three days later insecticide spraying began in South Vietnam. Workers had stripped "Patches" of all camouflage paint and coated it with an alodine compound to guard against the insecticide's corrosive effects. In the air, insecticide work also differed from herbicide missions. Insecticide missions were longer, making fuel conservation critical. The low rate of application, 8 ounces per acre, enabled one insecticide sortie to cover about 15,000 acres. Insecticide missions, however, did not require the precise navigation of herbicide spray runs. In any event, by the middle of 1967, Ranch Hand was flying about 20 insecticide sorties per month.[31]

During October, as the insecticide program got underway, the squadron continued its primary mission. Weather conditions hampered Ranch Hand's defoliation activities in the A Shau Valley and near the Demilitarized Zone, allowing increased spraying in Laos. To the south, in Vietnam, they tested the effectiveness of a reduced rate (1½ gallons per acre) of orange herbicide on mangrove trees in the Rung Sat Special Zone (south of Saigon) and in the Mekong Delta. The results were disappointing, and the targets had to be resprayed to achieve the desired results.[33]

In 1966 Ranch Hand received permission to spray an area that, though small geographically, was very important militarily—the southern portion of the Demilitarized Zone separating North Vietnam from South Vietnam. Infiltration by North Vietnamese troops across the DMZ was a significant threat to U.S. and South Vietnamese troops in I Corps. Defoliation there would help to uncover infiltration routes and supply stockpiles. On August 16, 1966, Ambassador Lodge informed the Secretary of State that General Westmoreland had proposed defoliation in and immediately south of the southern half of the DMZ, that is, that portion of the DMZ south of the Provisional Military Demarcation Line (PMDL), all of which was in South Vietnam. Ambassador Lodge had the authority to approve herbicide missions in South Vietnam, but, because of the political sensitivity surrounding the DMZ, he requested both State and Defense Department views on the matter. Recognizing that there were several key military advantages to be realized from defoliation in the DMZ, he expressed three major political reservations: a potential for North Vietnamese charges of chemical warfare, possible adverse impact on efforts to expand the influence of the International Control Commission, and untimeliness.[33]

On August 27, Admiral Sharp endorsed General Westmoreland's proposal. On October 4, the Secretary of Defense wrote the Secretary of State to add his endorsement, noting that the Joint Chiefs also felt that defoliation in the DMZ was highly desirable from a military standpoint. Secretary McNamara said that the North Vietnamese Army had recently sent its 324B Division through the DMZ directly into South Vietnam and was building a supply base in the DMZ for future operations. He cited the fact that defoliation had been conducted in South Vietnam since 1961 and in Laos since 1965, and stated his view that the political risks of defoliation missions in or near the DMZ would be less than the military risks of failing to take reasonable measures to deny the Viet Cong and North Vietnamese Army the use of the DMZ as sanctuary. Including a draft authorization for Saigon, the Defense Secretary asked Secretary Rusk to authorize defoliation missions to begin immediately.[34]

A further tightening of the limitations on herbicides occurred in March, although it had little, if any, practical impact. The authority granted in previous years to COMUSMACV to conduct herbicide operations outside South Vietnam was still valid, and the Assistant Secretary of Defense for International Security Affairs, G. Warren Nutter, felt that it should be withdrawn for two reasons: first, any use of herbicides in Laos or elsewhere after the phase-out in South Vietnam might incite public criticism, and, second, recent Senate inquiries had asked whether the new herbicide policies applied to Laos and Cambodia.[3] Laird adopted the ISA advice and on March 18, 1971, requested the Chairman of the JCS to insure that any proposal for U.S. herbicide operations in Laos, Cambodia, or Thailand be submitted to Laird for his approval.[4]

Secretary Rogers was justified in his fears that herbicide policies in Vietnam would cause problems during the Senate Foreign Relations Committee hearings. These public hearings, held March 5-26, 1971, provided a forum for several opponents of herbicides such as Meselson and Westing to present their views. The committee decided to take no immediate action on ratification. Senator J.W. Fulbright, the chairman, wrote to President Nixon on April 15 saying that after listening to the testimony, many members of his committee felt that the United States should not ratify the Geneva Protocol with understandings attached exempting herbicides and tear gas from its coverage. Fulbright urged Nixon to drop these exemptions, saying, " . . . I personally believe that were you to take this initiative your action would be regarded as truly courageous and possessed of real moral force."[5]

Packard's directive of January 16, 1971, ending crop destruction operations had also asked the Joint Chiefs to produce by April 15 a plan for disposing of herbicide orange stocks.[6] MACV forwarded its views on a range of alternatives on March 8. General Abrams' preferred option was to remove all orange stocks from Vietnam. His second preference was to have the orange incinerated in South Vietnam under the control of the U.S.[7] Admiral McCain viewed having U.S. forces spray the orange in support of the South Vietnamese as the best alternative, with removing the chemical from the country as his second choice.[8] The plan the Joint Chiefs forwarded to the Secretary of Defense on April 23, 1971, generally followed CINCPAC's preferences. The Chiefs asked once more for the lifting of the ban on herbicide orange so that it could be sprayed in remote areas. And, they said that the stocks of orange in Vietnam should remain the property of the South Vietnamese government for future use after they acquired spray capabilities under the Vietnamization program. If the ban on orange had to remain in effect, the Chiefs wanted the orange returned to the United States for destruction by burning. For stocks of orange stored at Gulfport, Mississippi, the Air Force had developed a plan to offer that portion with an acceptably low dioxin content for use by the government or for commercial sale and to destroy the rest by controlled burning.[9]

EXHIBIT 6

Agent Orange Use In Vietnam An Historical Overview From The Veterans Perspective

USE OF CHEMICALS CONTINUED IN VIETNAM

While the debate over the danger of Agent Orange and dioxin heated up in scientific circles, the U.S. Air Force continued flying defoliation sorties, and the troops on the ground continued to live in the chemical mist of the rainbow herbicides. They slept with it, drank it in their water, ate it in their food and breathed it when it dropped out of the air in a fine, white pungent mist.

Some of the troops in Vietnam used the empty Agent Orange drums for barbecue pits. Others stored watermelons and potatoes in them. Still others rigged the residue-laden drums for showers. The spraying continued unabated in 1968, even though, according to military records, it apparently was having minimal effects on the enemy. A series of memorandums uncovered in the National Archives and now declassified indicate that defoliation killed a lot of plants, but had little real effect on military operations.

ORANGE AEROSOL DISCOVERED

Meanwhile, the military continued to learn just how toxic Agent Orange could be. On October 23, 1969, an urgent message was sent from Fort Detrick, Maryland, to MACV concerning cleaning of drums containing herbicides. The message provided detailed instructions on how to clean the drums and warned that it was particularly important to clean Agent Orange drums. "Using the (Agent) Orange drums for storing petroleum products without thoroughly cleaning them can result in creation of an orange aerosol when the contaminated petroleum products are consumed in internal combustion engines. The Orange aerosol thus generated can be most devastating to vegetation in the vicinity of engines. Some critics claim that some of the damage to vegetation along Saigon streets can be attributed to this source. White and Blue residues are less of a problem in this regard since they are not volatile." Not only was Agent Orange being sprayed from aircraft, but it was unwittingly being sprayed out of the exhausts of trucks, jeeps and gasoline generators.

In March 1969, Lt. Col. Jim Corey, deputy chief of CORDS in I Corps reported to his boss, R.M. Urquhart, unusual defoliation in Da Nang. "A large number of beautiful shade trees along the streets in the city of Da Nang are dead or dying," Corey wrote. "This damage appears to be entirely a result of defoliation chemicals." There was no evidence of insect or fungus damage to the vegetation, according to the memo. "In every instance of tree and garden plot damage," Corey wrote, "empty defoliant barrels are either present in the area or have been transported along the route of the damage." The use of herbicides was not confined to the jungles. It was widely used to suppress vegetation around the perimeters of military bases and, in many instances, the interiors of those bases.

VETS BEGIN DEVELOPING HEALTH PROBLEMS

As soldiers who had served in Vietnam attempted to settle back into civilian life following their tours, some of them began to develop unusual health problems. There were skin and liver diseases and what seemed to be an abnormal number of cancers to soft tissue organs such as the lungs and stomach. There also seemed to be an unusually high number of birth defects among children born to Vietnam veterans who had been exposed to Agent Orange. Some veterans experienced wild mood swings, while others developed a painful skin rash known as chloracne. Many of these veterans were found to have high levels of dioxin in their blood, but scientists and the U.S. government insisted there was no link between their illnesses and Agent Orange. In the mid 1970s, there was renewed interest in dioxin and its effects on human health following an industrial accident in Seveso, Italy, in which dioxin was released into the air, causing animal deaths and human sickness.

STUDIES CONTRADICTORY AND CONFUSING

By 1983, the results of studies of Agent Orange and dioxin exposure began to trickle in. They were, for the most part, contradictory and confusing. A series of studies conducted between 1974 and 1983 by Dr. Lennart Hardell, the so called Swedish studies, showed a link between exposure to Agent Orange and soft tissue sarcomas and non-Hodgkin's lymphoma. And in July 1983, the

EXHIBIT 7

VETERANS SURVEY & TESTIMONIES

William G Wigginton, Jr.

Service Branch: U.S. Air Force
Korat Royal Thai Air Force Base, 388th Security Police Squadron K9
Dates: From December 22, 1971 To: December 21, 1972

I worked K9 posts on main base, fuel depot and at the Munitions Storage Area located five miles off base. The majority of the K9 posts had vegetation that was always minimal and sparse. When every other place on the base and off, the vegetation grew like wildfire, and had to be kept trimmed and mowed every week. I never, ever saw any crews mowing the K9 posts or inside or outside of the perimeter fences. However, I did see crews spraying these areas from a 2-½ truck with a tank and sprayer attached. I remember a slight chemical smell whenever it rained, and when it was really dry and the wind kicked up any dirt. As a K9 handler, my job was to be on that post anywhere from 8 to 12 hours, sundown to sunup, no matter what the weather. If there was any chemicals used as defoliants, the K9 troops and their dogs came into contact with this substance almost every day of our year assignment, and we walked in it, it permuted our clothes, our dogs had it all over them, and since we gave our dogs a lot of attention and praise, our hands were constantly in contact with them. When it rained, either a small amount, or during the monsoon period, we walked in water saturated with these chemicals, our dogs were soaked with it. During this period, it was not uncommon for the K9 troops to have water soaked clothing and gear for up to 12 to 14 hours a day, and the chemicals in this water from the ground, soaked into our skin for this time period. Typical K9 troops worked a 9 on and 2 off schedule. Which means that out of 365 days in Thailand, about 290 or so days were spent on these K9 posts.
The K9 troops by far spent much more time in contact with the ground, and any chemicals that were used to keep the vegetation low, much more than any other U.S. Air Force personnel on base. And not only did we have to deal with this, we also were exposed almost every day to malathion, which we used to clean the kennels, sprayed the kennel areas, the training areas, the areas around the kennels, dipped our dogs in, etc…

I have been diagnosed with Type 2 Diabetes about two years ago.

Dennis Oliver

I Dennis Oliver do hereby give accurate testimony to what I am about to say.

I was stationed at Korat, Thailand, from December 1966 to December 1967. I was assigned to the 388th MMS. Working both on base and at the Munitions Storage Area located off base.

I witnessed 55-gallon drums, stored in our revetments. Witnessed 55-gallon drums, being loaded on cargo planes.

I observed barren land; through out the base complex and at least 500 ft. passed the perimeter. No vegetation was visible. During monsoon season, the ground was covered in boot swallowing mud, necessitating the need to use the boardwalks.

I affirm that the photo below of the Korat MSA Perimeter, taken in 1970, shows the same cleared perimeter that existed during my tour of 1966 – 1967 when I was at.

James T. Strickland

I was stationed at Korat AFB Thailand from March 1969 thru March 1970. During this period of time, the Munitions "Storage Area (MSA), located approximate 5 to 7 miles from the base, never had foliage for 100 feet, both outside and inside, the perimeter fence. The inside was defoliated for over a 100 plus feet from the fence up to, but did not include, the bomb revetments since the grass/foliage was necessary to prevent soil erosion of the revetments.
One night I watched a pair of tigers stroll casually along the perimeter fence. The earth was so void of foliage, I could later easily follow their tracks in the dirt. On several occasions during the course of my tour, I observed the paths left in the dirt made by snakes that had previously crawled through the area.
In short, one could observe anything large or small, walking or crawling, for approximately a 100 feet beyond the perimeter fence and even farther inside the fence. Though this site was located in a tropical jungle where foliage grew at an incredible rate, this area was perpetually barren turf! It was consistently either mud or dust.

Other sites within the Korat Air base perimeter that I specifically recall being treated either in December of 1969 or early January 1970, were the K9 posts inside the taxi and runway. The foliage promptly died and crackled when walked upon. It had an extremely strong chemical smell for days, if not weeks. The stench was so strong I used to wonder if it would adversely affect my dogs' ability to make a scent detection. The other K9 post was, I believe either Kilo 9 or 14. It was located off the runway up along the perimeter fence line toward town. The entire post was originally triple canopied forest with huge trees, second level growth and then another layer of heavy ground brush. It was a very isolated post that no one desired to "pull". This post, and the others adjoining it, was totally defoliated during the same period of time. There was absolutely no living foliage remaining and the entire area smelled exceptionally strong with the same nauseating chemical odor present at the other above described sites. During my remaining tour, these areas remained void of foliage.

The above statements are true and I will testify to that fact. Terry Strickland

James J. Stastny

By my signature below I, **James J. Stastny** affirm that the information provided in this affidavit is my own personal testimony and is being provided of my own free will, without inducements or coercion. The account of events provided is an accurate presentation of the experiences I witnessed while serving at Korat Royal Thai Air Force Base.

United States Air Force
Korat RTAFB
From: May, 1970 To: May, 1971

Statement:

During my tour of duty at Korat RTAFB from 1970 to 1971 I recall a very interesting phenomena that took place along the perimeter of the base, where we sentry-dog handlers patrolled. Each evening we rotated from post to post, receiving a different assignment for each tour of duty. One evening I patrolled a particular area. I had been there on many other occasions. It was along the perimeter, just inside the security fence. Behind me, some distance away, was what we called the *flight line*. Between the *flight line* and me was heavy vegetation that provided cover. A short time later, after having worked other posts, I went back to the area in question. To my utter amazement I discovered that all the vegetation was gone. The reasons why this sticks out so strongly in my memory are: 1) I couldn't understand who would make such an idiotic decision to remove the cover that stood between the jungle outside the perimeter and the Security Police patrolling the area. Now we were sitting ducks as the lights of the base silhouetted us as we walked our assignments. I thought, "Great, now we're targets in a shooting gallery." 2) I was astounded that the vegetation had so quickly disappeared. I saw nothing that would explain it to me.

Current Health Issues
:

For quite some time I have experienced a lot of pain and stiffness in my bodies soft tissues (muscles). Only recently (the last few years) have I complained to any doctors. When I do, they all ask the same question: "Were you exposed to Agent Orange, or any other chemicals." The only ones I can think of are Agent Orange and Malathion, in which we would periodically immerse our dogs to kill tick, and was sprayed out on the perimeter to kill mosquitoes.

John Powell

Service Branch: Air Force
Installation Korat Thailand
From August 1968 To: August 1969

I saw the area sprayed behind the engine test cell when we were placing trip flares in a wooded area and in an area that the Japanese built barracks in World War 2. The bomb dump in side and the perimeter when sprayed with something, as grass never grew there.

Michael Balash

U.S. Air Force
Korat, Thailand
From March 1970 To: Jan 1972

The areas I remember the most of not having foliage grow were the perimeter of the base and the perimeter of the bomb dump. Other areas that were not growing back were areas on the flight line and around it. In the entire 19 months I was there, no vegetation grew back in these areas that I patrolled. Areas directly beyond the fence line that may not have been necessary to be sprayed with a defoliant were excessively vegetated as would be expected in that type of climate.

Type 2 Diabetes (Diabetes mellitus) – Diagnosed Nov. 1996 I have no family history of diabetes

Dale E. Everson

Branch of Service: USAF

Takhli Royal Thai Air Base, Thailand
From 12/22/66 To 8/1/67

I landed at Takhli and Udorn. It struck me as strange that these bases were in a jungle area and yet little if anything grew on the bases. I have sent emails to all the military engineering associations I can find asking any civil engineers that served in Thailand during the period 1962-1975 to contact me.

James Trapp

Witness Affidavit

I, James Trapp, served in the United States Air Force at Takhli Royal Thai Air Force Base, Thailand from October 1966 through October 1967 were I was assigned duties in a base warehouse processing equipment and supplies. We had l received an item of equipment that was classified and was required to be covered, but was not. I searched for the cover and under it were 40 barrels with green tops and white numbers 2,4,5-T. Over the course of my tour I witnessed additional barrels of 2,4,5-T process through the warehouse as well as barrels with the numbers 2,4,5-D or 0. They also had white destination labels signifying they were for the 315th A/C Sq.

Sincerely
James Trapp

Marty McCauley

USAF
Takhli RTAFB
From Nov-1973 To: Aug-1974

Around the Bomb Dump and the Base Perimeter there were many areas that vegetation did not grow. These areas were where the K-9 units patrolled. At the CE compound they stored pallets with 55 gal drums with orange stripes on them. Just before we closed the base these barrels disappeared.

David L. Wharton

United States Air Force
Nakhon Phanom Royal Thai Air Force Base
From: April 11, 1974 To April 11, 1975

TDY Location:
Korat Royal Thai Air Force Base
From Approx. September 1,1974 To Approx. November 22,1974

I witnessed Defoliation Spraying Activities around the perimeter at NKP air base from time to time. I worked on the 21ST SOS CH53 Helicopters and the 56TH SOW/SOL OV10 Bronco aircraft as a Jet Engine Mechanic and I remember witnessing from time to time Defoliation spraying around the base perimeter. I would see this as I worked on the aircraft and drove up and down our flight line with other mechanics in our 56TH CAMS work van. I saw drums behind an enclosed fence area on NKP Base and this most likely was the defoliant storage area. The defoliant spraying was done by hand held and truck spraying usually in the evening hours. I mostly worked the 7pm-7am shift. The whole perimeter at NKP looked like it had been defoliated. Also in between the main runway and the taxiway always looked like the perimeter after the defoliations.

While stationed TDY at Korat RTAFB-Thailand I saw the perimeter and it looked like what our perimeter at NKP looked like after defoliation.

Type 2 Diabetes (Diabetes mellitus).YES

Robert P. Lappin

USAF
2nd Assignment
Nakhon Phanom
From Jan 68 To: Jan 69

During my first tour I frequently flew missions targeted to fly air cover for 123's dropping Agent Orange. Also we flew missions to check the results, many times flying low over the drop area.

During my second tour as a FAC at NKP many times I flew missions over defoliated areas. I also crash landed an O-2 in Laos.

I have been diagnosed with enphasyma

ROMEO H. SINGLETON

USAF
NKP, RTAFB
From DEC 73 To: DEC 74

WHAT I CAN REMEMBER SEEING WHILE STATIONED AT NKP RTAFB, WAS THE OUTLYING AREA OF THE BASE WAS DEFOLIATED LIKE IT HAD BEEN SPRAYED. DIDN'T SEE ANY DRUMS, MACHINES OR PERSONNEL ACTIVELY SPRAYING.

Type 2 Diabetes (Diabetes mellitus) Diagnosed after retirement in 1986, (approx) at Cannon AFB, NM. No known family illness to the best of my knowledge. As far as I can ascertain no other medical test for this condition was performed.

Other Health Issues HTN (VA Comp 10%)

Sidney S. Chancellor

U. S. Army
Sakon Nakhon, Thailand
561st Engineers(Construction)
From June 1967 To: Dec 1967 and From: May 1968 To: November 1968

TDY Nakhon Phanom Air Base
2nd Platoon, 561stEngineers (Construction)
Dates; From Dec 1967 To: May 1968

TDY: Outside Korat (Couldn't find name on map)
561st Engineers (Construction)
Dates; From: November 1968 To August 1969 (ETS out)

We used a chemical spray during road construction to clear foliage so that we could build culverts for roads near Sakon Nakhon. When my platoon was TDY to NKP we had to build perimeter fences and the Air Force provided the spray material to remove the foliage so that the fences could be built. Chemicals were stored in containers with orange stripes and we mixed the chemical with diesel fuel and loaded the mixture into a large tank mounted trailer that was pulled by an air compressor truck to spray the materials. This would have occurred from June 1967 to November 1968. There was another chemical spray that was used by GIs and locals hired by the military to spray around all of the buildings, hooches and all other facilities. I am not sure what the spray contained; however, it is possible it was Malathion.

Timothy Potter

Air Force
Ubon RTAB
From: May 1969 To: Aug 1970

After a sapper attack in July 1969, all foliage around the base, in front of perimeter and behind perimeter, was either cut or sprayed. New fences were put up (concertina wire) and machine gun bunkers installed. Foliage was kept short from that point on, just don't know if it was sprayed or cut. I do know that there was an area, as you look down the runway, at the end and to the right that was used for dumping contaminated fuels and chemicals. My Sentry Dog, Duke 56M9, was confined to the kennels for a week, because of reaction to chemicals in that area, on the pads of his feet. I had to use another dog (Bullet) for that period of time.

Rodger Fausey

USAF
Ubon Royal Thai Air Base
From 12/1968 To: 12/ 1969

Nahkon Phanom (NKP)
From 8/ 1970 To: 8/1971

There was no vegetation growing anywhere on the base and the trees that were on both the bases were dead. I also remember seeing the Air America people on our base at NKP in their denim type flight suits. On both bases there was mostly sand and very little grass growing. I always thought that was strange considering off basis there were trees and grass everywhere. The only place where I remember grass was around the base chapel at Ubon Royal Thai Air Base.

Type 2 Diabetes (Diabetes mellitus) 12/ 2001

James Ziats

USAF Sgt-E4
Ubon, Thailand
From March 1970 To: March 1971

I never saw anything growing in the perimeter fence line. It looked like a dessert the whole time I was there. There was everything growing beyond the perimeter and after it but nothing in between.

John T. Kammer

US Air Force
U-Tapao RTNB, Thailand
Security Police- K-9 Dog Handler
From Aug 1969 To: Aug 1970

During my year as a sentry dog handler 1969/1970, much of the defenses along the perimeter road area were upgraded. The perimeter was widened. Areas of trees and brush along the perimeter road were removed to do this. I was on the perimeter only during the night. I didn't see what base engineers did during the day.

Non-Hodgkin's Lymphoma I was diagnosed with Non-Hodgkin's Lymphoma on December 19, 1975 at Thomas Jefferson Hospital in Philadelphia, PA. A couple years of chemotherapy and cobalt treatments followed. No one in my family ever had, or heard of, lymphoma prior to my illness.

Joseph Provost

US Air Force
U-Tapao RTNAB
From October 1969 To: October 1970

While stationed at U-Tapao, I was quartered in what was called the Mod Barracks, which were a pre-fabricated, 2 story structure. In an area, between the Barracks and the Barbed Wire fence line and the fence line and the Jungle was just a barren dirt area, very unusual.

The areas surrounding the B-52 parking areas, spot V-1 and along J row towards the runway were barren and empty also.

I remember seen small tanks on trailers being pull buy pick-up trucks driving perimeter roads, behind the revetments but don't believe I saw them actively spraying.

I do vividly remember a sprayer being pulled buy a pickup truck driving around the base, around sundown, in all areas, spraying for what was claimed to be mosquitoes

While stationed at U-Tapao, both hands became grossly infected with some type of fungus looking warts. At my next duty station, I sought medical treatment for this problem, because they were increasing and becoming larger. At Wurtsmith AFB these were diagnosed as Parauyclual and Peruingual Warts. Some of these were removed surgically and other burned off using Liquid Nitrogen.

After returning from U-Tapao, I also developed a skin problem, of acne in the area between my lower abdonime and knees, but only when the weather is hot and humid.
My family doctor, 30 years ago suggested that I wear only 100% cotton undergarments, us an anti-bacterial soap and powder the area frequently with a medicated powder.

I never gave it any thought that this could be related

My name is Stephen D. Pippenger, DOB 7/9/48, served in the US Air Force, Security Police, K-9 Section, Udorn AFB, Udorn Thailand. I was sent there in Sept, 1968 and departed in Oct, 1969. We departed the US for Asia from Medena and flew over California to Jaum, Midway, Ton Sanute let some people off and then to Udorn and off loaded 28 men and dogs. My dog was Mike M-930 which I took with me. When we landed we thought it was a desert. No sign of green and the ground looked like it was dead. Kicked up a lot of dust when we stopped.. Went to our assigned huts and got a bunk and then went to the kennels to settle our dogs in. They told us of a few things we should know. Do not walk in bushes, snakes which there were a number of bad ones out there, vipers, cobras, creates, et.al. Be watchful of certain things going on and that they had been attacked a few months before our arrival. Do no let dogs stay in sun to long and do not let them lick the ground or they would get sick. They said that some of the things they were spraying were not to good for dogs of men so be careful.

First day spent processing in and getting mail set up and our ration cards and such. The next day we were given our jungle boots, knives, shown where our weapons were and radios. That night we went to work. We were give maps and told where and shown where to patrol.I was next to the active runway the first night. We worked 11 hrs. even though our dogs were only good for 5 hrs. We were both tired when we got off. Went to work a 9 and got off at 8. Then the next week we went to work at 6 and got off at 5. All pm to am. We patrolled in a lot of areas. One was an ammo dump. They had napalm, Agent Orange, bombs and other ammo there. It smelled real bad. They had a lot of different barrels with different color rings painted around them. There were hundreds of them. We used to watch them load these barrels at night and put them on aircraft at night and some during the day. When they did it at nights they used the big Merc lights. I asked a guy loading one night what that stuff in the barrels was with the orange strip. He said bug juice. I said great and asked for some to put on to keep the bugs off of me. He said you would not want to put this on yourself because he did not know what it would do but he said it killed everything they sprayed it on even trees. That is when I learned they called it agent orange. The next week while patrolling in the loading area I saw them loading a chopper with the stuff and it had been set up with sprayers extended from the side. I know I did not see it and tripped over it. They looked like shower heads. The next day we went to the kennel area early and we saw the chopper out spraying in the area.. A few day later all the growth started dying and turning brown. It smelled real bad.

During the time we were there we were used to find out if our dogs or us could get different illness from each other. We were also putting medicine on our dogs food to see if it would protect them form ring worms, round worms, heart worms, and other worms. They took blood from both of us as the same time and looked at both to see if there was anything wrong. My dog got something on his muzzle and I had to carry a needle and medicine on post if he got sick I could give it to him. I had to give him 2 shots all the time I was there. I became anemick during the time I was there and have remained so since that time. I now suffer from high blood pressure, Migraine headaches 2-3 per week, panic attacks, depression, diabetes2, sleep apnea, PTSD, 40 percent loss of hearing, ringing in my ears so loud that it wakes me up, phlebitis, and have grown a 3rd testicle which is a tumor. Hearing was lost while waking flight line and not have any ear protection. They stated that we needed to be able to hear and could not use protection. Those jets busting there AB's was very hard on the ears. I had a hearing test done while there and they showed an above

average loss of hearing.

Everywhere you looked over there the bushes were dying, trees, and every once in a while we would find birds and dogs that had died. Some of the dogs we had to shot due to them becoming wild. The farmers and others would castrate the dogs by whacking off there testicles and turn them loss and they would either bleed to death or it would heal over and the dog got infection and went crazy from the pain and suffering. Talked to a guy that was over there the same time I was and he has prostrate cancer. I am growing tumors he has cancer and as I understand others have either died or have medical problems. I called to check on my dog and found that he had died in 1974 of complications of the bladder, cancer. I am trying to get the nacropsy report to find out for sure. I would like to know. Several people that I have commucated with said the same thing that there dogs had died from some form of cancer. I did not know you could get cancer and tumors from your dog but there are a lot of things I do not know. All I know is that since 1984 my life has started going down hill. Started panic attacks and depression and all of the rest followed. Man I wish I was not as sick as I am.

Stephen D. Pippenger
[redacted]
432 Security Police Sqdn. K-9
Udorn AFB, Udorn Thailand

Stephen D. Pippenger
[redacted]

STATE OF INDIANA
COUNTY OF MONROE

Dated this 27th day of JANUARY, 2005

Stella M Bruce
STELLA M. BRUCE
Notary Public

My Commission Expires
12/2/2006

Resident of Monroe County

Cut and paste information below into a new email and complete form. Open a new pre-addressed email by clicking here.

Survey of Military Veterans Assigned To SEA

First Name: JASPER

Middle Name EARLE

Last Name: BROWN

Date of Birth : 21 JAN 50

City of Residence : [redacted]

State of Residence: [redacted]

Zip: [redacted]

Email: [redacted]

Phone [redacted]

Branch of Service : USAIR FORCE

Tour Information

First Tour or TDY Location: SAN ANTONIO, TX

Installation : LACKLAND AFB

Dates; From/To: 14 JAN 70 - 7 MAR 70

Second Tour or (TDY) Location: WITCHITA FALLS, TX

Installation SHEPPARD AFB

Dates; From/ To: 8 MAR 70 - 30 MAR 70

Third Tour or TDY Location: MINOT, NORTH DAKOTA

Installation MINOT AFB

Dates; From/To: 31 MAR TO - 6 JAN 71

Fourth Tour or TDY Location: U-TAPAO RTAFB

Installation U-TAPAO AFLD, THAILAND

Dates; From/To: 28 JAN 71 - 8 JAN 72

FIFTH TOUR : JACKSONVILLE, AR
INSTALATION : LITTLE ROCK AFB
DATES, FROM/TO : 21 JAN 72 — 11 JAN 74

Observations of Chemical Use

Describe What You Saw Occurring – In your words describe activities that you saw or areas on installations that give evidence that defoliation activities occurred, seeing materials like drums of defoliants, etc

I WAS A SECURITY POLICEMAN WORKING AIR BASE DEFENSE.

Note, only write about what you saw or clearly remember. Do not write about what someone else told you.

I SAW AT U-TAPAO RTAFB : ① HELACOPTER SPRAYING AGENT ORANGE IN C AND D SECTOR.

AUGUST
SEPT
OCT
NOV
} 1971

② VEHICLE EQUIPED SPRAYERS SPRAYING IN D SECTOR

③ WHILE ON POST AT 6 AERIAL PORT SQD, I SAW DRUMS OF AO AND MALITHION.

Medical Condition

Have you been diagnosed with any of the following that are currently recognized as being attributable to Agent Orange? No

Chloracne

Non-Hodgkin's Lymphoma

Soft tissue Sarcoma

Hodgkin's Disease

Porphyia Cultanea

Multiple Cutanea Tarda (PCT)

Multiple Myeloma

Respiratory cancers (including cancers of the lung, larynx, trachea and bronchus)

Prostate cancer

Peripheral Neuropathy (acute or subacute)

Type 2 Diabetes (Diabetes mellitus)

Birth Defects in Off-spring : Spina Bifida -

Have you been diagnosed with any of the following that are currently recognized as being attributable to Malathion exposure? NO, BUT, I HAVE WEAKNESS IN ARMS AND LEGS.
Nerve damage, (Weakness or numbness of limbs)?

Dysphagia, which is a swallowing disorder. It is a neurological or a nerve motor problem.

Other Health Issues

Describe any medical conditions that you have that you suspect were the result of exposure to defoliants while in Thailand. If you have been diagnosed please provide the diagnosis. If not, describe your symptoms:

Other Evidence

Do you have photographs or other evidence of the presence of Agent Orange:

Thai Vietnam Vets for Equity in Treatment Privacy Statement

By providing the information you understand that it is for the sole purpose of establishing that herbicide defoliants, commonly referred to as Agent Orange, Agent Blue, or other names were used in and/or around U.S installations in Thailand during the Vietnam War. The information you provide may be included with other documentation to appropriate Federal Government agencies for the sole purpose of establishing that human health risk

June 23, 2003

Department of Veterans Affairs
VA Regional Office
3225 N. Central Ave.
Phoenix Az. 85012-2489

[redacted]
Kaiser, William F

Dear Sir or Madam:

I am submitting additional information for a claim for Diabetes Mellitus Type II with Diabetic Neuropathy in both arms and legs.

The VA under the Agent Orange Act has found a positive association exists between exposure to herbicides and the subsequent development of Type II (adult-onset) Diabetes Mellitus and Neuropathy.

I was stationed at Camp Mukdahan Det 6, 621st Tactical Control Squadron Mukdahan, Thailand from July 1st 1966 to June 30th 1967. This site was in existence from 1966 to 1969. This site was continually sprayed with herbicides to control the foliage in the site and particularly by the bunkers and concertina wire around the perimeter.

Approximately 100 personnel manned this site at the time I was there, and I have been able to contact five (5) of them, and have attached letters from four (4) of them confirming the use of herbicides to control the foliage in and around the site. I am still waiting for one additional letter to confirm the spraying of herbicides, but I felt that I already had enough letters to confirm this action, so I decided to submit without the additional letter.

Of the five (5) people I have contacted, it is interesting to note that three (3) of them and myself have Type II Diabetes Mellitus. This relates to a ratio of 68% with Diabetes, which seems extremely high.

I have also attached a picture that was scanned from a slide that I have showing where the herbicides were sprayed along the concertina wire. As you can see by the picture it is green on both sides of the wire, and brown under the wire where the herbicides were sprayed. You can also see the puddle of water in the picture. This was taken during the rainy season over there and being a tropical area nothing turns brown unless sprayed.

The site was also continually sprayed with insecticides to control the vast amount of mosquitoes and other insects. The roads on the site were also coated with waste motor oil to keep the dust down.

You should already have a copy of my medical records from Dr. Schneider confirming my Diabetes and Neuropathy. A copy of my Agent Orange Registry Exam should also be in your records confirming my diabetes. I am receiving my medical treatments for diabetes and neuropathy from the Phoenix VA Hospital.

STATE OF GEORGIA)
)
COUNTY OF ROCKDALE)

TO WHOM IT MAY CONCERN) **AFFIDAVIT OF JAMES D. HOPKINS, JR.**

STATE OF GEORGIA)
)
COUNTY OF ROCKDALE)

I, James D. Hopkins, Jr., [redacted] being first duly sworn, states as follows:

1. I was assigned to Detachment 6, 621st AC & W Squadron at Mukdahan RTAFB, Thailand from June 1966 to June 1967.

2. I observed spraying of herbicides to control vegetation at perimeter and miscellaneous fences; around various structures; around and under board walks; and around bunkers and in the entrances of said bunkers.

3. The name and/or kind of the herbicides are unknown to me.

James D. Hopkins, Jr.

Subscribed and sworn to before
me this 19 day of June, 2003.

Notary Public
Notary Public, Rockdale County, Georgia
My Commission Expires March 7, 2004

6/26/03

To: William KAISER
[redacted]

Dear Bill:

Sorry this took so long. I do remember the perimeter of Mukdo harm R.T.A.F.B. being sprayed to keep the weeds and brush off the Wire. Especially directly behind the powerhouse and Chowhall Area.

My tour of duty began in August, 1966 and last one year.

As I remember they used both a trailer set up pulled by a jeep and canisters packed either by hand or on the back.

I am not aware of exactly what Chemical was used, however it was effective.

You are the fifth man I've talked to who was over there at the same time I was and I am the only one who does not have diabetes.

I hope this helps you.

Sincerely
Clifford A. Mack
[redacted]

WARREN A. SHEARLEY SR.
CWO-4, RETIRED.
[redacted]

To Whom It May Concern;

This is to certify that I was stationed at the 621st T.C.S.; DET. 6; Nakhon Phanom, Thailand in 1966 and 1967.

While there I observed the spraying around the perimeter of the base, a herbacide to kill the weeds, around and under one barb wire perimeter fence. This occured on more than one occasion.

Warren A. Shearley Jr.

13 June 2003

Robert W. Baker, Msgt Retired
[redacted]

May 27, 2003

William F. Kaiser
[redacted]

Dear Bill

It was good to speak and remember about times at Camp Mukdahan. It has been many years since I have been in contact with anyone that was assigned there when I was. I was at Camp Mukdahan Thailand from 1966 to 1967.

I remember that herbicides were sprayed around the perimeter and around the bunkers of the camp on a regular basis to kill the foliage. I especially remember when this was done it would move the snakes out of the undergrowth and into the camp grounds. I also observed C-130 aircraft spraying 40 miles north of Mukdahan in an insurgency area west of the Mekong River, on one of my trips to NKP for a mail run.

I hope this bit of information will be of help to you.

Sincerely yours,

Robert W. Baker, MSgt RETIRED

Robert W. Baker

JAMES T. HARROD
[redacted]

29 May 2003

To Whom It May Concern:

I, James T. Harrod do hear-by affirm that during the period of May 1966 through May 1967, I was stationed at Detachment 6, 621st Tactical Control Squadron, Mukdahan Radar Site, also known as the Mukdaharn Royal Thai Air Force Station, Thailand.

I also affirm that throughout this period, herbicides were used, on a continuing basis, to control and kill vegetation growing throughout the site, particularly within the rolls of concertina wire that was used to form a perimeter barrier around the site. An open area behind our dining facility was also sprayed. Other areas throughout the site were sprayed, as needed.

In addition to the herbicides, insecticides were also sprayed on a frequent basis to control or kill the vast hoards of mosquitoes and other insects that were present throughout the area. Individual cans of military issue spray were provided to each airman and were used to spray individual sleeping areas before turning in for sleep each night or day, depending on assigned duty shift.

I would also like to state, as a matter of record, that I have been under treatment for Type II Diabetes since 1985.

Please refer any questions to the undersigned at the address or telephone number depicted above.

JAMES T. HARROD
SMSGT, USAF, Ret.

EXHIBIT 8

The Dogs Of War, Rachel's Environment & Health Weekly #436

==========Electronic Edition==========

RACHEL'S ENVIRONMENT & HEALTH WEEKLY #436
---April 6, 1995---
News and resources for environmental justice.

Environmental Research Foundation
P.O. Box 5036, Annapolis, MD 21403
Fax (410) 263-8944; Internet: erf@rachel.clark.net

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==Previous Issue==========Next Issue==

THE DOGS OF WAR

Somewhere between 2.6 and 3.8 million American men and women served in Vietnam during the years 1965 through 1971, the years when chemical herbicides were being used to denude the jungle and destroy enemy crops. Military records do not allow a more accurate determination of the true number who served. [1]

Alongside the humans serving in Vietnam, there were 3895 military working dogs, almost all of them purebred German shepherds. [2] (Among the 3895, there were 64 Labrador or golden retrievers used as trackers; the other 98.3 percent were German shepherds.) These dogs served as scouts, sentries, trackers, mine detectors, and tunnel explorers. About 91% of these dogs were "intact" (uncastrated) males.

When a military working dog dies, regardless of the circumstances of death or the duty location, an autopsy is performed by a veterinarian, and a standardized set of tissue specimens and organs are sent to the Armed Forces Institute of Pathology in Washington, D.C.

During the late 1980s, researchers compared autopsy records of 1167 military working dogs with Vietnam service against autopsy records of 791 military working dogs who served in the continental U.S. and saw no Vietnam service. In a separate study, the stateside dogs were also compared to 437 dogs that died in Okinawa, because many dogs that served in Vietnam were sent to Okinawa after the war. [3]

These studies showed that dogs who served in Vietnam were about twice as likely (1.8 times as likely) to have cancer of the testicles, compared to military working dogs who served only in the states. Likewise, military dogs that died in Okinawa were about twice as likely (2.2 times as likely) to have testicular cancer as dogs who served only in the states. A separate study was then conducted, excluding the dogs who had testicular cancer. Among the non-cancer dogs, there was clear evidence of significant deterioration of the testicles in those dogs who served in Vietnam (compared to dogs who served only in the U.S.): degeneration of the testicles, atrophy (shrinking) of the testicles, and evidence of a below-normal ability to produce sperm.

Dogs have often served as sentinels of human disease. Back in 1938, the well-known researcher W.C. Hueper showed that beta-naphthylamine caused bladder cancer in dogs. [4] In 1954, researchers showed that another industrial chemical, 4-aminodiphenyl, produced bladder cancer in dogs. [5] In 1980, a study of 8760 pet dogs showed that bladder cancer in dogs correlated with residence in industrialized counties in the U.S. and Canada; this same study showed that bladder cancer in men and women was similarly correlated with residence in industrialized areas. "The findings of this study suggest that the bladder cancer experience of pet dogs resembles that of human beings living in the same general locale," the study concluded. [6]

Pet dogs are particular relevant in such studies because 40 million pet dogs share their owner's domestic environment yet do not indulge in behavior that could confuse or confound the interpretation of epidemiologic studies: dogs don't smoke, and they usually don't work. In 1983, a study of pet dogs with the asbestos-related lung disease, mesothelioma,

showed that their disease correlated with household members who (a) worked in an asbestos-related job, or (b) had an asbestos-related hobby or (c) applied flea powder to their dog. [7]

For these reasons, the finding of testicular cancer and testicular dysfunction in dogs who served in Vietnam was an eye-opener, and it soon led to a comparison of 271 human veterans with testicular cancer to 259 veterans without testicular cancer, to see whether Vietnam service was related to testicular cancer. This study revealed that, like dogs, human veterans of Vietnam were about twice as likely (2.5 times as likely), to have testicular cancer compared to veterans who did not serve in Vietnam. [8]

Naturally, the question occurs, what aspects of military service in Vietnam caused testicular cancer in men, and testicular cancer and dysfunction in military working dogs?

An obvious suspect is Agent Orange, which was sprayed in large quantities (11.2 million gallons, or 42.4 million liters) over 3.6 million acres (1.5 million hectares) of Vietnam. Agent Orange, named for the orange stripe on its 55-gallon storage containers, was a 50-50 mixture of two herbicides: 2,4,5-T and 2,4-D. One of these, 2,4,5-T, was banned in the U.S. about 1980 because evidence indicated that it could cause birth defects in humans; the other half of Agent Orange, 2,4-D, remains in wide use throughout the U.S. where it is popular for killing dandelions and other broad-leaf plants in lawns, and as an agricultural weed killer.

During manufacture, the herbicide 2,4,5-T becomes contaminated with dioxin unavoidably. According to the National Academy of Sciences, the average dioxin contamination in Agent Orange in Vietnam was 2 parts per million (ppm). An estimated total of 368 pounds of dioxin was sprayed onto Vietnam's land and people during the 7-year spray program. [9]

However, a recent study of Vietnam veterans that tried to estimate 2,4,5-T exposure and link it to testicular cancer found that only Navy men had elevated levels of testicular cancer associated with 2,4,5-T exposure; men in the other services showed no such effect of exposure to 2,4,5-T. [10] The authors of that study speculated that Navy men might also have been exposed to fuels (oil and gasoline), which previous studies have linked to testicular cancer.

The other half of Agent Orange, herbicide 2,4-D, is also a suspect. Although the manufacturers of 2,4-D claimed for years that their products were not contaminated with dioxin, this claim has now been shown to be false, using the manufacturers' own data. [11]

Dioxin has been shown to damage the reproductive organs and systems of many animal species, including men and women. [12]

A study of pet dogs in the U.S. found excess cancers (lymphomas) associated with 2,4,-D lawn spraying. [13] And a study of 32 farmers who sprayed 2,4-D, compared to a control group of 25 unexposed farmers, revealed significant effects on the exposed farmers: diminished sperm count, increased number of sperm with poor motility (swimming ability); increased numbers of dead sperm; and increased numbers of malformed sperm. [14]

No federal agency keeps close track of pesticide use in the U.S.; however U.S. Environmental Protection Agency (EPA) estimates that farmers apply 25 to 30 million pounds (11.3 to 13.6 million kilograms) of "active ingredient" of 2,4-D each year in the U.S. Non-agricultural use of 2,4-D in the U.S. is estimated to total another 12 to 15 million pounds (5.4 to 6.8 million kilograms) of "active ingredient" per year. [15] The "active ingredient" of a pesticide is only 0.5% to 5% of the total formulation so these "active ingredient" amounts must be multiplied by anywhere from 20 to 200 to get the total 2,4-D formulation used each year. The bulk of the formulation is secret ingredients (called "inerts") which are, themselves, often toxic solvents. [16]

Other chemicals suspected of causing testicular cancer and dysfunction in dogs and humans who served in Vietnam are the antibiotic tetracycline and the pesticide malathion. Many military dogs in Vietnam suffered from ear infections and other diseases. [17]Therefore, many received one or more doses of tetracycline during their tour of duty. Tetracycline is strongly absorbed by sperm in mammals, and is known to cause testicular atrophy (shrinkage), and diminished sperm

quality in humans and dogs.

The other suspicious candidate is malathion. The same military unit that sprayed Agent Orange also sprayed DDT and malathion extensively in the vicinity of U.S. troops, to reduce the dangers of malaria carried by mosquitoes. It has been reported that 44% of the land of southeast Asia, mainly Vietnam, was sprayed with malathion during the war. [18] Furthermore, military working dogs in Vietnam were dipped in a 0.5% solution of malathion to kill disease-carrying ticks. Malathion is known to cause testicular atrophy and damage to the sperm-generating cells of laboratory animals. [19]

Malathion is widely use throughout the U.S. today for mosquito control though not for fear of malaria. Mosquitoes are simply a nuisance. EPA estimates that 4 to 6 million pounds (1.8 to 2.7 million kilograms) of "active ingredient" of malathion are sprayed in the U.S. each year. The yearly total of malathion formulation sprayed is, again, 20 to 200 times this amount.

Sperm count in men throughout the industrialized world appears to be dropping. (See RHWN #343 and #432.) Testicular cancer is the most prevalent cancer among white males between the ages of 25 and 34 years and the second most common in the 35-to-39 age group. The causes of testicular cancer are thought to be environmental because the rates vary widely from one location to another. During the last 15 years, the rates have increased rapidly (2.3% to 3.4% per year) in many industrialized countries. [20]

It may take scientists many decades to tell us all we would like to know about a complex chemical like dioxin, or malathion. However, we already know enough to act: To guide our personal choices, and new public policies, to minimize the danger to ourselves, our families, and our communities, we need only to remember that chemicals not used cannot cause harm. This we can learn from the dogs of war.

--Peter Montague

[1] Harold Fallon and others, VETERANS AND AGENT ORANGE: HEALTH EFFECTS OF HERBICIDES USED IN VIETNAM (Washington, D.C.: National Academy Press, 1993), pg. 3-1.

[2] Howard M. Hayes and others, "U.S. Military Working Dogs with Vietnam Service: Definition and Characteristics of the Cohort," MILITARY MEDICINE Vol. 159, No. 11 (November 1994), pgs. 669-675.

[3] H. M. Hayes and others, "Excess of Seminomas Observed in Vietnam Service U.S. Military Working Dogs," JOURNAL OF THE NATIONAL CANCER INSTITUTE Vol. 82, No. 12 (June 20, 1990), pgs. 1042-1046.

[4] W.C. Hueper and others, "Experimental Production of Bladder Tumors in Dogs by Administration of Beta-Naphthylamine," The JOURNAL OF INDUSTRIAL HYGIENE AND TOXICOLOGY Vol. 20, No. 1 (January 1938), pgs. 46-84.

[5] A.L. Walpole and others, "Tumours of the Urinary Bladder in Dogs After Ingestion of 4-aminodiphenyl," BRITISH JOURNAL OF INDUSTRIAL MEDICINE Vol. 11 (1954), pgs. 105-109.

[6] Howard M. Hayes and others, "Bladder Cancer in Pet Dogs: A Sentinel for Environmental Cancer?" AMERICAN JOURNAL OF EPIDEMIOLOGY Vol. 114, No. 2 (1981), pgs. 229-233.

[7] Lawrence T. Glickman and others, "Mesothelioma in Pet Dogs Associated with Exposure of Their Owners to Asbestos," ENVIRONMENTAL RESEARCH Vol. 32, No. 2 (December 1983), pgs. 305-313.

[8] Robert E. Tarone, and others, "Service in Vietnam and Risk of Testicular Cancer," JOURNAL OF THE NATIONAL CANCER INSTITUTE Vol. 83, No. 20 (October 16, 1991), pgs. 1497-1499.

[9] Fallon, cited above, pg. 2-4.

[10] Tim A. Bullman and others, "Risk of Testicular Cancer Associated with Surrogate Measures of Agent Orange Exposure among Vietnam Veterans on the Agency Orange Registry," ANNALS OF EPIDEMIOLOGY Vol. 4, No. 1 (January 1994), pgs. 11-16.

[11] U.S. Environmental Protection Agency, ESTIMATING EXPOSURE TO DIOXIN-LIKE COMPOUNDS VOL. II PROPERTIES, SOURCES, OCCURRENCE AND BACKGROUND EXPOSURES [EPA/600/6-88/005Cb June 1994 External Review Draft] (Washington, D.C.: U.S. Environmental Protection Agency, 1994), Table 3-18 on pg. 3-58.

[12] Arnold Schecter, editor. DIOXINS AND HEALTH (New York: Plenum Press, 1994); see, for example, pgs. 26, 145, 318, and 332, among others.

[13] Howard M. Hayes and others, "Case-Control Study of Canine Malignant Lymphoma: Positive Association With Dog Owner's Use of 2,4-Dichlorophenoxyacetic Acid Herbicides," JOURNAL OF THE NATIONAL CANCER INSTITUTE Vol. 83, No. 17 (September 4, 1991), pgs. 1226-1231.

[14] D. Lerda and R. Rizzi, "Study of reproductive function in persons occupationally exposed to 2,4-dichlorophenoxyacetic acid (2,4-D)" MUTATION RESEARCH Vol. 262 (1991), pgs. 47-50.

[15] Arnold L. Aspelin, PESTICIDES INDUSTRY SALES AND USAGE; 1992 AND 1993 MARKET ESTIMATES [733-K-94-001] (Washington, D.C.: U.S. Environmental Protection Agency, June 1994), pg. 19.

[16] John H. Bukowski and Leroy W. Meyer, "Simulated Air Levels of Volatile Organic Compounds Following Different Methods of Indoor Insecticide Application," ENVIRONMENTAL SCIENCE & TECHNOLOGY Vol. 29, No. 3 (1995), pgs. 673-676.

[17] Paul B. Jennings and others, "A Survey of Diseases of Military Dogs in the Republic of Vietnam," JOURNAL OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION Vol. 159, No. 4 (August 15, 1971), pgs. 434-440.

[18] Fallon, cited above, pg. 3-14.

[19] K. Balasubramanian and others, "Effect of malathion on the testis of male albino rats," MEDICAL SCIENCE RESEARCH Vol.15 (1987), pgs. 229-230.

[20] Hans-Olav Adami and others, "Testicular Cancer in Nine Northern European Countries," INTERNATIONAL JOURNAL OF CANCER Vol. 59 (1994), pgs. 33-38.

Descriptor terms: vietnam war; military; army; navy; marines; air force; herbicides; veterans; dogs; german shepherds; labrador retrievers; golden retrievers; okinawa; testicular cancer; sperm count; testicular atrophy; 4-aminodiphenyl; beta-naphthylamine; bladder cancer; asbestos; mesothelioma; flea powder; agent orange; 2,4,5-t; 2,4-d; birth defects; agriculture; farming; dioxin; fuel; oil; gasoline; lymphoma; pesticide use data; inert ingredients; secret ingredients; antibiotics; tetracycline; malathion; mosquito control;

Next issue

EXHIBIT 9

NECROPSY REPORT FOR CANINE BRUTUS X321

CANINE BRUTUS MALE 1391240
DOG X321
11TH USAFH APO SF 96330
8 OCT 71 AP-T

Chief, Veterinary Services (SGV)
11th USAF Hospital
APO San Francisco 96330

EWM/PRR/fe
xxxxx AFIP-DPH

30 March 1972

1. Endarteritis, parasitic, severe, chronic, active, pulmonary arteries, lung, canine, due to dead Dirofilaria immitis.
2. Pneumonitis, patchy, subacute, with fibrosis, lung, secondary to Dirofilaria immitis.
3. Phlebitis, mild, chronic, active, hepatic vein, liver.
4. Nephritis, interstitial, mild, chronic, kidney.

COMMENT: The lung lesions were relatively severe at the microscopic level, however, it is doubtful that they were extensive enough to produce clinical signs. We will forward a report on the hip joints at a later date as the specimens have been forwarded to Dr. Van Sickle, Purdue University, as part of a special study on canine hip dysplasia. We are contacting Dr. Van Sickle for an individual report on this animal and will forward it when received.

R. W. MORRISSEY
Colonel, USAF, MC
The Director

Examination and Report By:

F. R. ROBINSON, Lt. Col., USAF, VC

CANINE BRUTUS MALE 1391240
DOG X321
11TH USAFH APO SF 96330
8 OCT 71 AP T

Chief, Veterinary Services (SGV)
11th USAF Hospital
APO San Francisco 96330

RWM/FRR/fe
xxxxx AFIP-DPH

20 APR 1972

SUPPLEMENTAL

Hip dysplasia, low grade, with early secondary osteoarthritis, canine.

COMMENT: Principal gross findings in the left coxofemoral joint was an intact joint with a thickened joint capsule. The articular surface of the femoral head showed a 1 cm. erosion on the posterior portion adjacent to the intact round ligament. The right coxofemoral joint was slightly unstable, but with an intact round ligament and a greatly thickened joint capsule. Moderate degeneration and chrondromalacia of the articular surface of the femoral head was visible anteriorly and posteriorly.

R. W. MORRISSEY
Colonel, USAF, MC
The Director

Examination and Report By:

F. R. ROBINSON, Lt. Col., USAF, VC

VETERINARY NECROPSY REPORT

DATE OF REPORT: 20 Sep 71 1391210

1. NAME AND ADDRESS OF UNIT ACCOUNTABLE FOR ANIMAL: 635th CSO, U-Tapao Air Field APO SF 96330 — MRS. M. MOXLEY

3. NAME OF ANIMAL: Brutus — Canine

3. TATTOO, BRAND OR IDENTIFICATION NUMBER	4. SEX	5. DATE OF BIRTH	6. DATE OF DEATH	7. HOURS BETWEEN DEATH AND NECROPSY
X321	Male	16 Nov 63	7 Sep 71	0

8. CLINICAL DIAGNOSES

Hip displasia which did not respond to medical treatment

AP-T

9. NECROPSY DIAGNOSES

Hips removed in-tack for submission for laboratory determination at AFIP

10. CLINICAL ABSTRACT

The dog arrived at this base in July 1968. Review of medical records indicates immunization for rabies, distemper, infectious hepatitis and leptospirosis. Acceptance radiographs of the hips, as determined by the Lackland Military Working Dog Center, the animal had billateral grade I hip displasia. On 26 Apr 71, the animal was having difficulty walking. Radiographs were taken and a tentive diagnosis was made of avascular necrosis of the acetabulum. Kennel rest and Butazolidun was prescribed without significant improvement. The dog had an abnormal stance and extreme difficulty in making short turns. The animal has been on several courses of Butazolidun and Sorticone drug without improvement.

GROSS FINDINGS *(If more space necessary continue on blank sheets and identify the items)*

11. GENERAL *(Weight, condition of cadaver, hair coat, body orifices, scars, wounds, superficial tumors, etc.)*

The carcass was in good condition and weighed 78 pounds. The necropsy was performed immediately after the dog was euthanized with 7cc Lethol. The gross findings were normal.

12. PRIMINARY INCISION *(Subcutaneous fat, muscles, peritoneum, position of viscera, body lymph nodes, etc.)*

The viscera were in normal position. No abnormalities were noted.

13. RESPIRATORY SYSTEM *(Larynx trachea, bronchi, lymph nodes, lung pleura)*

Lung weight: Left - 300 gms Right - 400 gms. The lungs appeared normal.

T

OK to acc. Per Vet Section

DD FORM 1 AUG 67 1626 REPLACES AF FORM 1100, NOV 61, WHICH IS OBSOLETE IN THE USAF

14. HEART (*Pericardium, epicardium, myocardium, endocardium, valves, coronary vessels.*)

Weight - 850 gms. No abnormalities were noted. Thirty three male and female Dirofilaria immitis were noted in the right ventricle. All previous Knott's tests on this animal were negative.

15. AORTA, BLOOD & LYMPH VESSELS

No gross lesions observed.

16. SPLEEN

Weight 350 gms. No gross lesions observed.

17. LIVER (*Gallbladder, bile ducts*)

Weight 1,500 gms. No gross lesions observed. The gall bladder was distended with semi viscous dark green bile.

18. ENDOCRINE GLANDS (*Thyroid, parathyroid, thymus, pituitary, pancreas, adrenals, pineal*)

No gross lesions noted. Pancrease weight - 60 gms.

19. GASTROINTESTINAL TRACT (*Mouth, tongue, esophagus, stomach, small intestine, cecum, colon, rectum and anus*)

No abnormalities noted. The intestinal tract was examined for parasites. The caecum was examined for whipworms. The dog had been treated for whipworms five days earlier with Atguard V (Shell).

20. URINARY SYSTEM (*Kidneys, ureters, bladder, urethra*)

Kidney weight - Left 140 gms Right 150 gms. No abnormalities noted.

21. GENITAL SYSTEM (*Testis, epididymis, spermatic cord, prostate, seminal vesicles and bulbo-urethral glands, penis, cervix, vagina, vulva*)

The testicles were normal. No gross lesions noted.

22. HEAD

No abnormalities noted. The teeth had considerable dental calculus. The lower incisors exhibited considerable wear.

23. BRAIN

Not examined.

24. SPINAL CORD

Not examined.

25. BONE MARROW

The femoral marrow examined appeared normal.

26. BONES AND JOINTS

The shoulder and elbow joints were examined and appeared normal. The hip joints were removed intact for submission as specimen.

27. MUSCULATURE

No gross lesions noted.

28. EXAMINATIONS CONDUCTED AT DIAGNOSTIC LABORATORIES

None

29. REMARKS

The specimens were preserved in 10% Formalin. The following organs submitted for histopathological studies: Rt. Hip joint; Duodenum; L. Hip joint; Large intestine; Small intestine; Stomach; Rt. Lung; Prostate; L. Kidney; Spleen (upper and lower portions); Heart; and L. Lung.

30. NAME AND ADDRESS OF REPORTING UNIT (*Include ZIP Code*)

Veterinary Service, 11th USAF Hospital, APO SF 94[illegible]

CLEVELAND L. PARKER, Lt Colonel, USAF, VC

SPO 944-904

DEPARTMENT OF THE AIR FORCE
11TH USAF HOSPITAL (PACAF)
APO SAN FRANCISCO 96330

REPLY TO
ATTN OF: SGV

24 Sep 71

SUBJECT: Request for Pathology Report

TO: AFIP

Please report to this office the pathological determinations of the intack hip joints of Brutus, X321.

CLEVELAND L. PARKER, Lt Colonel, USAF, VC
Chief, Veterinary Service

PURDUE UNIVERSITY
SCHOOL OF VETERINARY SCIENCE AND MEDICINE
LAFAYETTE, INDIANA 47907

DEPARTMENT OF VETERINARY ANATOMY

April 12, 1972

Lt. Colonel H. W. Casey
Armed Forces Institute of
Pathology
ATTN: AFIP-DPH
Washington, D.C. 20305

Dear Colonel Casey:

The following is a gross description of AFIP Accession No. 1391240, Tatoo No. X321.

Left Coxofemoral Joint: The intact joint was relatively stable and the round ligament was intact. The joint capsule was three times thicker in the anterio-dorsal quadrant than in the anterio-ventral quadrant and had the consistency of fibrocartilage. The articular cartilage on the anterior dorsal surface of the femoral head was fibrillated while that on the posterior surface was degenerating with a resultant defect 1 cm. in diameter adjacent to the round ligament. The dorsal posterior articular surface was remodeled in an oblong fashion extending toward the greater trochanter. The lesser trochanter appeared enlarged.

Right Coxofemoral Joint: This joint was more unstable than the left however the round ligament was intact. The anterio-dorsal joint capsule was seven times thicker than the anterio-ventral capsule. Degeneration and chondromalcia of the anterior and posterior dorsal articular surfaces of the femoral head were apparent. These appeared to be primary defects which would include loss of the tangential layer of the articular cartilage. The dorsal articular surface was remodeled in oblong fashion toward the greater trochanter. The lesser trochanter appeared enlarged.

Comments: The bone, cartilage, and capsular tissue reactions indicate a biomechanical instability in these joints with the right being more unstable than the left. The capsular thickening indicates that the femoral heads were attempting to move dorsally while the enlarged lesser trochanters would indicate muscle pull to maintain integrity of the joint. The articular cartilage degeneration could be responsbile for the villous synovial membrane reaction similar to that seen in the cul-de-sac area of the canine shoulder following degenerative joint disease. This investigator has not had the opportunity to radiograph this specimen so that there may be more bone remodeling than is evident on gross examination. The preceding lesions are those of early secondary osteoarthritis accompanying a low grade hip dysplasia.

These specimens are especially valuable in the current investigation, since by studying these early stages, a more complete pathogenesis of the condition can be elaborated.

I hope the above description is satisfactory. I would be most interested in knowing if this animal was exhibiting posterior lameness. It wouldn't surprise me if it did, since the degenerating articular cartilage could excite a chemical synovitis even before the florid bony osteophytosis would develop.

I hope everyone in the section is well and hearty. I just returned from the west coast where Dr. Mike Herron and I presented the spring seminars. I'll enclose our handout and would appreciate any comments you might have about it.

Tell Colonel Robinson I received the slides in good shape and will begin to work on the project this month. To date I have received 4 boxes of gross specimens and the recent slides. This should be enough to keep me out of mischief for a while.

If you need additional information on the above case, please drop me a line.

Yours truly,

David C. Van Sickle
Associate Professor

DCVS/dk

Enc.

RWM/HWC/fe
xxxxx AFIP-DPH

29 MAR 1972

Dr. David C. Van Sickle
Veterinary Anatomy Department
School of Veterinary Science
and Medicine
Purdue University
Lafayette, Indiana 47907

Dear Doctor Van Sickle:

We have received a request from one of our contributors for a report on hip joint specimens submitted from a military working dog. The specimen, AFIP Accession No. 1391240, Tattoo No. X321, has been forwarded to you for study. If possible, we would like a gross diagnosis and brief comment on the specimen to forward to the contributor in the near future.

Sincerely,

R. W. MORRISSEY
Colonel, USAF, MC
The Director

Prepared By:

HAROLD W. CASEY
Lt. Col., USAF, VC

Med Command

note to Van Sickle for your evaluation

Dr. David C. Van Sickle
Purdue U.
For comparative study
2 Mar 72

Kelly

SGV

24 Sep 71

Request for Pathology Report

AFIP

Please report to this office the pathological determinations of the intack hip joints of Brutus, X321.

CLEVELAND L. PARKER, Lt Colonel, USAF, VC
Chief, Veterinary Service

Veterinary Case Worksheet

Pathologist Casey Kuehn AFIP Accession No. 1391240

Common Name (dog, cat, etc.) dog

Breed (mixed, short-hair, etc.) Ger. Shep

Class (canine, feline, primate, etc.) Canine

Microscopic diagnoses:

1. Endarteritis, parasitic, ova +, chronic-active, pulmonary arteries, lung, canine, dog to dead Dirofilaria immitis
2. Pneumonitis, patchy, subacute, with fibrosis, lung, secondary to Dirofilaria immitis infection
3. Phlebitis, mild, chronic-active, hepatic vein, liver
4. Nephritis, interstitial, mild, chronic kidney

Comment: The lung lesions were relatively severe at the microscopic level however it is doubtful that they were extensive enough to produce clinical signs. We will forward a report on the hip joints at a later date as the specimens have been forwarded to Dr. Van Lichle, University of Purdue as part of a special study on canine hip dysplasia. We are awaiting Dr. Van Lichle for a completed report on this animal and will forward it when received.

Surgical - Neoplasm: Yes (No)

(Euthanasia) - cause: Hip dysplasia

Died - cause:

VETERINARY DIAGNOSTIC COMPUTER INPUT WORKSHEET

5.31.72

1.	ANIMAL NAME	10 Dog	1.
2.	BREED OR STRAIN (CIRCLE OR WRITE OUT)	* NA OR GERMAN-S'Hepherd	2.
3.	VETERINARY ID	◊ Canines	3.
4.	CONTRIBUTOR (ABBREVIATE)	* 17 F 11 USAF Disp, THAILAND	4.
5.	CONTRIBUTOR'S NUMBER	Unk	5.
6.	SATELLITE NUMBER	N A	6.
7.	AFIP ACCESSION NUMBER	* 1341240	7.
8.	STATUS (USE AFIP CODE)	* M	8.
9.	AGE (USE AFIP CODE)	07	9.
10.	YEAR OF SURGICAL OR AUTOPSY (USE LAST 3 DIGITS ONLY)	971	10.
11.	SEX (CIRCLE ONE)	* (M) F N U B G "	11.
12.	VETERINARY CODE	* 9	12.
13.	TYPE OF EXAMINATION (CIRCLE ONE)	S (A)	13.
14.	ROUTINE AUTOPSY (CIRCLE ONE)	YES (NO)	14.
15.	EUTHANASIA (CIRCLE ONE)	(YES) NO	15.
16.	TYPE OF ACCIDENT (CIRCLE NA OR USE AFIP CODE)	(NA) OR	16.
17.	SPECIAL FACTORS (CIRCLE NA OR USE AFIP CODE)	(NA) OR	17.
18.	MATERIAL AVAILABLE (CIRCLE AS NECESSARY)	(S) (B) (T) G P X	18.
19.	LOCATION OF ANIMAL (USE AFIP CODE)	* 462	19.
20.	PATHOLOGY BRANCH ASSIGNED, AFIP	Z	20.
21.	SPECIAL INDEX (CIRCLE AS NECESSARY)	GEN (GEO) AER A-B FØR	21.
22.	REGISTRY	VET	22.
23.	ADDITIONAL DESCRIPTION (LEAVE BLANK OR USE UP TO 50 CHARACTERS)	SENTRY named Brutus, TATTOO # X321	23.
24.		CASEY	24.

NOTE: QUOTATION MARK (") MAY BE USED ON ABOVE ASTERISKED (*) ITEMS, WHEN INFORMATION IS THE SAME AS ON THE PREVIOUS WORKSHEET OF THE SAME CASE. PUT SLASH THRU ALPHABETIC "O" (Ø)

CODED BY: [illegible]

SHEET 1 OF 1 SHEETS

AFIP FORM 226a
1 JULY 68

✓

Supplemental Report

1392/1240 – Tattoo No. X321

Diagnosis: Hip Dysplasia, low grade, with early secondary osteoarthritis, canine

Comment: Principal gross findings in left coxofemoral joint ~~was~~ intact joint with a thickened joint capsule. ~~with~~ The articular surface of the ~~[illegible]~~ femoral head showed an ~~[illegible]~~ erosion on the posterior portion adjacent to the intact round ligament. The right coxofemoral joint was slightly unstable but with an intact round ligament and a greatly thickened joint capsule. Moderate ~~[illegible]~~ degeneration and chondromalacia of the articular surface of the femoral head was visible anteriorly and ~~[illegible]~~ posteriorly.

Purdue University

Dear Dr. Van Sickle

We have received a request from one our contributor ~~who desires~~ for report on the [illegible] specimen he submitted from a military working dog. The ~~dog~~ specimen AFIP accession 1391240, tattoo K321, has been forwarded to you for study. If possible would a gross diagnosis and comment of the specimen be forward to the contributor in the near future

CANINE BRUTUS MALE 1391240
DOG X321
11TH USAFH APO SF 96330
8 OCT 71 AP-T

ACC Nº 1391240

DATE OUT	NAME	DATE RETURNED	FOLDER	SLIDES
OCT 8 1971	VETERINARY SECTION		✓	
	JUN 9 1972 FILE			

AFIP FORM 70
8 MAR 57

ACCESSION FOLDER LOCATOR

Daily

Dear Dr. Van Kirk

We have received a request from one of our contributors for a report on the four specimens submitted from a military working dog. The specimen AFIP Accession 1391440, Letter X321, has been forwarded to you for study. If possible we would like a gross diagnosis and brief comment on the specimen to forward to the contributor in the near future.

1391240

CANINE BRUTUS MALE 1391240
DOG X321
11TH USAFH APO SF 96[illegible]30
8 OCT 71 AP-T

PHOTO ______ X-RAY ______

REGISTRY & NUMBER OR STUDY	FU	EXAM	ACCIDENT	SPECIAL FACTORS	MATERIAL	STATUS	RACE	SEX	AGE	DIAGNOSES	DIAGNOSTIC CODES
✓										1. Endarteritis, [illegible], chronic, active, pulmonary arteries, lung, canine, due to Dirofilaria immitis	40-40-40
✓										2. Pneumonitis, patchy, subacute, with fibrosis, lung, secondary to Dirofilaria immitis	26-40-40
✓										3. Phlebitis, mild, chronic active, hepatic vein, liver	40-40
✓										4. Nephritis, interstitial, multifocal, mild, chronic, kidney	71-40
✓										5. Euthanasia, [illegible]	00-01 11-70

DATE	S OR A NUMBER	AP	S	B	T	GROSS	CONTRIBUTOR

AFIP FORM 34 1 APR 62 EDITION OF 1 MAR 57 MAY BE USED

ACCESSION FOLDER

EXHIBIT 10

MILITARY MEDICINE
STUDIES OF MILITARY WORKING DOG NECROPSIES

A COHORT STUDY O THE EFFECTS OF VIETNAM SERVICE ON TESTICULAR PATHOLOGY OF U.S. MILITARY WORKING DOGS

MILITARY MEDICINE, 160, 5:248, 1995

A Cohort Study of the Effects of Vietnam Service on Testicular Pathology of U.S. Military Working Dogs

*Howard M. Hayes, DVM**
Robert E. Tarone, PhD†
Harold W. Casey, DVM PhD‡

Using histopathologic diagnoses made on necropsy material from 3,024 military working dogs (MWDs) who died from 1968 to 1973, we analyzed the effect of military service in the Republic of Vietnam on testicular pathology. Among 1,048 MWDs that died in Vietnam and had no reported developmental risk factors for testicular disease, significant excesses of testicular hemorrhage, epididymitis/orchitis, sperm granuloma, testicular degeneration, and seminoma were evident. Among 126 MWDs with prior Vietnam service who died at other duty stations outside Vietnam from 1968 to 1973, significant excesses of testicular degeneration and seminoma were likewise evident. Among 136 MWDs with prior Vietnam service that later died from 1974 to 1980, seminoma continued to be diagnosed in significant excess. In each instance, the odds ratio for the association between Vietnam service and seminoma was 2.0 or greater. Analysis of ever service by Corps Tactical Zones showed significant excesses of seminoma with each Corps area of service compared to Vietnam-era MWDs, but risk was highest in I Corps, particularly at Da Nang Port and Da Nang Air Base. This finding with respect to I Corps is consistent with certain human studies in Vietnam veterans and points to the need for further investigation of possible environmental exposures, particularly those associated to a greater extent with service in I Corps.

Introduction

During the Vietnam War, U.S. military working dogs served with companion dog handlers in close proximity, sharing common exposures to war-related activities, chemical insecticides, phenoxy herbicides, and zoonotic infections. To gain insight into the effects of the Vietnam experience, we have examined tumor morbidity data obtained from the necropsy of U.S. military working dogs (MWDs) that died between January 1968 and March 1973 and whose necropsy tissue specimens were reviewed histopathologically by the Armed Forces Institute of Pathology (AFIP).[1] In an analysis adjusting for age at death, we found that MWDs that died in the Republic of Vietnam (RVN) had a significant excess of testicular neoplasms in general, and specifically testicular seminoma, compared to MWDs dying in the continental United States (CONUS) during the same time period. In an analysis based on 190 additional MWDs repatriated to the U.S. in four separate groups in 1971–1972, and 9 other MWDs with known Vietnam service that were later transferred to duty locations outside of RVN and CONUS and died from 1974 to 1978,[1] a similar 2-fold significant excess of testicular seminoma was observed using the tumor morbidity of CONUS MWDs dying from 1974 to 1978 as the referent. This strengthened the evidence of a causal association between Vietnam service and increased risk of testicular neoplasia in the MWD.

Because of this observed risk in Vietnam service MWDs, we then evaluated service in Vietnam as a risk factor by abstracting military service history from the occupational histories of a case-control study of testicular cancer involving human patients treated from January 1976 to June 1981 at the National Navy Medical Center, Walter Reed Army Medical Center, and the National Institutes of Health Clinical Center.[2] We found an unreported significant 2-fold increased risk of testicular cancer associated with service in Vietnam. In both the MWD study and the human study, the effect was seen in younger patients.[1,2]

Through an extensive review of military and medical service records not available to us at the time of the first MWD study,[1] we have now (1) verified or corrected the signalment (age at death, breed, sex [including whether intact or castrated], and unique identity tattoo) on 92% of the AFIP necropsy reports for 1968 to 1980 (N = 5,964),[3] (2) identified 479 MWDs with prior Vietnam service before death elsewhere and necropsy review by AFIP,[3] (3) determined the military units and Corps Tactical Zones (CTZ) of service for 1,584 of 1,663 necropsied MWDs (1968–1980) with Vietnam experience, and (4) identified MWDs in the AFIP Registry with previously undocumented developmental abnormalities (cryptorchism or inguinal hernia) that are known risk factors for testicular pathology.[4] The present investigation examines all reported testicular pathology recorded in necropsied MWDs, from 1968 to 1973, to assess the effect of the Vietnam experience. In addition, testicular seminomas diagnosed in MWDs necropsied from 1974 to 1980 will be evaluated to assess the risk associated with prior Vietnam service compared to those whose military service was exclusively performed elsewhere.

Materials and Methods

Specially trained working dogs have been utilized extensively by the U.S. military during conflicts over the last century; the U.S. military working dog program has been described in detail elsewhere.[1] During the Vietnam War, at least 3,895 dogs, usually 1- to 2-year-old German shepherd phenotypes, were procured by the U.S. and sent to the Vietnam theater of operations.[3] From January 1968 to March 1973 at least 2,389 served exclusively with U.S. forces and died in Vietnam; another 479 with Vietnam service experience completed their military service outside Vietnam through 1980. From this combined group (N = 2,868), 1,663 were necropsied with histopathological tissue examination by the AFIP; they serve as the Vietnam service cohort for epidemiological analyses. In the evaluation of Vietnam as a risk factor for testicular disease, 3,714 intact male MWDs (1968–1973, N = 1,731;

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This manuscript was received for review in May 1994. The revised manuscript was accepted for publication in March 1995.

1974–1980, N = 1,982) that served at any duty station worldwide other than Vietnam and whose tissues underwent similar histopathological examination will be used as the referent cohort, and will be referred to in the sequel as Vietnam-era MWDs.

From late 1967 through mid-1979, all MWDs dying while in the service of the U.S. Forces, regardless of the duty location or circumstances of death, were required to be necropsied and a standard set of tissue specimens forwarded to the AFIP for histopathological examination (exception was made for cadavers that had become too decomposed). The overall percentage of MWDs dying in Vietnam whose tissues actually underwent AFIP histopathological examination was affected by hazards associated with wartime service, such as the inability to retrieve animals killed in the field or to place MWDs suffering sudden death in the field or in their kennel under refrigeration before severe tissue autolysis occurred. There is no evidence to suggest, however, that the presence of any testicular pathology in a MWD reduced the likelihood of tissue collection or the subsequent opportunity for histopathological examination.

Excluded from the present study were female MWDs, males that were castrated prior to entry into the MWD program, and other males listed as castrated at the time of death but without medical record verification detailing histopathologic examination of their excised testes. Those that were castrated with documented histologic examination of their excised testes were included in the analyses, with age at death substituted for the age at castration for any testicular pathology noted (1968–1973, N = 17; 1974–1980, N = 68).

Testicular pathology was categorized as the presence of inflammation, congestion and/or frank hemorrhage, sperm granuloma, degeneration (to include tubular atrophy, tubular degeneration, giant cell formation, fibrosis, or oligospermatogenesis), or neoplasia. Since any of the composite entities categorized as testicular "degeneration" may be sequela to the other listed testicular diseases,[5] concomitant occurrence with other testicular pathology was not considered. The presence of testicular pathology was categorized according to whether or not the MWD was cryptorchid or had an inguinal hernia.

Canine ehrlichiosis, a parasitism caused by a tick-borne rickettsial organism, was common in Vietnam service MWDs in 1968–1969, but was also occasionally observed in MWDs that served in Okinawa, Thailand, and Puerto Rico.[6,7] Before 1969 no mention was made in the veterinary literature of an association between testicular pathology and ehrlichiosis.[8] The MWD experience, however, demonstrated that acute ehrlichiosis often resulted in gross or petechial hemorrhage of the urogenital tract, particularly the penis and testis.[6,7] Because of this, we identified all MWDs whose necropsy results were noted by the AFIP, either in their computerized necropsy data base or in the summary follow-up letter that reported their findings to the prosector, to be suggestive of infection by *Ehrlichia canis*, in order to permit an independent analysis of, and adjustment for, the effects of ehrlichiosis.

We computed the prevalence of each condition in Vietnam service MWDs and compared that with those from Vietnam-era MWDs. Conditional maximum likelihood estimates of prevalence odds ratios (OR) were calculated, with the associated exact 95% confidence intervals (CI).[9] All analyses were adjusted for age at death. In general, the relationship between disease incidence rates and prevalence rates at necropsy is not a simple one for occult conditions (i.e., conditions not apparent until necropsy or histopathological examination).[10] For nonlethal tumors, such as testicular neoplasms in the dog, however, there is a direct relationship between incidence and prevalence rates,[10] so that elevated prevalence ORs indicate elevated relative risks for tumor incidence.

Results

A total of 3,024 male MWDs that died from 1968 to 1973 and met the inclusion criteria were identified for analysis, of which 256 were cryptorchid and another 5 had inguinal hernia not associated with trauma. Of those without these developmental defects, 29% of MWDs dying in Vietnam (N = 1,048) had identified testicular pathology, as did 29% of the Vietnam veteran MWDs that died elsewhere (N = 125) and 17% of Vietnam-era MWDs (N = 1,554) (Table I). The most prevalent single condition was some form of testicular degeneration. Testicular seminoma was the most common neoplasm in occurrence, followed by interstitial cell tumors and Sertoli cell tumors.

Testicular neoplasms were the most common diagnoses among cryptorchid MWDs. Again, seminomas had the highest prevalence, occurring in 19% of the total group (Table II). MWDs with developmental risk factors that died in Vietnam were on average 5.6 years of age (±0.23 SE), whereas Vietnam-era MWDs with these developmental defects averaged 7.0 years at death (±0.20). The overall prevalence odds ratio for association between Vietnam service and the presence of cryptorchism or inguinal hernia was 1.2 (95% CI = 0.9, 1.5). Among MWDs with developmental risk factors, the odds ratio for association with Vietnam service and seminoma was 0.8 (0.4, 1.5) and 0.6 (0.3, 1.1) for any testicular tumor

To assess the effect of ehrlichiosis, we classified males (withou cryptorchism or inguinal hernia) from the Vietnam service cohc that died from 1968 to 1973 according to whether they were ide tified by AFIP as likely to have been infected with *E. canis* at deati (*N* = 269) or whether there was no suggested evidence of such infection (*N* = 779). Infection of the lower urinary tract and/or the prostate is considered a primary cause of epididymitis/orchitis.[11] We identified all MWDs diagnosed at death with pyelitis, cystitis, urethritis, or prostatitis to permit their exclusion from analyses involving the prevalence of epididymitis/orchitis. Within the Vietnam service cohort only, we computed ORs measuring associations between likely ehrlichiosis infection and various testicular conditions, using those dogs without evidence of infection as the referent (OR = 1).

Ehrlichiosis showed no discernible effect on the occurrence of testicular neoplasms in the Vietnam cohort (Table III). Three conditions, however, were found to be significantly associated with ehrlichiosis: epididymitis/orchitis, testicular congestion/hemorrhage, and testicular degeneration. Subsequent analyses of the prevalence of these three conditions with Vietnam service will exclude MWDs noted by the AFIP as likely to have been affected by ehrlichiosis.

We computed the OR by measuring the association between Vietnam service and each testicular condition, excluding known risk factors where appropriate, adjusting for age at death by 2-year intervals, and using the Vietnam-era cohort (1968–1973)

TABLE I

DIAGNOSED TESTICULAR PATHOLOGY IN U.S. MILITARY WORKING DOGS WITHOUT DEVELOPMENTAL RISK FACTORS FOR TESTICULAR DISEASE[a] THAT DIED 1968–1973, BY DUTY SITES OF MILITARY SERVICE

Diagnosis[c]								Service History[b] (N = 1,048)	(N = 125)	(N = 1,554)
SEM	ICT	SCT	NOS	Epididymitis/ Orchitis	Congestion/ Hemorrhage	Sperm Gran.	Testis DGN	Vietnam Last Duty	Vietnam Vet	All Duty Elsewhere
+	–	–	–	–	–	–	NA[d]	44	9	60
+	+	–	–	–	–	–	NA	2	3	8
+	–	+	–	–	–	–	NA	2	—	3
+	–	–	–	+	+	–	NA	2	—	—
+	–	–	–	+	–	–	NA	3	—	3
+	+	+	–	–	–	–	NA	1	—	1
–	+	+	–	–	–	–	NA	1	—	3
–	+	–	–	–	–	–	NA	15	3	29
–	+	–	–	+	–	–	NA	—	—	1
–	–	+	–	–	–	–	NA	2	—	6
–	–	–	+	–	–	–	NA	1	—	1
–	–	–	–	+	–	–	NA	57	3	26
–	–	–	–	NA	+	–	NA	74	—	13
–	–	–	–	NA	+	+	NA	3	—	—
–	–	–	–	+	–	+	NA	5	—	—
–	–	–	–	–	–	+	NA	8	1	8
–	–	–	–	–	–	–	+	82	18	99
–	–	–	–	–	–	–	—	746	88	1,293

[a] Cryptorchism, inguinal hernia.

[b] Vietnam last duty = military service ended in Vietnam; Vietnam vet = served in Vietnam and was transferred to another duty station outside Vietnam before end of military service.

[c] SEM = seminoma; ICT = interstitial cell tumor; SCT = Sertoli cell tumor; NOS = testicular tumor, cell type not determined; Sperm gran. = sperm granuloma; testis DGN = testicular degeneration (including tubular atrophy, degeneration, giant cell formation, fibrosis, or oligospermatogenesis); + = condition diagnosed; – = condition not diagnosed.

[d] NA = not applicable; condition likely to be secondary to one of the other diagnoses indicated.

TABLE II

DIAGNOSED TESTICULAR PATHOLOGY IN U.S. MILITARY WORKING DOGS WITH DEVELOPMENTAL RISK FACTORS FOR TESTICULAR DISEASE[a] THAT DIED 1968–1973, BY DUTY SITES OF MILITARY SERVICE

Diagnosis[c]						(N = 104)	Service History[b] (N = 14)	(N = 141)
SEM	ICT	SCT	NOS	Epididymitis/ Orchitis	Congestion/ Hemorrhage	Vietnam Last Duty	Vietnam Vet	All Duty Elsewhere
+	–	–	–	–	–	13	6	32
–	+	–	–	–	–	2	—	6
–	–	+	–	–	–	1	1	12
+	–	–	–	+	–	1	—	2
+	–	+	–	–	–	3	—	—
–	–	+	–	NA[d]	+	1	—	1
–	+	+	–	–	–	1	—	—
–	–	–	–	NA	+	6	—	—
–	–	–	–	+	–	3	—	3
+	+	–	–	–	–	—	—	1
+	+	+	–	–	–	—	—	1
+	–	+	–	–	–	—	—	5
–	–	–	+	–	–	—	—	1
–	–	+	–	+	–	—	—	2
–	–	–	–	–	–	73	7	75

[a] Cryptorchism (N = 256), inguinal hernia (N = 5).

[b] Vietnam last duty = military service ended in Vietnam; Vietnam vet = served in Vietnam and transferred to another duty station outside Vietnam before end of military service.

[c] SEM = seminoma; ICT = interstitial cell tumor; SCT = Sertoli cell tumor; NOS = testicular tumor, cell type not determined. Sperm granuloma was unreported.

[d] NA = not applicable; condition likely to be secondary to one of the other diagnoses indicated.

TABLE III

ODDS RATIO[a] OF TESTICULAR PATHOLOGY DIAGNOSED IN U.S. MILITARY WORKING DOGS (MWD) THAT SERVED AND DIED IN VIETNAM, 1968-1973: ASSOCIATION WITH SUSPECTED *EHRLICHIA CANIS*[b] INFECTION

	Histopathologic Findings Suggestive of Erhlichiosis			
	No (*N* = 779)	Yes (*N* = 269)		
Diagnosis	Cases	Cases	OR	95% Confidence Interval
Epididymitis/orchitis[c]	25	14	2.2	1.0- 4.6
Testicular congestion/hemorrhage	18	61	11.1	6.1-20.3
Sperm granuloma	11	5	1.5	0.4- 5.0
Seminoma[d]	43	11	1.1	0.5- 2.2
Interstitial cell tumor[d]	15	4	1.3	0.3- 4.5
Sertoli cell tumor[d]	3	3	4.7	0.7-33.0
Testicular degeneration[e]	59	23	1.7	1.0- 2.9

[a] Odds ratio (OR) adjusted for age at death for intact MWDs without developmental risk factors for testicular pathology characterized as likely to have been infected with *E. canis* at time of death using the prevalence among unlikely infected MWDs as the referent (OR = 1).

[b] Cases considered likely to have been infected with *E. canis* were so noted in their histopathological report from the Armed Forces Institute of Pathology.

[c] Analysis excludes all cases reported with testicular/epididymal hemorrhage, urethritis, cystitis, pyelitis, or prostatitis.

[d] Analysis excludes all cases reported with cryptorchism or inguinal hernia.

[e] Analysis excludes all cases reported with cryptorchism, inguinal hernia, testicular/epididymal inflammation or hemorrhage, sperm granuloma, and testicular neoplasms.

as the referent (OR = 1). In Vietnam service MWDs, the odds ratios of sperm granuloma, testicular congestion/hemorrhage, epididymitis/orchitis, and testicular degeneration were significantly elevated, whereas interstitial cell and Sertoli cell tumors of the testis occurred about equally in Vietnam MWDs and Vietnam-era MWDs (Table IV). Testicular seminoma was significantly elevated in both those that died in Vietnam (OR = 2.0; 1.3, 3.0) and those that were transferred out of Vietnam and later died at other duty locations, from 1968 to 1973 (OR = 3.2; 1.5, 6.5) (Table V). The excess of seminomas continued to occur in Vietnam veteran MWDs that later died from 1974 to 1980 (OR = 2.0; 1.3; 3.1) (Table VI). Of MWDs that died from 1968 to 1980, all non-cryptorchid MWDs diagnosed with seminoma under age 5 had served in Vietnam (Tables V and VI).

When categorized by military occupation/service, all Vietnam service MWDs (1968-1980) except those serving with the Marine Corps demonstrated significantly elevated ORs for seminoma compared with Vietnam-era MWDs (Table VII). Army scout/tracker/mine detection MWDs and Navy sentry MWDs had higher ORs than other Vietnam service MWDs. Of 18 qualified Navy dogs, 16 served at Da Nang Port for some period of time (5 cases of seminoma; OR = 15.0, CI = 3.6, 59.3); 3 of the 16 later served at Da Nang Air Base. Examination of those Air Force MWDs that ever served at Da Nang Air Base showed that they, too, had a higher OR for seminoma (OR = 3.9, CI = 1.6, 9.4) compared with Vietnam-era MWDs.

ORs were computed for seminoma by CTZ of service with Vietnam-era MWDs as the referent cohort; significant ORs were evi-

TABLE IV

ODDS RATIO[a] FOR TESTICULAR PATHOLOGY[b] DIAGNOSED IN U.S. MILITARY WORKING DOGS (MWD) THAT DIED 1968-1973: ASSOCIATION WITH VIETNAM SERVICE

	Vietnam Era	Served and Died in Vietnam			Served in Vietnam/ Died Elsewhere		
Diagnosis	Cases	Cases	OR	95% CI	Cases	OR	95% CI
Epididymitis/orchitis[c]	24	25	2.6	1.5-5.0	2	1.4	0.2- 6.2
Testicular congestion/hemorrhage[d]	9	18	3.2	1.3-8.2	0	0	0.0-38.2
Sperm granuloma	10	16	2.8	1.2-7.0	1	1.2	0.1- 9.5
Interstitial cell tumor	42	19	1.1	0.6-2.1	6	2.3	0.9- 6.0
Sertoli cell tumor	14	6	1.0	0.3-2.9	0	0	0.0- 4.0
Testicular degeneration[e]	98	59	1.6	1.1-2.3	15	2.9	1.5- 5.5

[a] Odds ratio (OR) adjusted for age at death for intact MWDs with Vietnam service using prevalence among Vietnam-era MWDs (no known Vietnam service) as the referent (OR = 1).

[b] Excluding cryptorchism and inguinal hernia.

[c] Analysis excludes all cases reported likely to have been infected with *E. canis* plus those with testicular/epididymal hemorrhage, urethritis, cystitis, pyelitis, or prostatitis.

[d] Analysis excludes all cases reported likely to have been infected with *E. canis*.

[e] Testicular degeneration = giant cell formation; tubular degeneration, atrophy, fibrosis; or oligospermatogenesis. Analyses excluded cases with testicular neoplasia, congestion and/or hemorrhage; orchitis, epididymitis, sperm granuloma, and ehrlichiosis.

TABLE V

ODDS RATIO[a] BY AGE OF TESTICULAR SEMINOMA DIAGNOSED IN U.S. MILITARY WORKING DOGS (MWD) THAT DIED 1968–1973 WITHOUT KNOWN RISK FACTORS[b] FOR TESTICULAR NEOPLASIA: ASSOCIATION WITH VIETNAM SERVICE

	Vietnam Era		Served and Died in Vietnam			Served in Vietnam/ Died Elsewhere		
Age in Years	Cases	N	Cases	N	OR	Cases	N	OR
1–2	0	59	0	68	0	0	4	0
3–4	0	186	3	302	∞	2	26	∞
5–6	3	249	14	276	4.4[c]	0	31	0
7–8	18	506	19	262	2.1[c]	2	37	1.5
9–10	40	468	18	130	1.7	6	22	4.0[c]
11–12	13	82	0	10	0	2	5	3.5
13–14	1	4	0	0	0	0	0	0
					Summary 2.0 (95% CI =1.3, 3.0)			Summary 3.2 (95% CI = 1.5, 6.5)

[a] Odds ratio (OR) adjusted (age at death) for intact MWDs with Vietnam service using prevalence among Vietnam-era MWDs (no known Vietnam service) as the referent (OR = 1).
[b] Cryptorchism, inguinal hernia.
[c] 95% CI excludes 1.

dent with service in each CTZ (Table VIII). Evaluation of ever/never military service by CTZ (i.e., analysis restricted to Vietnam MWDs only, with MWDs that never served in a given CTZ as the referent cohort) indicates significantly greater risk associated with ever service in I Corps (the most northern CTZ) than elsewhere in Vietnam (Table IX).

Discussion

Studies of morbidity among human Vietnam veterans have been criticized as being particularly prone to certain kinds of misclassification or bias. Misclassification may result from inaccurate demographic data or patient identity, missing or incomplete medical or service records, or inaccurate diagnoses. Our recent extensive review of service and medical records of MWDs has verified or corrected the demographic and identity data of 91.2% of those who died in Vietnam and 91.1% of those dying elsewhere, and indicated no association between duty station and the likelihood of an identity recording error in AFIP records.[3] In addition, our ability to locate and examine archived records from the same percentage of Vietnam and Vietnam-era MWDs indicates that equal care was taken to preserve records regardless of the last duty station. Because of the standardized MWD necropsy protocol used world-wide and the centralized histopathological examination of tissues at the AFIP, the disease diagnoses in the MWD cohort are not subject to criticisms regarding the competence and consistency of diagnoses that apply to some observational human studies. Furthermore, the MWD cohort is not subject to the common criticisms of many human Vietnam veteran health studies regarding the potential for biases due to the self-selection of study subjects and selective recall of disease outcomes or exposure opportunities.

This investigation details the severe effects of the Vietnam experience on the canine testis. Ehrlichiosis appears to have been directly associated with the development of epididymitis/orchitis, testicular congestion/hemorrhage, and testicular degeneration (which may be the sequela of the former two conditions). However, there is little evidence that this parasitism was associated with the development of testicular tumors (Table III).

After excluding MWDs likely to have been infected with *E. canis*, it was found that epididymitis/orchitis, sperm granuloma, and testicular congestion/hemorrhage were significantly associated with service and death in Vietnam, but were not particularly associated in those MWDs that were subsequently transferred to other duty stations outside of Vietnam before their deaths, from 1968 to 1973. After exclusion of dogs with known risk factors, testicular degeneration was significantly elevated in both MWDs that died in Vietnam and those that were transferred outside of Vietnam before their deaths, from 1968 to 1973. The AFIP data do not per-

TABLE VI

ODDS RATIO[a] BY AGE OF TESTICULAR SEMINOMA DIAGNOSED IN U.S. MILITARY WORKING DOGS (MWD) THAT DIED 1974–1980 WITHOUT KNOWN RISK FACTORS FOR TESTICULAR NEOPLASIA[b]: ASSOCIATION WITH VIETNAM SERVICE

	No Vietnam Service		Vietnam Veteran		
Age in Years	Cases	N	Cases	N	OR
1–2	0	16	0	0	0
3–4	0	70	0	0	0
5–6	3	130	1	3	21.2
7–8	37	409	5	28	2.2
9–10	143	796	23	79	1.9[c]
11–12	91	383	10	26	2.0
13–14	8	25	0	0	0
					Summary 2.0 (95% CI = 1.3, 3.1)

[a] Odds ratio (OR) adjusted for age at death for intact MWDs with Vietnam service using prevalence among Vietnam-era MWDs (no known Vietnam service) as the referent (OR = 1).
[b] Cryptorchism, inguinal hernia.
[c] 95% CI excludes 1.

TABLE VII

ODDS RATIO[a] OF TESTICULAR SEMINOMA BY MILITARY OCCUPATION[b] AND/OR BRANCH OF SERVICE AMONG U.S. MILITARY WORKING DOGS (MWD) THAT SERVED IN VIETNAM, 1968–1973, AND DIED 1968–1980

Military Service	Assigned Occupation	Number of MWDs	OR	95% Confidence Interval
Army	Sentry,[c,d]	336	1.9	1.2- 5.0
	Scout[c], tracker or mine detection	453	3.1	1.8- 5.3
Air Force	Sentry[d]	415	2.2	1.4- 3.4
Navy	Sentry[d]	18	12.7	3.2–48.0
Marine Corps[e]	Sentry and scout combined	52	1.6	0.1–12.9
Unknown[f]	Unknown	56	1.4	0.3- 6.0

[a] Odds ratio (OR) adjusted for age at death in the periods 1968–1973 and 1974–1980 for intact MWDs with Vietnam service and without a history of cryptorchism or inguinal hernia using prevalence among Vietnam-era MWDs (no known Vietnam service) as the referent (OR = 1).

[b] Occupation determined from military service records.

[c] Thirteen identified as having performed both Army sentry and Army scout functions; they were included in each category.

[d] Two Navy sentry MWDs later served with the Army; five other Navy sentry MWDs later served with the Air Force. Each MWD serving with multiple military services were counted in each appropriate category.

[e] Records are unclear for many of the Marine Corps MWDs establishing service function; therefore, they were combined for analysis.

[f] Of those designated as "Unknown," many had no service records to review other than AFIP necropsy data: 36 of 56 were reported less than 5 years of age at death; of these, 18 were awaiting assignment to an Army unit when they died of ehrlichiosis, the effects of heat stroke, or were found unfit for further service in Vietnam.

mit an examination of risk for testicular degeneration among Vietnam veteran MWDs dying from 1974 to 1980, since these diagnoses were apparently grouped into general statements such as "other degenerative changes were present in several organs as typically seen in older military working dogs."[3] The current study does reconfirm the major finding of the first MWD study, which was subject to some misclassification of Vietnam service,[1] that seminoma was significantly elevated in Vietnam service MWDs, particularly in younger dogs (Table V and VI).

There are no obvious sources of bias that could have led to a spurious finding of increased risk of testicular degeneration or seminoma in MWDs that died in Vietnam or that served there before dying elsewhere. There were no striking differences in the demographic profiles of Vietnam service and Vietnam-era MWDs except for the fact that the Vietnam service MWDs died, on average, at a younger age.[3] All available records were carefully examined to identify the presence of the known risk factors for seminoma (cryptorchism and inguinal hernia; 37% of these occurrences were unrecorded on the necropsy report sent to AFIP). Interestingly, seminomas did not occur more frequently in Vietnam service MWDs with these risk factors than in Vietnam-era MWDs with the same. This would argue against a prosector or histopathologist bias associated with tissue specimens originating from Vietnam.

Certain human-made chemicals were used extensively throughout Vietnam by the U.S. military. These include the insecticide malathion (sprayed aerially by Operation Ranch Hand for mosquito control and used as a dipping solution on MWDs for tick control), tetracycline antibiotics (TCL) used as a therapeutic or prophylactic for ehrlichiosis, and the herbicides 2,4-dichlorophe-

TABLE VIII

ODDS RATIO[a] OF TESTICULAR SEMINOMA BY CORPS TACTICAL ZONE (CTZ)[b] OF VIETNAM DUTY STATION AMONG U.S. MILITARY WORKING DOGS (MWD) THAT SERVED IN VIETNAM, 1968–1973, AND DIED 1968–1980

CTZ	Number of MWDs	OR	95% Confidence Interval
I Corps	350	3.1	1.9–4.9
II Corps	637	1.9	1.4–2.8
III Corps	829	2.2	1.6–3.0
IV Corps	112	2.3	1.0–5.0

[a] Odds ratio (OR) adjusted for age at death in the periods 1968–1973 and 1974–1980 for intact MWDs with Vietnam service and without a history of cryptorchism or inguinal hernia using prevalence among Vietnam-era MWDs (no known Vietnam service) as a referent (OR = 1).

[b] MWDs included in each Corps area of their service. Many, particularly U.S. Army sentry and scout dogs, served in more than one Corps areas during multiple tours of Vietnam service; they were included in each appropriate CTZ.

TABLE IX

ODDS RATIO[a] OF TESTICULAR SEMINOMA FOR (EVER) SERVICE BY CORPS TACTICAL ZONE (CTZ)[b] AMONG U.S. MILITARY WORKING DOGS (MWD) THAT SERVED IN VIETNAM, 1968–1973, AND DIED 1968–1980

	Ever Served			
CTZ	No	Yes	OR	95% Confidence Interval
I Corps	959	350	1.7	1.03–2.8
II Corps	672	637	0.8	0.5 –1.3
III Corps	480	829	1.2	0.7 –1.8
IV Corps	1197	112	1.1	0.5 –2.3

[a] Odds ratio (OR) adjusted for age at death in the periods 1968–1973 and 1974–1980 for intact MWDs without history of cryptorchism or inguinal hernia; non-service in cited Corps area used as the referent (OR = 1).

[b] MWDs included in each Corps area of their service; many, particularly U.S. Army sentry and scout dogs, served in more than one Corps areas during their multiple tours of Vietnam service.

noxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), and picloram. Two extensively applied herbicide mixtures, Agent Orange and Agent White, were sprayed aerially over Vietnam by Operation Ranch Hand. Agent Orange was also applied by rotary aircraft, riverine craft, truck-mounted spray booms, and individual backpack sprayers. It was composed of a 1:1 mixture of the *n*-butyl esters of 2,4-D and 2,4,5-T; Agent White was composed of 4:1 mixture of the triisopropanolamine salt of 2,4-D and picloram. The toxic compound 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)[12] was a manufacturing contaminate of 2,4,5-T[13] and was reported in at least one instance in 2,4-D.[14] Several other chlorinated dibenzodioxins other than TCDD are known to have contaminated 2,4-D.[15]

All of these chemicals have been reported to be toxic to the testes of laboratory animals or humans.[1] Malathion has been demonstrated to cause testicular atrophy and damage to the seminiferous tubules in laboratory rats.[1,16] Testicular degeneration of one form or another has been linked to (1) exposure to phenoxy herbicides and/or dioxin in six different laboratory species,[1] (2) exposure to picloram in laboratory mice,[1] and (3) agricultural exposure to 2,4-D in men.[17]

The toxic effects of TCDD on the male reproductive system are becoming better understood. In utero and lactational exposure demasculinizes and feminizes male rats.[18] Sexually mature male laboratory rats fed TCDD in small amounts show dose-related decreases in serum testosterone and sex organ weights that are not explained by hypophagia associated with such experiments.[19] Subsequent research has shown that TCDD affects pituitary responsiveness to testosterone and alters the regulation of pituitary responsiveness to pituitary gonadotropin-releasing hormone.[20]

Studies in USAF Vietnam veterans who participated in Ranch Hand spraying operations showed serum dioxin was significantly associated with "decreased" testicular size; in contrast, serum testosterone levels were only weakly associated with serum dioxin.[21] However, a recent investigation of serum hormone levels in U.S. chemical workers with work-related exposure to TCDD demonstrated that current serum dioxin level was positively and significantly ($p < 0.05$) related to serum luteinizing hormone level and serum follicle-stimulating hormone level and inversely related to total testosterone level. The authors concluded that these results support the animal literature in which dioxin-related effects have been observed in the hypothalamic-pituitary-Leydig-cell axis and on testosterone synthesis.[22] Testicular degeneration, including impaired spermatogenesis, and the development of germ cell neoplasms (e.g. seminoma, embryonal carcinoma) are considered to share common environmental or genetic etiologic risk factors in men.[23,24]

It is likely that most Vietnam service MWDs were exposed to malathion and many to TCL. Beginning in late 1968, Vietnam service MWDs were frequently dipped in a 0.5% solution of malathion for tick control, generally once or twice a month, and many Army MWDs routinely received TCL. Similarly, U.S. Army MWDs serving on Okinawa were dipped for tick control in a 1% solution of malathion, usually once a month, and also often received TCL. However, medical records indicate that USAF MWDs serving on Okinawa apparently were never dipped nor received TCL routinely. The age-adjusted OR for seminoma in Army MWDs serving on Okinawa (10 seminomas diagnosed in 194 MWDs) is 1.3 (0.4, 4.1) compared to USAF MWDs serving on Okinawa (7 seminomas diagnosed in 118 MWDs). Although the Okinawan MWD malathion dose exposure is not exactly the same as that for Vietnam service MWDs, this analysis suggests that malathion and TCL are unlikely to be solely responsible for the elevated risks observed among Vietnam service MWDs.

There is no similar method to evaluate the possible contribution of herbicide exposure to the increased risk of seminoma and testicular degeneration in Vietnam MWDs. As is the case with similar studies in humans, it must be considered that every Vietnam MWD had the opportunity for exposure to herbicides; however, documentation of actual exposure and accurate assessment of exposure levels is difficult. Each MWD occupation appears to be at significantly increased risk, as does "ever" service in each CTZ (Tables VII and VIII). However, U.S. Army scout/tracker/mine detection MWDs exhibited the highest risk, possibly in keeping with greater exposure opportunities while working in the field compared to other MWDs limited to sentry duty at locations typically not defoliated by Ranch Hand operations, although other possibilities of exposure remain to be determined.

It has been reported that phenoxy herbicides are excreted rapidly in urine, exiting the dog within 24 hours of exposure to grass treated with 2,4-D[25] and with a half-life of 77 hours after oral administration of 2,4,5-T.[26] A recent more detailed study, however, has shown that 2,4-D applied to fenced residential lawns in the U.S. leads to detectable urine 2,4-D levels in exposed pet dogs for up to 14 days after application.[27] Thus, given the likely work exposures of Vietnam service MWDs, certainly some would have been subjected to virtually a continuous body burden of 2,4-D throughout their Vietnam tours of service. In addition, dioxin is lipid soluble and as such may be stored in body fat for an estimated 7-year half-life (TCDD) in one human study,[28] and 10-14 years in another study,[29] the former being lifetime exposure for a MWD.

Although elevated risks for seminoma were associated with service in each of the Corps areas of Vietnam, it is noteworthy that the risk in MWDs appeared to be highest in I Corps, the Corps area for which elevated risks have been observed for various human cancers in studies of Vietnam veterans conducted by the Centers for Disease Control[30-32] and others.[33,34] To the limited extent that we could examine specific duty stations within the Corps areas (MWDs served multiple tours of duty, often changing duty stations with each tour, particularly with the Army), service in Da Nang, both at the Air Base and the Port, appeared to be associated with higher risk for MWDs compared to other Vietnam duty stations. The Port of Da Nang was the entry, storage, and exit point in I Corps for herbicides transported in 55-gallon barrels, and Da Nang Air Base was the point of origin of Operation Ranch Hand flights in I Corps.[35] The reason for the overall higher risk in I Corps is unclear, however, and warrants further investigation.

In summary, after correcting for misclassification of Vietnam service known to exist in the previous study,[1,3] and after identifying and controlling for other known risk factors for canine testicular pathology,[4] we reconfirm that military service in the Republic of Vietnam was associated with significantly increased risk of testicular seminoma and, independently, testicular degeneration in U.S. military working dogs. As noted previously,[1,2] human studies of Vietnam veterans have observed similar significant excesses of testicular degeneration and testicular cancer. The current study

identified a greater risk for canine seminoma associated with service in I Corps and inconclusive evidence that the Da Nang area may be associated with particularly high risk. Further investigations are under way to study other disease conditions related to MWD service in Vietnam and to explore the possibility that testicular tumors in the MWD may be a biologic marker for particular exposure to environmental hazards.

Acknowledgments

Dr. Harold W. Casey died April 12, 1993. He retired from the U.S. Air Force as a Colonel in 1980 after serving as chairman of the Department of Veterinary Pathology, Armed Forces Institute of Pathology.

The authors wish to thank BG Robert E. Via, Jr. VC, USA (Ret.), COL James M. Lyday VC, USA (Ret.), Ms. Joyce Manus, and Mr. Richard I. Ramsbottom for valuable assistance.

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US MILITARY WORKING DOGS WITH VIETNAM SERVICE

VOLUME 159 NOVEMBER 1994 NUMBER 11

MILITARY MEDICINE

ORIGINAL ARTICLES

Authors alone are responsible for opinions expressed in the contribution and for its clearance through their federal health agency, if required.

MILITARY MEDICINE, 159, 11:669, 1994

U.S. Military Working Dogs with Vietnam Service: Definition and Characteristics of the Cohort

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We verified and corrected inaccuracies in descriptive profile information on military working dogs (MWDs) that died from 1965 to 1980 and were reported in the Armed Forces Institute of Pathology Registry of Veterinary Pathology. Using other available military records, we determined which dogs served in Vietnam. Identified were 3,895 MWDs with a unique identity tattoo that served in Vietnam, of which 2,389 served exclusively with U.S. military forces and died in Vietnam. Another 479 Vietnam veteran MWDs completed their service elsewhere. This overall effort resulted in signalment corrections, generally age at death, in 21% of the Registry MWD accessions during the study period. The improved definition and characterization of the Vietnam cohort will lead to greater precision in epidemiologic investigations of the health effects from the Vietnam experience in U.S. military working dogs.

Introduction

Recently we undertook a tumor morbidity study of U.S. military working dogs (MWDs) that died between 1968 and 1978 and whose necropsy tissue specimens were reviewed histopathologically by the Armed Forces Institute of Pathology (AFIP).[1] This investigation detected a significant excess of testicular neoplasms both in those MWDs that died in Vietnam from 1968 to 1973, and in 199 known Vietnam veteran MWDs that were repatriated to the U.S. or sent elsewhere and subsequently died from 1974 to 1978 when compared to other MWDs dying in the continental United States (CONUS) during the same time periods. We then evaluated Vietnam military service as a risk factor for testicular cancer among human cancer patients treated at three Washington, D.C., area hospitals from January 1976 to June 1981.[2] We found a significant, 2-fold increased risk of testicular cancer associated with service in Vietnam, and as in the MWD study, a greater increase in risk was seen in younger patients.[1,2]

Studies of possible adverse health effects associated with Vietnam service in the MWD population are of great potential value. The AFIP Registry was not constructed, however, to serve as a primary data resource for epidemiologic studies. An important limitation of the Registry is that the only recorded duty station of military service is that at the time of death. Many dogs with Vietnam service died at duty stations other than Vietnam, such as Okinawa, where many U.S. Army sentry dogs that served in Vietnam were reevaluated and retrained from 1968 to 1973.[3] In this paper we report the results of an extensive effort undertaken to ascertain as completely as possible the cohort of MWDs with Vietnam service, and to verify signalment (year of death, age, breed, and sex [including intact or castrated]) for all MWDs recorded in the AFIP Registry from 1965 to 1980, plus the fate of other MWDs whose tissues were not subjected to histopathological examination.

Our investigation also identified MWDs that served in and left Vietnam alive, and died at other duty stations during the years 1974 to 1980 (1980 was the last year in which Vietnam veteran MWDs were identified among the necropsy sets evaluated by the AFIP). Lastly, certain limitations of the AFIP Registry data related to completeness of pathology reporting from 1974 to 1980 were identified. These limitations and their implications for future epidemiologic research are delineated.

Materials and Methods

The AFIP Registry of Veterinary Pathology is computerized and contains, by accession number, histopathologic evaluations on the necropsy specimens of at least 6,454 MWDs that died worldwide from 1965 to 1980. Standardized submission of tissues taken at necropsy of MWDs began in late 1967. The

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This manuscript was received for review in June 1994. The revised manuscript was accepted for publication in October 1994.

Registry also contains signalment obtained from the necropsy report that accompanies each submission of tissue specimens.[4] This descriptive profile should include a unique alphanumeric tattoo identity (ID), name, age, sex, breed, date of death, circumstances of death, and site of the necropsy (country or state); however, some of these data were occasionally omitted.

Additional records were required to ascertain Vietnam service in MWDs dying outside of Vietnam, to validate signalment, and to correct or complete faulty entries (e.g., incorrect or missing age, sex, and tattoo ID). Accordingly, we obtained access to (1) roll microfilm copies of >400,000 frames of archived military and medical records pertaining to 7,575 individual MWDs that served and died worldwide from 1965 through 1978 and microfiche copies of the same types of records for 199 MWDs that died from 1979 to 1980, (2) microfiche copies of the Sentry Dog Record Card for approximately 10,000 MWDs that entered the service from 1961 through 1979, and (3) the "Preston Brand" log book for 15,305 MWDs procured from 1961 to 1971 at the Department of Defense Military Working Dog Agency, Lackland AFB, Texas. The Sentry Dog Record Card (AF Form 323: Dec 60, Jan 64, Feb 69) was initiated on each MWD at procurement and supposedly contained the dog's name, date of birth, assigned tattoo ID, unit assignments, and often information on final disposition. The Preston Brand log book contained the tattoo ID (typically containing one alphabetic and three numeric characters) assigned to each MWD by the Military Working Dog Agency, plus the dog's name and date of procurement. We also abstracted information from (1) military correspondence, identifying by name and tattoo ID, 861 MWDs whose blood was drawn for laboratory analysis in Vietnam or Okinawa following service in Vietnam,[5,6] (2) field and pathological reports on 155 MWDs whose necropsy specimens were histopathologically reviewed by the Division of Veterinary Pathology, Walter Reed Army Institute of Research (WRAIR), during a period of intense workload (1968–1969) at the AFIP, and (3) related material pertaining to Vietnam that included individual identification of MWDs.[7–9]

AFIP records were matched by tattoo ID to other types of records, and the signalment was verified by hand against roll microfilm and microfiche reference sources. Service in Vietnam was determined by reviewing unit assignments, by documentation of medical examinations, vaccinations, or medical treatment in Vietnam, or by indications of travel into Vietnam or out of Vietnam to a subsequent duty station. Tattoo ID, duty stations, service units, and disposition or cause of death were abstracted for all MWDs identified from available sources, including those with no entry in the AFIP Registry. The Preston Brand log book resolved 41 discrepancies between tattoo ID and dog names on AFIP entries (e.g., incomplete IDs or IDs with characters transposed or incorrectly transcribed). On rare occasions when age at death was missing for MWDs in the AFIP Registry and could not be clarified using other sources of data, age at death was estimated by assuming dogs were 1.5 years of age at procurement.

Results

Service in Vietnam was documented for 3,895 MWDs, of which at least 1,027 were initially or ultimately turned over to the Armed Forces of the Republic of Vietnam (ARVN) (Table I). Once these animals became the property of ARVN forces, medical and service records ceased to be maintained by U.S. personnel. Of the remaining 2,868 MWDs that served exclusively with the U.S. Forces in Vietnam, 479 were transferred out of Vietnam to complete their military service elsewhere. Of the 2,389 that completed their service in Vietnam, 1,311 were necropsied with subsequent histopathological evaluation. Of the remaining 1,078 MWDs, the majority either had an unknown fate or died due to hostile action or other sudden death conditions, so that their bodies either were not recovered from the field or

TABLE I

UNIQUELY IDENTIFIED U.S. PROCURED MILITARY WORKING DOGS THAT WERE TRAINED AND SERVED IN THE REPUBLIC OF VIETNAM[a]

	Served with U.S. Forces		Served with RVN Forces[c]	
Year[b]	Service and Disposition in RVN	Service in RVN, Disposition Elsewhere	MWDs Sent Direct from the U.S.	Transferred from U.S. Armed Forces Serving in RVN
1965	14	0	0	0
1965	155	2	68	0
1967	187	14	87	0
1968	400	29	85	0
1969	527	103	249	9
1970	456	25	147	169
1971	355	22	0	57
1972	272	57	0	88
1973	23	37	0	68
1974–1980	na	190	na	na
Total	2,389	479	636	391

[a]RVN = Republic of Vietnam; MWD = military working dog; na = not applicable.
[b]Year determined by date of last recorded available information.
[c]MWDs were known to be alive in the year noted.

TABLE II

OUTCOME OF 2,389 TRAINED U.S. MILITARY WORKING DOGS THAT SERVED EXCLUSIVELY WITH U.S. FORCES AND ARE NOT KNOWN TO HAVE BEEN TRANSFERRED OUT OF VIETNAM

	Armed Forces Institute of Pathology Histopathological Necropsy Review								
	No (N = 1,078)					Yes (N = 1,311)			
Year	Fate Unknown[a]	Losses Due to Hostile Action[b]	Died of GDV[c]	Died of Heat Stroke	Death Due to Other Causes[d]	Losses Due to Hostile Action[e]	Died of GDV	Died of Heat Stroke	Death Due to Other Causes
1965	0	0	0	4	8	0	0	0	2
1966	108	7	3	4	29	0	0	0	4
1967	88	28	0	11	56	0	0	0	4
1968	107	56	4	12	82	7	4	6	122
1969	42	60	3	15	55	11	2	9	330
1970	41	56	3	6	36	16	9	8	281
1971	28	18	1	0	16	9	1	2	280
1972	66	0	3	0	17	1	2	1	182
1973	3	0	0	0	2	0	0	0	18
Total	483	225	17	52	301	44	18	26	1,223

[a]Includes 19 MWDs missing in action.
[b]Composed of 221 killed in action and 4 wounded in action that died due to injury.
[c]GDV = gastric dilatation-volvulus syndrome.
[d]Includes deaths due to natural or unknown causes and euthanasia.
[e]Composed of 29 killed in action and 15 wounded in action that died due to injury.

became too decomposed in the tropical climate to permit effective histopathologic evaluation (Table II).

Losses due to hostile action accounted for the death of at least 269 MWDs employed by U.S. Forces between 1965 and 1972. Losses for the Army, Navy, and Marine Corps by Corps Tactical Zone for 1968 to 1972 are shown in Table III (data on USAF sentry dog unit strength were not available for 1968 to 1972). Typically, the highest yearly death rates from hostile action were seen in I Corps.

Heat prostration was the second-leading cause of sudden death for MWDs serving in Vietnam, accounting for 78 deaths. The mean ages at death were similar for dogs dying of heat prostration and for dogs killed in action (KIA), except for 1965 and 1966, during which years dogs dying of heat prostration tended to be older (Table IV).

Of the 479 Vietnam veteran MWDs who left Vietnam, 25 were given away to local law enforcement agencies or private individuals in the U.S. Another 49 MWDs had unknown disposition, but it is likely that these too were similarly transferred. The remaining 405 Vietnam veteran MWDs died in U.S. military service. Of these, 352 (87%) were necropsied and underwent histopathologic evaluation by AFIP (Table V).

Almost all of the MWDs used by the U.S. that ended their service from 1968 to 1973 were purebred or phenotypic German shepherd dogs. Notable exceptions were 64 Labrador or golden retrievers used in Vietnam as trackers and 45 other retrievers that served elsewhere. Examination of sex ratio showed that 93.9% of MWDs dying in Vietnam were males, compared to 94.0% of MWDs serving and dying elsewhere. The only striking profile difference between Vietnam service MWDs and those serving elsewhere was age at death. MWDs dying in Vietnam were significantly younger at death than MWDs dying at other duty stations (Table VI).

Vietnam veteran MWDs were found to have been dispersed

TABLE III

LOSSES DUE TO HOSTILE ACTION[a] BY CORPS TACTICAL ZONE AMONG COMBINED U.S. ARMY, NAVY, AND MARINE CORPS MILITARY WORKING DOGS, 1968–1972

Year	I Corps	%	II Corps	%	III Corps	%	IV Corps	%	Total[b]	%
1968	24/356	6.7	7/328	2.1	15/483	3.1	7/101	6.9	59/1268	4.7
1969	28/314	8.9	17/285	6.0	18/422	4.3	4/61	6.6	68/1082	6.3
1970	40/405	9.9	13/338	3.8	12/363	3.3	0/18	0	72/1124	6.4
1971	21/234	9.0	3/149	2.0	2/127	1.6	0/13	0	27/523	5.2
1972	1/10	10.0	0/22	0	0/101	0	0/9	0	1/142	0.7
Summary	114/1319	8.6	40/1122	3.6	47/1496	3.1	11/202	5.4		

[a]Killed in action or wounded in action and died due to injury (including euthanasia); 1968 denominator based on mean annual authorized unit strength by Corps area;[20] 1969–1972 denominators based on mean annual unit strength determined from blood sample statistics.[6]
[b]Includes 15 killed in action whose Corps service area at death is unknown.

throughout the military system (Table VII). All of those finishing their career in CONUS were originally among the 190 repatriated animals flown to the U.S. in 1971 to 1972.[1] plus an Air Force sentry dog returned to the U.S. in 1967 because of his valor.[8] The majority of those dying outside of Vietnam from 1968 to 1973 had Okinawa as their last duty station, followed by South Korea, which received replacements on occasion from the sentry dog retraining program on Okinawa.

Of the 497 MWDs that died in Okinawa and whose tissues underwent histopathologic review at AFIP, 92% had medical and service records complete enough to verify prior Vietnam service. Compared to other MWDs dying on Okinawa, those

TABLE IV

DISTRIBUTION BY YEAR AND MEAN AGE OF U.S. MILITARY WORKING DOGS[a] THAT WERE KILLED IN ACTION OR DIED FROM HEAT PROSTRATION IN THE REPUBLIC OF VIETNAM

	Killed in Action or Wounded in Action and Died of Injuries			Died of Heat Prostration		
Year	N	Mean Age	Standard Error[b]	N	Mean Age	Standard Error
1965	0			4	5.3	(1.03)
1966	7	2.7	(0.57)	4	5.3	(1.38)
1967	28	2.5	(0.17)	11	2.4	(0.15)
1968	63	3.6	(0.19)	18	3.5	(0.29)
1969	71	3.3	(0.16)	24	3.3	(0.23)
1970	72	3.9	(0.14)	14	4.0	(0.39)
1971	27	4.0	(0.22)	2	5.0	(1.00)
1972	1	4.0		1	8.0	
1973	0			0		
Total	269	3.5	(0.08)	78	3.6	(0.18)

[a]Includes those serving with U.S. Army, Navy, Air Force, and Marine Corps units.
[b]Standard error of the mean.

TABLE V

OUTCOME OF 479 U.S. MILITARY WORKING DOGS THAT SERVED IN VIETNAM AND ARE KNOWN TO HAVE ENDED THEIR MILITARY SERVICE ELSEWHERE

	Armed Forces Institute of Pathology Histopathological Necropsy Review							
	No (N = 127)					Yes (N = 352)		
Year	Gave Away	Fate Unknown	Died of GDV[a]	Died of Heat Stroke	Death Due to Other Reasons[b]	Died of GDV	Died of Heat Stroke	Death Due to Other Reasons
1965	0	0	0	0	0	0	0	0
1966	0	0	0	0	2	0	0	0
1967	0	0	0	1	1	1	0	11
1968	0	0	0	1	7	0	1	20
1969	0	39[c]	0	0	10	1	1	52
1970	0	0	0	0	2	0	0	23
1971	5	0	0	1	1	0	0	15
1972	10	9	0	0	2	0	0	36
1973	7	0	1	0	6	0	0	23
1974	2	1	0	0	1	3	0	23
1975	1	0	1	0	3	2	0	31
1976	0	0	0	0	3	0	0	46
1977	0	0	0	0	2	1	0	28
1978	0	0	0	0	3	0	1	17
1979	0	0	0	0	2	0	0	13
1980	0	0	0	0	3	0	0	3
Total	25	49	2	3	48	8	3	341

[a]GDV = gastric dilation-volvulus syndrome.
[b]Includes deaths due to natural or unknown causes and euthanasia.
[c]Represents 39 of 124 military working dogs (MWDs) whose blood was drawn in Okinawa to test for erhlichiosis, following transfer from Vietnam between July 14 and September 18, 1969; the fate of the remaining 85 Vietnam service MWDs is known.

TABLE VI

MEAN AGE AT DEATH BY LAST DUTY STATION FOR THE NECROPSY POPULATION OF TRAINED U.S. MILITARY WORKING DOGS ARCHIVED IN THE ARMED FORCES INSTITUTE OF PATHOLOGY NECROPSY DATA REGISTRY, 1968–1980

Duty Station	1968–1973 N	1968–1973 Mean Age	1968–1973 Standard Error[a]	1974–1980 N	1974–1980 Mean Age	1974–1980 Standard Error
Republic of Vietnam	1,303	5.7	(0.06)			
Vietnam veteran MWDs that died elsewhere	172	6.5	(0.18)	168	9.4	(0.11)
Continental U.S.	844	7.1	(0.09)	1,020	9.1	(0.07)
Okinawa	384	7.1	(0.14)	181	8.9	(0.15)
South Korea	269	7.8	(0.12)	316	9.2	(0.11)
West Germany	172	7.6	(0.15)	192	8.6	(0.16)
Thailand	117	6.9	(0.17)	163	8.5	(0.11)
Japan	86	8.4	(0.21)	55	9.6	(0.29)
Philippines	82	7.0	(0.21)	189	8.7	(0.13)
All others combined	123	7.7	(0.16)	128	8.0	(0.20)

[a]Standard error of the mean.

TABLE VII

DISTRIBUTION OF KNOWN VIETNAM VETERAN U.S. MILITARY WORKING DOGS BY LAST DUTY STATION ARCHIVED IN THE ARMED FORCES INSTITUTE OF PATHOLOGY NECROPSY DATA REGISTRY, 1968–1980

Duty Station	1968–1973 N[a]	1968–1973 %	1974–1980 N	1974–1980 %
Okinawa	115/499	23.0	14/195	7.2
South Korea	37/306	12.1	27/343	7.9
Philippines	2/84	2.3	14/203	6.9
Continental U.S.	15/859	1.7	97/1,117	8.7
West Germany	2/174	1.1	6/198	3.0
Thailand	1/118	0.8	5/168	3.0
Japan	0/86	0	0/55	0
All others combined	0/123	0	5/133	3.8

[a]Denominator is number of AFIP necropsy submissions from duty station; numerator is the number of these submissions from MWDs that served in Vietnam.

with Vietnam service were typically younger at death in 1968 and 1969, but older at death thereafter (Table VIII).

Of all 1965 to 1980 AFIP Registry MWD file accessions, 21% had their signalment changed based on review of other records. Of the submissions from Vietnam, the descriptive profile in 29% of the AFIP records required changes; most (87%) involved the addition of a missing age at death or correction of the listed age at death (possibly the prosector did not always have access to an animal's field service record at the time of necropsy). Of submissions from outside of Vietnam, the profile data in 19% of AFIP records required changes, with 72% of changes also involving a missing or incorrect age at death. The tattoo ID as supplied or corrected in 223 necropsy accessions, 19% of which involved MWDs dying in Vietnam. Another 15 necropsy accessions were identified as having an incorrect tattoo ID that could not be corrected using available records; 5 of these were submissions from Vietnam units. A total of 126 AFIP accessions were identified as belonging to dogs that failed entrance training and were rejected from the military working dog program.

Medical and service record matches to AFIP necropsy records were found for 91.2% of MWDs dying in Vietnam and 91.1% of MWDs dying elsewhere from 1968 to 1973. Thus, care in handling and archiving military service and medical records does not appear to differ for Vietnam MWDs compared to other MWDs. Fifty-five cases were discovered on roll microfilm in which the AFIP sent a letter to the unit veterinarian confirming receipt (accession number provided), review, and histopathologic evaluation of submitted specimens from their MWD, but the accession number and pertinent data were not captured on the computerized AFIP file. These 55 instances appear to be random omissions (2 of the 55 were for Vietnam MWDs), and the data obtained from the microfilm were added to our working AFIP necropsy file. Another 8 MWDs had WRAIR pathology reports not captured in the AFIP registry (3 were Vietnam MWDs). These 8 records were also added to our working AFIP necropsy file. Tables I to VIII include these 63 additional records.

Detailed review of pathology reports revealed additional limitations of the AFIP Registry data related to investigations of certain outcomes in dogs dying from 1974 to 1980. Beginning in mid-August 1976, most AFIP histopathological reports contain summaries of more mundane findings commonly observed in aged animals using general statements such as "aging changes of little significance were also present in several other organs," or "other common but inconsequential changes were present in various organs." Diagnoses that were incorporated as examples in some summaries (but that were usually not specified individually) included testicular degeneration, cystic glandular hyperplasia of the prostate, glandular atrophy of the prostate, nodular hyperplasia of the adrenal gland, and cysts of the thyroid and parathyroid glands. Because of uncertainty regarding exactly which of these diagnoses were made in individual MWDs whose records contain such summary statements, these outcomes may be difficult to study in dogs dying from 1974 to 1980.

In March 1979, a policy change was instituted whereby histopathological examination was made only on tissue sets from dogs that died unexpectedly, died of unknown cause, or whose death or tissue specimens were of special interest to the prosec-

TABLE VIII

PRIOR SERVICE HISTORY OF U.S. MILITARY WORKING DOGS THAT DIED IN OKINAWA FROM 1968 TO 1973 AND WHOSE NECROPSY FINDINGS ARE ARCHIVED IN THE ARMED FORCES INSTITUTE OF PATHOLOGY NECROPSY DATA REGISTRY

	Records Indicate No Vietnam Service			Vietnam Veteran MWDs			Unknown Service History Prior to Death in Okinawa		
Year	N	Mean Age	Standard Error[a]	N	Mean Age	Standard Error	N	Mean Age	Standard Error
1968	56	7.8	(0.28)	21	4.5	(0.55)	25	6.0	(0.53)
1969	63	6.6	(0.32)	52	5.8	(0.31)	2	8.0	(1.00)
1970	70	6.1	(0.41)	14	7.1	(0.77)	7	9.0	(0.31)
1971	74	7.2	(0.34)	8	8.4	(0.82)	2	11.0	(0)
1972	45	7.5	(0.36)	17	8.1	(0.37)	0		
1973	38	7.8	(0.28)	3	6.3	(0.67)	2	9.0	(0)
Total	346	7.1	(0.15)	115	6.2	(0.24)	38	7.1	(0.43)

[a] Standard error of the mean.

tor. Thus, epidemiological studies of dogs dying after 1978 may be subject to selection bias. This policy change also affected at least 94 sets of submitted necropsy specimens from MWDs dying from 1977 to 1981, none of which received histopathologic evaluation. Three of these tissue sets were from Vietnam veteran MWDs. It is not known how many tissue sets were never submitted following the policy change in March 1979. MWDs dying in the period from 1974 to 1980 but whose submitted necropsy specimens were not examined due to the policy change will be excluded from further consideration for inclusion in epidemiologic investigations of cancer.

Discussion

Our original study of MWDs identified 18 dogs in the AFIP Registry with Vietnam service that died outside of Vietnam between 1968 and 1973.[1] The present investigation has identified another 154 MWDs in the AFIP Registry, with most having Okinawa as their last duty station. Furthermore, we previously were able to identify 96 MWDs in the AFIP Registry with Vietnam service that died subsequent to 1973; the present study has increased this number to 168 (Tables VI and VII). These improvements in the classification of MWDs that served in Vietnam will lead to greater precision in studies in the future.

In spite of the extensive review of military and medical records, it is certain that this work still represents an underreporting of the actual number of MWDs that served in Vietnam. We suspect that most of the underreporting affects the period 1965 to 1967, before military regulations required standardized necropsy tissue specimen submission to AFIP on all MWDs dying from any cause anywhere in the world. Copies of military and medical records archived on microfilm for this period identified only 11 Vietnam service MWDs; another 9 Vietnam service MWDs have necropsy evaluations in the AFIP file. The remaining 336 Vietnam service MWDs reported for 1965 to 1967 (Table I) were identified from microfiche copies of Sentry Dog Record Card or military related correspondence.

It has been reported that about 350 sentry dogs were in service with U.S. Army and Marine Corps units in Vietnam in 1965 to 1966,[10] and that 36 U.S. MWDs were killed by hostile fire in 1966.[11] Our investigation identified only 7 MWDs that died due to hostile fire in 1966 (Table II). Whether or not the remainder are among the 108 identified as "fate unknown" (Table II) is speculative. It should be reiterated that for a MWD to be countable for our study purposes, it must be identified by a valid unique tattoo ID. After our review, 95 MWDs with necropsy evaluations recorded in the AFIP Registry from 1965 to 1980 remain with no listed tattoo identity. Three of 14 submitted by Vietnam prosectors were during 1965 to 1967. None of the 95 MWDs are included in Tables I to VIII.

The current investigation led to additions or corrections to 21% of the signalment in the AFIP necropsy records under consideration. Most of the changes involved the addition or correction of the age at death. The age changes were largely the result of a standardization in calculating age at death, which usually added or subtracted 1 year to the reported age in the AFIP Registry. We chose to consider a MWD born in January of year 1 and dying in December of year 2 as 2 years old at death. The same criterion was applied to the signalment of all MWDs.

The first MWDs for support of U.S. operations arrived in Vietnam on July 17, 1965. The first recorded death was due to heat stroke on July 18; the second recorded death was due to accidental electrocution on August 6, 1965. The third death was reported on October 2, 1965, again due to heat stroke in a MWD that arrived on September 30. The buildup of MWDs continued through 1968; the number stayed relatively level through 1970, then diminished with the implementation of the Vietnamization Program. Records show that the last three MWDs to die in Vietnam died on February 16, 1973. The last known U.S. MWD in Vietnam was reported to either have been stolen or have "run off" on March 3, 1973, while assigned for duty to military police involved in customs investigation.

Hostile action in Vietnam accounted for at least 269 deaths of MWDs; tissue specimens were not available for review by AFIP for 84% of these dogs. Half of these KIAs were the result of tripping explosive "bobby traps" or stepping on land mines, often sparing the life of the handler. The animal's body usually was not recovered. Sudden death, however it occurred in the field, including heat stroke or gastric dilatation-volvulus syndrome, often resulted in an autolytic cadaver due to the high ambient temperature, thus rendering the organ tissues unsuitable for histopathologic evaluation. Military policy in Vietnam

was that animals dead for more than 8 hours and not kept under refrigeration were to be necropsied, but tissue specimens were not to be submitted for histopathologic evaluation.[12]

A number of other deaths (N = 301) in which tissues were not, or could not be, histopathologically evaluated were the result of (1) field mishaps (e.g., vehicular accidents), (2) deaths occurring between work shifts resulting in cadaver decomposition before discovery, (3) lost or misplaced tissue specimens, (4) missing paperwork or mixing of two sets of specimens together, or (5) a lack of fixation solution to preserve specimens prior to shipment. That tissue specimens from 69% of accountable deaths in Vietnam were successfully reviewed by AFIP is remarkable. There is no evidence, other than that presented, to suggest that cause of death played a role in the likelihood of specimen collection and the opportunity for subsequent histopathologic evaluation.

The causes of death in MWDs are as numerous as those in pet animals, with additional hazards related to occupation, duty location, and exposure to man-made chemicals associated with wartime conflict (e.g., C4 poisoning, malathion poisoning).[13,14] Many MWDs, particularly those 5 to 6 years of age and older, underwent euthanasia because of ineffectiveness related to hip dysplasia, arthritic conditions, unacceptable disposition (e.g., gun shy or too vicious), or loss of stamina.[4] All of these conditions may have been more acute and could have led to a greater likelihood of earlier death in the wartime environment of Vietnam compared to that at other duty stations. However, none of these conditions are known to be associated with an increased risk of neoplasia per se.

Studies of human health effects related to Vietnam service have sometimes been criticized for relying on patient self reporting, or for inconsistent or questionable diagnostic competence. Neither criticism is applicable to MWD studies based on the AFIP Registry. Previous questions regarding identification of MWDs with Vietnam service and the validity of their signalment have now been resolved to the extent possible by available means. Subsequent MWD studies will involve cohort comparisons of dogs with Vietnam service to those without Vietnam service and case-control studies evaluating exposure variables identifiable from medical and service records. The companion dog has served as a surrogate for human disease development in a number of past situations.[15-19] Those MWDs that served in Vietnam as scouts, trackers, sentries, mine detectors, or tunnel explorers may continue to serve as sentinels for related health effects of the Vietnam experience in U.S. military personnel with similar exposures.

Acknowledgments

Dr. Harold W. Casey died April 12, 1993. He retired from the U.S. Air Force as a Colonel in 1980 after serving as chairman of the Department of Veterinary Pathology, Armed Forces Institute of Pathology.

The authors wish to thank BG Robert E. Via, Jr. VC, USA (Ret.), COL James M. Lyday VC, USA (Ret.), Ms. Joyce Manus, Mr. Richard I. Ramsbottom, and COL William H. H. Clark VC, USA (Ret.) for valuable assistance.

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EXCESS OF SEMINOMAS OBSERVED IN VIETNAM SERVICE U.S. MILITARY WORKING DOGS

Excess of Seminomas Observed in Vietnam Service U.S. Military Working Dogs

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During the Vietnam War, US military working dogs served with their companion dog handlers in close proximity, sharing common exposures to war-related activity, many zoonotic infectious agents, chemical pesticides, phenoxy herbicides, and extensive use of therapeutic drugs. To gain insight into the effects of the Vietnam experience, we investigated the occurrence of neoplasms in military working dogs based on standard necropsy examination by the Armed Forces Institute of Pathology. We observed that these dogs experienced significant elevated risks for testicular seminoma and, independently, testicular dysfunction. Experimental evidence shows testicular dysfunction and impaired spermatogenesis in laboratory animals exposed to phenoxy herbicides, dioxin, or tetracycline, an antibiotic used extensively in military working dogs in Vietnam. Because an unexplained significant decrease in sperm quality in Vietnam veterans has been observed by the Centers for Disease Control, further research is warranted if we are to clarify military service in Vietnam as a risk factor for testicular dysfunction. The testis should be made a priority site in the study of Vietnam experience-related cancers. [J Natl Cancer Inst 82:1042–1046, 1990]

US military working dogs (MWD) proved to be sentinels for the presence of zoonotic infectious agents in their military dog handlers in southeast Asia (*1,2*). Because the dog has been demonstrated to be a useful indicator of carcinogenic risk to humans (*3–5*), examination of the occurrence of neoplasia in MWDs serving in southeast Asia may be useful in an assessment of whether service in Vietnam led to increased cancer risk in humans. To determine if service in that country led to increased cancer risk in dogs, we compared their experience with that of MWDs that served in the continental United States (CONUS) during the same time.

Materials and Methods

During the Vietnam conflict, MWDs were purchased by the US government from private citizens. Most of these animals were phenotypic German shepherds, although occasionally other breeds were obtained for special purposes. Each dog had to be 1 to 3 years of age, have suitable body conformation, and pass a rigorous physical and medical examination (*6*). About 91% of the MWDs were intact males.

Each animal accepted for the MWD program was tattooed with a unique identity number which, with permanent administrative and health records, accompanied the MWD throughout its duty (*7*). Most MWDs either worked as scouts with forward elements or as sentries in security units at fixed installations (*7,8*).

Each MWD was assigned to a military handler who was responsible for its immediate care, feeding with standard rations, and day-to-day evaluation of performance. Outpatient care was provided by a trained veterinary technician, who also updated the medical records; serious medical problems were referred to a military veterinarian (*9*).

When an MWD died, regardless of the circumstances of death or the duty location, a necropsy was performed by a veterinarian, and a standardized set of tissue specimens and major organs was submitted to the Armed Forces Institute of Pathology (AFIP) in Washington, D.C. for histopathologic evaluation (*10*). Evaluations were made by at least two veterinary pathologists, including one who was board certified; final necropsy reports were maintained for historical purposes. One co-author (Casey) personally reviewed or supervised over 90% of all the histologic diagnoses considered in this study. Each necropsy report contains the MWD's breed (99% were German shepherds), tattoo number, name, age, sex, date and circumstances of death, and duty location at time of death (*11*).

Permanent military service records, which could be used to identify all MWDs with Vietnam service, are not available for computer access. Thus we could identify unequivocally as dogs with Vietnam service only those animals listed on necropsy reports as having died in Vietnam, and 199 additional MWDs identified from military correspondence as having been returned alive from Vietnam in 1971–1973, usually to the United States. Sixty-four of these 199 dogs have been described in detail (*2*).

Although military dog handlers usually rotated out of Vietnam after about 1 year of service, the MWD typically remained to be teamed with a new handler. This process, which involved evaluation and possibly retraining, often took place in Okinawa. A considerable number of Vietnam MWDs undergoing reevaluation did not perform at acceptable levels and were euthanized. Thus many MWDs with Vietnam service were reported on the AFIP records as having died in Okinawa. In other Asian duty stations (e.g., Japan, Korea, and Thailand), new dog handlers were usually united with their military dogs "in-country," thereby minimizing the possible diversion of MWDs to Vietnam and vice versa.

Our analysis was restricted to the results of necropsies conducted on MWDs 3 years of age and older who were identified by a complete tattoo number. The AFIP records were searched for necropsy reports of all such MWDs that died in CONUS, Vietnam, Okinawa, Japan, Korea, or Thailand from 1968, the first year of complete data available for study, through 1973. Identified were 1,167 MWDs with known Vietnam service, 437 that died in Okinawa and thus may have served in

Received March 1, 1990; revised April 4, 1990; accepted April 11, 1990.

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We thank L. R. Townsend and J. Manus for assistance in data verification; C. F. Conroy, S. V. James, J. M. Lyday, G. P. Wilson, J. S. Walker, and H. L. Hamby for background data; and M. A. Tucker, P. S. Hartge, B. McKnight, and P. H. Gibbs for review of the manuscript.

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Vietnam, 483 that died in either Japan, Korea, or Thailand and probably did not see service in Vietnam, and 791 that died in CONUS and had no known Vietnam service. Of the 199 Vietnam veteran MWDs known to have left Vietnam alive, 18 were identified in AFIP records as MWDs dying in CONUS or elsewhere between 1971 and 1973; these 18 were included in the Vietnam service cohort.

We computed the prevalence of neoplasms at necropsy for each group and compared the prevalence rates from Asian duty stations with those from CONUS. Conditional maximum likelihood estimates of prevalence odds ratio (OR) were calculated, with associated exact 95% confidence intervals (CI), and adjusted for age and sex (*12*). Generally, the relationship between rates for tumor incidence and prevalence at necropsy for occult tumors is not a simple one (*13*). For nonlethal tumors such as seminomas in the dog, however, there is a direct relationship between incidence and prevalence rates (*13*), so that elevated prevalence ORs indicate elevated relative risks for tumor incidence.

Results

There were no significant differences in the occurrence of tumors in general, malignant neoplasms of any cell type, carcinomas of any site, soft tissue sarcomas, or malignant lymphomas in any of the duty locations compared with the CONUS referent MWDs (table 1). No present evidence indicates that service in Vietnam led to increased risk in MWDs for soft tissue sarcoma or lymphoma, cancers for which herbicide exposure has been proposed to be a risk factor in Vietnam veterans. However, statistically significant elevations in ORs were evident for all testicular tumors combined and for testicular seminomas among MWDs with known Vietnam service and those that died in Okinawa (table 1).

To corroborate or refute the excess relative risk for testicular seminoma among MWDs with known Vietnam service dying between 1968 and 1973, we searched AFIP records through 1978 (the last year complete data were available for this study) for necropsy results about those Vietnam veteran MWDs known to have left Vietnam alive. Identified were 96 unneutered males that died between 1974 and 1978. With the same analytic method and using the necropsy reports of 682 CONUS MWDs without known Vietnam service dying in the period 1974–1978 as the standard (OR = 1), we observed the 96 Vietnam veteran MWDs to have a significant excess risk for seminoma, which supported the findings in the earlier period. The incremental ORs by age for seminoma in Vietnam veteran MWDs are presented for both periods in table 2. Combined analysis of both cohorts, adjusted for age and time, gives an overall OR of 1.9 (CI = 1.4, 2.8) for seminoma in MWDs known to have served in Vietnam.

Abnormalities of spermatogenesis are common at the time of diagnosis of testis cancer in man (*14,15*); it has been suggested that common genetic or environmental factors are responsible for the impaired spermatogenesis and the development of germ cell tumors of the testis (*16,17*). An examination of the AFIP necropsy records for MWDs dying between 1968 and 1973, excluding those with known endogenous factors related to altered spermatogenesis (i.e., those with testicular neoplasm, hypoplastic testis, orchitis or epididymitis, or those that were cryptorchid), revealed that testicular dysfunction (degeneration, atrophy, and/or oligospermatogenesis) was diagnosed significantly more often in MWDs in Vietnam (OR = 1.7; CI = 1.1, 2.6) and in Okinawa (OR = 2.0; CI = 1.2, 3.3), when compared with those in CONUS.

Discussion

No obvious sources of bias could have led to a spurious finding of increased risk of testicular dysfunction and testis tumors in Vietnam MWDs. If selection for service in Vietnam was based on factors or characteristics that are also related to testicular tumor risk, this could have resulted in bias. Dogs were allocated to Vietnam in groups as needed, without consideration being given to characteristics of individual animals. For example, no difference was noted in the percentage of female MWDs serving in Vietnam and other duty stations. Bias also could have resulted if a cause of death was more common in Vietnam and Okinawa than in CONUS, and if this was positively associated with testicu-

Table 1. Percent (%) frequency and prevalence OR, adjusted for age and sex, of certain neoplasms observed among necropsied MWDs by duty experience, 1968–1973*

Neoplasm	CONUS		Vietnam			Okinawa			Other Asian countries†		
	%	OR	%	OR	95% CI	%	OR	95% CI	%	OR	95% CI
Tumor, any cell type	15.2	1	13.3	1.1	(0.8, 1.4)	21.5	1.3	(1.0, 1.9)	14.8	0.8	(0.6, 1.1)
Malignant tumor, any cell type	4.7	1	3.3	0.9	(0.5, 1.5)	5.5	1.1	(0.7, 2.0)	7.6	1.6	(0.9, 2.6)
Soft tissue sarcomas	2.0	1	0.8	0.5	(0.2, 1.3)	2.5	1.2	(0.5, 2.8)	2.3	1.0	(0.4, 2.4)
Carcinoma, any site	1.6	1	1.5	1.2	(0.5, 2.7)	2.1	1.2	(0.5, 3.1)	2.5	1.4	(0.6, 3.3)
Malignant lymphoma	0.8	1	0.4	0.6	(0.2, 2.4)	0.5	0.5	(0.1, 2.6)	1.2	1.3	(0.4, 4.5)
Testis tumor, any cell type	7.3‡	1	8.5	1.8§	(1.2, 2.7)	15.4	2.2§	(1.5, 3.4)	5.8	0.7	(0.4, 1.2)
Seminoma	4.7	1	6.3	1.9§	(1.2, 3.0)	11.2	2.6§	(1.6, 4.3)	4.2	0.8	(0.4, 1.5)
Interstitial cell tumor	2.1	1	2.0	1.7	(0.8, 3.6)	3.7	1.8	(0.8, 3.9)	1.1	0.5	(0.2, 1.5)
Sertoli cell tumor	1.4	1	1.0	1.0	(0.4, 2.6)	2.2	1.6	(0.6, 4.3)	0.9	0.6	(0.2, 2.2)

*Of the MWDs identified, 791, 1,167, 437, and 483 served in CONUS (known Vietnam veterans excluded), Vietnam, Okinawa, and other Asian countries, respectively.
†Data for Japan, Korea, and Thailand are combined.
‡Data are sex specific; for unneutered male dogs: CONUS = 727, Vietnam = 1,086, Okinawa = 402, other Asian countries = 450.
§$P < .05$.

Table 2. Frequency of testicular seminoma, by age, observed among MWDs by necropsy period; prevalence OR, adjusted for age, for seminoma in Vietnam MWDs

Age (yr)	MWDs, 1968–1973					MWDs, 1974–1978				
	CONUS		Vietnam		OR	CONUS		Vietnam veteran		OR
	No. of cases	No. of necropsies*	No. of cases	No. of necropsies*		No. of cases	No. of necropsies*	No. of cases	No. of necropsies*	
3–4	1	135	6	313	2.6	1	30	0	0	—
5–6	1	126	17	317	7.1†	1	51	1	5	12.5
7–8	11	229	28	307	2.0	10	133	4	22	2.7
9–10	17	197	17	137	1.5	48	309	14	45	2.5†
11–12	3	37	0	11	0	35	148	6	24	1.1
13–14	1	3	0	1	0	3	11	0	0	—
	Summary OR = 1.9 (95% CI = 1.2, 3.0)					Summary OR = 2.0 (95% CI = 1.2, 3.5)				

*Values represent total number of necropsies of unneutered male dogs.
†95% CI excludes 1.

lar tumor risk. No evidence was seen for such a source of bias, and the finding of an increased risk of testis tumor in Vietnam veteran MWDs dying in CONUS during 1974–1978 argued against such a bias. Given the strength of the observed associations and the lack of identifiable sources of bias, we conclude that some factor(s) or exposure(s) associated with service in Vietnam had a deleterious effect on the testes of MWDs and led to increased testicular tumor risk.

The anatomic development of the male genital tract, testis descent, and tunic relationships in the dog closely parallel that in man (*18*). Man and dog also share most of the same epidemiologic features regarding tumor development, although they differ in cell type frequencies and overall frequency of occurrence. Embryonal carcinomas and teratomas predominate in children and seminomas in adults, but Sertoli cell and interstitial cell tumors, which occur in equal proportion to seminoma in the dog, are very rare in man (*19*). Man and dog share many of the known risk factors, including the strong association with cryptorchism and to a lesser extent inguinal hernia (*19,20*), and occasional familial tendencies (*21*). Histologically, canine seminoma is identical to the classic seminoma seen in man, except that in the dog it is usually benign, as are most canine testis tumors (*22*). Because of a significant predisposition to seminoma development in the German shepherd (*23*), MWDs may be a particularly sensitive sentinel for exposure(s) leading to increased seminoma risk in man.

MWDs that served in Vietnam were exposed to many infectious zoonotic agents (*1,2*) and native parasites; harsh ambient working conditions; extensive therapeutic treatment with drugs, particularly tetracyclines (*24*); and levels of man-made chemicals not experienced by their CONUS counterparts. It is unclear whether any of these factors affected the increased risk of testicular dysfunction and seminoma in Vietnam MWDs, but some of the exposures have been demonstrated to have adverse affects on sperm quality, spermatogenesis, and testicular tissue.

Many Vietnam MWDs received extensive treatment with tetracyclines for ehrlichiosis, a parasitism caused by a tick-borne rickettsial organism. No immunity was imparted following recovery (*25*), and thus many Vietnam MWDs received regimens of tetracycline two or more times during one duty tour. No mention was made of testis pathology with canine ehrlichiosis prior to the Vietnam era (*26,27*), and no association was observed in this study between ehrlichiosis and testicular dysfunction or seminoma.

Tetracycline is known to be strongly absorbed by mammalian spermatozoa in vivo and in vitro (*28,29*). Testicular atrophy has been reported in the tetracycline exposed rat and dog (*30,31*), as has impaired spermatogenesis in in vivo rat studies (*32–34*). Furthermore, in vitro exposure to tetracycline has led to reduced sperm quality in man and dog (*35,36*). Thus extensive tetracycline exposure may have contributed to the increased risk of testicular problems observed in Vietnam service MWDs.

Testicular involvement and dysfunction have been observed in laboratory animals exposed to phenoxy herbicides used extensively in Vietnam. Feeding studies with rats have shown chlorinated dibenzo-*p*-dioxin in the testis (*37*). Furthermore, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin induces arylhydrocarbon hydroxylase activity (*38*) and binds to receptor proteins in the rat testis (*39*). Investigators (*40–47*) have demonstrated testicular dysfunction in six laboratory animal species after exposure to phenoxy herbicides or dioxin. Although some have argued that these abnormalities are a secondary effect due to wasting (*42,43*), abnormally reduced androgen levels (*48*), decreased steroidogenesis (*49*), and enhanced lipid mobilization and peroxidation (*50*) have been identified in rats as likely being responsible for the testicular effects rather than nutritional deprivation.

Available evidence, although limited, shows that other chemicals sprayed extensively in Vietnam [picloram (*51*), a component of the herbicide Agent White, and malathion (*52–54*), an insecticide used to control mosquitos] also cause testicular atrophy and damage to the seminiferous tubules in laboratory animals. MWDs in Vietnam and Okinawa received considerable direct exposure to malathion, as they were regularly dipped in a 0.5% solution for tick control following the *Ehrlichia* epizootic in 1968–1969 (*8,55*).

Epidemiologic studies of cancer risk in Vietnam veterans have, for the most part, assessed mortality. For the most part, mortality has been assessed in epidemiologic studies of cancer risk in Vietnam veterans. However, high survival rates of testicular

cancer patients (*56*) limits the power of mortality studies to detect increased testis cancer risk in Vietnam veterans. A mortality study in West Virginia did reveal a significant increase in testicular cancer deaths (three cases observed vs. 0.6 expected) among Vietnam veterans compared with Vietnam-era veterans who did not serve there (*57*). Another such study conducted by the Veterans Administration reported nonsignificant elevated relative risks of 1.1 for US Army personnel and 1.3 for US Marines who served in Vietnam (*58*). Other mortality studies have shown no difference in testicular cancer death rates between veterans of Vietnam and those who did not serve there (*59,60*) or have not addressed the issue (*61–63*).

One ongoing study (*64*) of cancer incidence in Vietnam veterans is the prospective investigation of US Air Force veterans involved in the spraying of herbicides in Operation Ranch Hand (RH). A recent update from the RH incidence study notes three confirmed cases of testicular cancer in 995 individuals in the RH group and none in 1,299 US Air Force controls (Michalek J: unpublished results). The recent Vietnam Experience Study of the Centers for Disease Control that evaluated veteran physical health by medical examination (*65*) noted unexplained differences in semen quality of veterans 15+ years after leaving that country, including a decrease in sperm motility and significant decreases in sperm concentration and the average proportion of morphologically "normal" sperm cells. Semen evaluation of the RH cohorts, however, showed no difference in sperm count or percentage of abnormal sperm between RH members and their matched controls (*66*). However, a decrease in sperm concentration, although not significant, has been reported among selected Vietnam veterans from Texas, thought to have received high exposures to Agent Orange (*67*). Low sperm counts also have been reported in a self-selected group of Vietnam veterans claiming exposure to this herbicide (*68*).

At present, we have no convincing evidence that service in Vietnam led to increased risk of testicular cancer in veterans. However, the magnitude of the observed excess risk of testicular seminoma and dysfunction in MWDs serving in Vietnam strongly suggests that military service in Vietnam be considered a risk factor for testicular cancer.

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Phase I Trial of 5-Day Continuous Venous Infusion of Oxaliplatin at Circadian Rhythm-Modulated Rate Compared With Constant Rate

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The toxic effects and tissue uptake of both cisplatin and oxaliplatin—[(1*R*, 2*R*)-1,2-cyclohexanediamine-*N*,*N*'] [oxalato(2-)-*O*,*O*']platinum—were previously shown to vary similarly according to dosing time in mice. A 4-hour infusion of cisplatin resulted in fewer side effects and allowed administration of higher doses at 16 hours than at 4 hours in patients with cancer. We hypothesized that the continuous venous infusion of oxaliplatin for 5 days would be less toxic and would deliver a higher dose to the patient if the drug were infused at a circadian rhythm-modulated rate (peak at 16 hr; schedule B) rather than at a constant rate (schedule A). We tested this hypothesis in a randomized phase I trial. We escalated the dose of oxaliplatin to the patient by 25 mg/m² per course. Courses were repeated every 3 weeks. An external, multichannel, programmable-in-time pump was used for the infusions. Toxicity was assessable for 94 courses in 23 patients (12 patients with breast carcinoma, nine with hepatocellular carcinoma, and two with cholangiocarcinoma). The incidence of neutropenia of World Health Organization grades II–IV and the incidence of distal paresthesias were 10 or more times higher ($P < .05$) with schedule A than with schedule B. In addition, vomiting was 55% higher ($P = .15$) with schedule A than with schedule B. Furthermore, with schedule B, the mean dose of oxaliplatin ($P < .001$) and its maximum tolerated dose ($P = .06$) could be increased by 15% over those doses with schedule A. An objective response was achieved in two of the 12 patients with previously treated breast cancer. We recommend that the dose of oxaliplatin for phase II trials be 175 mg/m², delivered according to the circadian rhythm-modulated rate. [J Natl Cancer Inst 82:1046–1050, 1990]

Received March 26, 1990; accepted April 3, 1990.
Supported in part by grant 6180 from the Association pour la Recherche sur le Cancer, Aguettant Laboratories, and Debiopharm.

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We thank Elisabeth Couvé and Sylvie Rech for editorial assistance.

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EXHIBIT 11

Military Working Dogs That Served in Thailand
1968 - 1976

USAF MILITARY WORKING DOGS IN THAILAND 1968-1976

The listing of dogs on the following pages has been compiled through records that we have been able to obtain and an extensive effort to locate the men who handled them. The following are qualifiers concerning the information provided.

BRAND/NAMES - Like their predecessors, the dogs of the Vietnam Era were obtained from the general public who donated or sold their pets to the nation's defense effort. Upon entry into the military, the dogs were given a serial or brand number consisting of three numeric and one alpha character that was tattooed in the ear of the dog. When assigned to a base the dogs were recorded on the base equipment inventories by their brand number. Their names were not used. The records we were able to obtain of the dogs that were sent to Thailand provide the brand numbers and the handlers assigned to the dog. We have obtained the names through an effort to locate the handlers. We have found that what information was provided on brand numbers and handlers was very accurate, but not complete. The handlers we have located have informed us of dogs' names whose brand number was not on the list. Because handlers remember their dogs by their names they rarely have information about brand numbers. We have some dogs listed by name, but without brand numbers. In such cases we have done our best to verify information on dog's names by more than one person. When brand numbers are not known we included the name of handler of the dog when ever possible.

EARLY LOSSES - If a dog died prior to the base closing the necropsy report and the dog's records were immediately returned to the United States. The necropsy report was sent to the Armed Forces Institute of Pathology in Washington, D.C. The dogs other records were sent to the Military Dog Center at Lackland Air Force Base, TX and the dog was removed from the base inventory list. The documentation we were able to obtain was primarily the inventory of dogs at the time of the base closing; therefore those dogs that were killed in combat action, or died from other causes were not included in the documentation we received.

The information we have on those dogs has been obtained from the handlers assigned to the base K-9 units at the time of the dog's death.

Credits - The listing of the dogs and brand numbers provided below has been developed through the dedicated efforts of Bill Cummings, a retired Maryland State Police Officer who served with the 635th Security Police Squadron, K-9 Section, U-Tapao RTNAB from 1970 through 1971. Mr. Cummings' diligent efforts were complimented by former Vietnam K-9 Veterans who joined the effort to search for other men and obtain more information on the dogs, names, and brand numbers. This search has been a labor of love conducted to honor the memory of those dogs that had protected us at the cost of their own lives. It was not developed for the purpose of this report, but is considered to be an invaluable resource given the evidence the dogs surrendered in their death.

The following symbols have been used by dogs names to designate special notations:

♦ = Killed in Combat Action

◊ = Wounded in Combat Action

▼ = Died before base closing see remarks section for cause

DOGS OF DON MUANG RTAFB

Dog Name	Brand	Remarks
Shep	80M3	
Duke	571M	
Lux	2B47	
Mr. Misty	XM851	Served first at Korat RTAFB

DOGS OF KORAT RTAFB

Dog Name	Brand	Remarks
Bill	OK19	
Blackie	X850	
Boots	645M	
Brandy	X422	
Buck	V031	
Bullet	0M24	
Bullet	Y028	
Casey	3M89	
Cedrick	27M9	
Champ	85X7	
▼ Chigger	8A17	Killed by handler 1969 Handler Court Marshaled
Clipper	65M5	
Cochise	UNK	Handled by James Hazelton 1975-1976
Duchess	UNK	Handled by Rick Galbraith 1968-1969
Duke	M392	
Fritz	646M	
George	01X1	
Grey	637M	
Hansi	M542	
Heineken	V001	
Herman	05M0	
Joe	6M43	
Kiko	X092	
King	754A	
Lex-Loci	X075	
Lighting	77A2	
Lobo	17M4	
Lucky	95M5	
Major	V040	
Major	X138	
Major	5M??	
Marcus	UNK	Handled by Guy Prango 1968-1969
Morris	UNK	Handled by James Hazelton 1975-1976
Nondo	UNK	
Nemo	V010	
Poncho	42M8	
Prince	18M5	
Prince	839X	

Dog Name	Brand	Remarks
Prince	83M7	
Prince	UNK	Handled by Jerry Robertson 1973-1974
Reggie	09X7	
Rebel	48M2	
Rex	UNK	
Rex	7A98	
Rex	M704	
Rover	M610	
Salvador	71M1	
Sam	46M4	
Sam	983M	Korat & Takhli and Returned to Lackland MWD Center 1975-76
Sarge	617X	
Shadow	X117	
Smokey	23M2	
Smokey	41A0	
Smokey	X939	
Sport	66M2	
Static	UNK	
Stony	114M	
Teddy	36X8	
Tuck	X065	Also Served at Don Muang
▼ Tuffy	X446	Killed by handler 1969 Handler Court Marshaled
Unknown	039M	
Unknown	0K73	
Unknown	109M	
Unknown	13A4	
Unknown	20M0	
Unknown	20M8	
Unknown	3M59	
Unknown	42M8	
Unknown	5F17	
Unknown	5K60	
Unknown	5K79	
Unknown	6K60	
Unknown	70M6	
Unknown	77M2	
Unknown	7A56	
Unknown	7M01	
Unknown	85M7	

Dog Name	Brand	Remarks
Unknown	8A14	
Unknown	8A42	
Unknown	8A63	
Unknown	8X96	
Unknown	983M	
Unknown	A745	
Unknown	M124	
Unknown	M689	
Unknown	M701	
Unknown	M904	
Unknown	S790	
Unknown	S990	
Unknown	X380	
Unknown	X437	
Unknown	X613	
Unknown	Z356	
Wolfgang Rango	02M0	

DOGS OF NAKHOM PHANOM

Dog Name	Brand	Remarks
Ango	0K31	
♦ Beno	Unk	KIA in Laos on a downed aircraft recovery incident in 1969
Bosco	V028	
Briska	S521	
Bruno	X987	
Chedder	9M29	
Chips	W190	
Cindy	M427	
Dante	632M	Also Served at Takhli
Duke	2S66	
Duke	3X58	
Duke	50X4	
Duke	V030	
Duke	X651	
Frey	0H49	
Hitler	UNK	
Ingred	53M7	
King	56M2	
Kurt	23M5	
Nick	523M	Also Served at Ubon
Nickie	M310	
Pig	61M8	
Ranger	UNK	
Sam	66A7	Also Served at U-Tapao
Satan	27M8	
Smokey	04X6	
Sport	831X	
Tag	X933	
Teddy	60M6	
Teneg	T012	
Thor	452M	
Thor	UNK	Handled by Robert Miller 1973
Tina	M777	
Unknown	014A	
Unknown	0H59	
Unknown	0M09	

Dog Name	Brand	Remarks
Unknown	0X04	
Unknown	0X14	
Unknown	14M9	
Unknown	17X3	
Unknown	1M85	
Unknown	1S76	
Unknown	27M8	
Unknown	2S41	
Unknown	30M4	
Unknown	310M	
Unknown	33M1	
Unknown	38M1	
Unknown	3A61	Also Served at Don Muang and Korat
Unknown	3M14	Also Served at Korat and Takhli Returned to Lackland MWD Center 1975-76
Unknown	3M60	
Unknown	429M	
Unknown	45M4	
Unknown	465M	
Unknown	46M9	
Unknown	48M1	
Unknown	571M	
Unknown	61M7	
Unknown	64M6	
Unknown	714X	
Unknown	73X8	
Unknown	755X	
Unknown	75X8	
Unknown	910X	
Unknown	91X8	
Unknown	K063	
Unknown	M666	
Unknown	M961	
Unknown	S727	
Unknown	S990	
Unknown	V011	
Unknown	V028	
Unknown	X178	
Unknown	X724	

Dog Name	Brand	Remarks
Unknown	X787	
Unknown	X511	
Unknown	X812	
Unknown	X918	
Unknown	X928	
Unknown	X934	
Unknown	X962	
Unknown	X987	
Unknown	Z183	
Unknown	Z353	

DOGS OF TAKHLI RTAFB

Dog Name	Brand	Remarks
Baron	UNK	
Big Foot	32X4	Also Served at 6499 Provisional Sq
Brandy	UNK	
Bruno	32M2	
Bullet	X762	Also Served at Ubon
Charlie	2M45	
Chiko	3M59	
Duke	UNK	
Harras	K051	
Joey	UNK	Handled by Fred Czekanski 1972
King	UNK	
Prince	51X9	
Prince	UNK	
Smokey	392A	
Steed	UNK	Handled by Robert Collie 1972
Stoney	047M	
Thor	X198	Also Servied at Nakhom Phanom (NKP)
Tina	UNK	
UNK	004M	
UNK	04X6	
UNK	0K63	
UNK	0X04	
UNK	109M	
UNK	16A0	
UNK	1X08	
UNK	21M7	
UNK	22A8	
UNK	2X27	
UNK	30M4	
UNK	3M60	
UNK	3X98	
UNK	458M	
UNK	4B07	
UNK	4M35	
UNK	54X6	
UNK	571M	
UNK	632M	

Dog Name	Brand	Remarks
UNK	77A2	
UNK	7A56	
UNK	83X6	
UNK	86M7	
UNK	898A	
UNK	983M	
UNK	A595	
UNK	K002	Also Served at Don Muang and Korat
UNK	M151	
UNK	M244	
UNK	M261	
UNK	X415	
UNK	X610	
UNK	X742	
UNK	X768	
UNK	X826	
UNK	X917	

DOGS OF UBON RTAFB

Dog Name	Brand	Remarks
Aard	OE68	
Baron	279M	
Big Foot	UNK	
Bobo	UNK	
Champ	UNK	
Chin	UNK	
Cindy	280X	
Darin	98A6	
Denny	X606	
Duchess	6X06	
Duke	52M2	
Duke	56M9	
Duke	8M55	
Duke	X601	
Fritz	M272	
Fritz	X7O4	
General	6A39	
Gray	X769	
Hasso	0K69	Also Served at Udorn, and U-Tapao
Hasso	K098	
Hunce	4M35	Also Served at Takhli
◊ Jody	89X1	Wounded in Action 1/13/70
♦ King	A642	Killed in Action 1/13/70
Klu	97M7	
Major	27M7	Served at Cam Ranh Bay (The only dog known to have served in both Thailand and Vietnam)
Major	4A78	
Matchless	X860	
Moose	000A	
Mushy	61X4	
Nick	A163	
Otto	283M	
Pep	41M7	
Prinz	K080	
Ranger	861X	
Rebel	7M98	
Rex	M261	

Dog Name	Brand	Remarks
Rico	3X64	
Rinny	53X4	
Sam	UNK	
◊ Sheaffer	X846	Wounded in Action 7/28/69
Shep	X789	
Smokey	X910	
Spice	0M86	
Sport	69X3	
Teke	V070	
Unknown	068M	
Unknown	0K19	
Unknown	0K45	
Unknown	112A	
Unknown	18M6	
Unknown	1X90	
Unknown	27M3	
Unknown	27M8	
Unknown	2M45	
Unknown	329M	
Unknown	335M	
Unknown	361M	
Unknown	45M1	
Unknown	46M1	
Unknown	48X3	
Unknown	4B06	
Unknown	4M83	
Unknown	51X8	
Unknown	527M	
Unknown	5A95	
Unknown	644A	
Unknown	661M	
Unknown	668X	
Unknown	68M0	
Unknown	6K60	
Unknown	77X7	
Unknown	7A81	
Unknown	7A93	
Unknown	7M96	
Unknown	8A25	

Dog Name	Brand	Remarks
Unknown	8A63	
Unknown	98A6	
Unknown	9A74	
Unknown	9M60	
Unknown	9M79	
Unknown	9M86	
Unknown	A864	
Unknown	A866	
Unknown	M244	
Unknown	M261	
Unknown	M301	
Unknown	M831	
Unknown	S731	
Unknown	S845	
Unknown	S990	
Unknown	X150	
Unknown	X338	
Unknown	X415	
Unknown	X505	
Unknown	X705	
Unknown	X762	
Willy	51X8	
Wolf	879M	
Zeus	7A29	

DOGS OF UDORN RTAFB

Dog Name	Brand	Remarks
Bebe	UNK	Handled by William Holmes
Bollie	590M	
Brix	636A	
Chen	659M	
Chico	UNK	Handled by Richard Maurer 1969
Chief	Z002	
Chris	77M3	
Count	M952	
Duke	7A46	
Duke	8A65	May Have Served in Operation Safeside
Duke	X093	
Duke	UNK	Handled by Patrick Fagan Jr 1947
Dunker	38M7	
Eric	4M81	
Fritz	8M31	
Hans	UNK	Handled by William Holmes
Keyto	UNK	
King	UNK	
Larvick	UNK	Handled by James Shingler 1970
Lucky	51X9	Also Served At Takhli
Mac ("Big Mac")	UNK	Handled by Curtis Daniel, Jr. 1971
Major	UNK	Handled by Stephen Crane 1969
Max	K000	
Mickey	1A88	
Mike	M930	
Poco	UNK	
Pombo	UNK	Handled by David Everett 1974
Prince	4S00	
Prince	563M	Also Served At Ubon
Prince	8A66	
Prince	UNK	Handled by Robert Furchner 1975
Rabbit	M083	
Rebel	112A	
Reggie	09X7	
Reggie	09X7	
Rex	528M	
Rowdy	65X9	

Dog Name	Brand	Remarks
Sargent	4M59	
Sargent	X403	
Shawnee	A840	
Sheba	7X54	
Shep	UNK	Handled by Gregory Allen 1975
Tarzan	K053	
Thor	76M5	
Timmy	47X0	
Tiny	31M7	
Toni	4A93	
Unknown	M692	
Unknown	03M2	
Unknown	03M6	
Unknown	0X83	
Unknown	12M3	
Unknown	14M0	
Unknown	1M32	
Unknown	29M1	
Unknown	4M07	
Unknown	4M70	
Unknown	5A60	
Unknown	6K88	
Unknown	6X33	
Unknown	7M29	
Unknown	86A7	
Unknown	8M31	
Unknown	90M1	
Unknown	A575	
Unknown	M083	
Unknown	M449	
Unknown	X166	
Unknown	X263	
Unknown	X917	
Unknown	X921	
Valentine	UNK	Ron Stewart 1968
Vic	X823	

DOGS OF U-TAPAO RTNAB

Dog Name	Brand	Remarks
Ali	UNK	Handled by Emile David 1970-1971
Arry	0K33	
Bang	UNK	
Blaze	88A0	
Boise	36M6	
Boots	Y313	
▼ Brutus	X321	Euthanized 1971 due to sever hip displasia
Bullet	1M95	
Buster	3X71	
Chief	A595	
Coffee	903M	
Diablo	M543	
Dino	968M	Also Served At Don Muang
Duke	62M7	
Duke	W297	
Ed	53M4	
Eric	861A	
Ford	UNK	
Frank	UNK	
Fred	UNK	
Fritz	UNK	
G.I.	798A	
Girl	UNK	Handled by Bob Ebersole 1968-69 and Ernest Kuhns 1971-72
Gretchen	63M5	
Griff	UNK	
Hasso	0K69	
Heidi	D038	
Hitler	UNK	
Hombre	412M	
Jerry	X561	
King	0A07	
King	271X	
King	41M3	
King	4S16	
King	66X0	
King	674A	

Dog Name	Brand	Remarks
King	72X5	
Kriss	72X5	
Lucky	9M18	
Mac	3M72	
Mac	7X34	
Major	4X08	
Major	UNK	
Major	053M	
Marc	UNK	Handled by Gary Herbert 1972-1973
Max	UNK	Handled by Gary Coe 1973
Mike	M406	
Mike	X054	
Mister	63M8	
Moose	UNK	Handled by Gary Adams 1974-75 and Larry Haynie 1975-76
Navigator	M828	
▼ Nero	UNK	Died in kennel accident 1969
Pistol	540M	
Poncho	96M9	
Prince	264X	
Prince	606M	
Prince	8M59	
Puppy II	X821	
Rebel	8M12	Also Served At Don Muang & Ubon
Rex	0H23	
Rex	675X	
Rex	9A77	
Ringo	5X46	
Rinny	83M1	
Ripper	UNK	Handled by Joe Yutzy 1974-75
Rolphe	68X0	
Rusty	88M7	
Senta	891A	
Sam	66A7	
Shadow	UNK	
Shannon	37M4	
Shannon	M868	
Shep	69M1	
Smokey	UNK	Handled by Richard Vivio 1970-72

Dog Name	Brand	Remarks
Smokey	X008	
Smokey	X430	
Sport	3K04	
Tarzan	X810	
Ted	M201	
Thomas	UNK	Handled by Laszio Korosi 1975-76
Thor	S497	
Thunder	678M	
Thunder	X912	
Tiger	9A57	
Tiki	6X69	
Tiki	7A19	
Trazen	392A	
Trojan	M553	
Troy	7A52	
Whitey	18M3	
Zorro	X193	