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**AIDS and Its Impact on
Medical Readiness**

By Edmund C. Tramont

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ASSOCIATION OF THE UNITED STATES ARMY**

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AIDS and Its Impact on Medical Readiness

by

Edmund C. Tramont

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Colonel Tramont prepared this paper while in his present assignment at the Walter Reed Army Institute of Research.

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FOREWORD

Acquired Immunodeficiency Syndrome (AIDS), caused by the contamination of blood by the Human Immunodeficiency Virus (HIV-1), is a new infectious disease that has emerged over the past 20 years. It is always fatal; there is currently no cure or vaccine. HIV-1 is transmitted by sexual contact or other direct means, such as blood transfusions or unsterilized needles. It is worldwide in its distribution and growing.

AIDS is a problem of unique military concern—present and future, especially when we consider the stationing of troops in highly infected areas and the use of blood supplies for treating both military and civilian casualties in war.

The Army Medical Research and Development Command, as discussed in this paper, is deeply involved in AIDS research with emphasis on prevention, education, early diagnosis and, hopefully, the development of an effective vaccine or prophylactic drugs. The subject merits the attention of military commanders, planners and policy-makers.

A handwritten signature in black ink, appearing to read 'J. N. Merritt', written over a horizontal line.

JACK N. MERRITT
General, USA Ret.
Executive Vice President

November 1990

INTRODUCTION

“In the course of normal events, lessons learned in battle are lost from conflict to conflict. The Military Medical Department is not immune to this affliction. In the arena of medical disorders in the combat environment, sufficient historical perspective exists to allow global planning strategy to include a detailed analysis of disease as it may affect the U.S. military in any environment. Disease is woven intricately into the fabric of war. The story of one cannot be told without the other and yet, each succeeding generation of history, soldier and scholar alike, seems to be destined to repeat the errors of history and fail to perceive the impact of disease.”¹

Acute diseases involving three organs of the body have most often affected military operations: the gastrointestinal tract, blood and the genital tract, i.e., diarrhea, malaria and gonorrhea, etc. The Human Immunodeficiency Virus-1 (HIV-1), the cause of AIDS (Acquired Immunodeficiency Syndrome), infects two of these organ systems. *HIV is a fatal sexually transmitted disease that contaminates blood!* As such, its impact on medical readiness is broad and far-reaching.

BACKGROUND

Human beings are constantly victimized by new infectious or communicable diseases which, at various times in history, have decimated the population (plague in the Middle Ages) or changed the course of history (diarrhea [shigellosis] during the campaigns at Gallipoli and Northern Africa). In the past 15 years, Legionnaires' Disease, Lyme Disease, Toxic Shock Syndrome and a score of other lesser known *new* infectious diseases have afflicted man. HIV infection (AIDS) is another. But unlike those noted above, HIV is much more diabolic. It is spread by means that have social, political and moral consequences (sex) or threaten the underpinning of modern medicine (blood). And it is always fatal.

There is now considerable evidence that HIV originated in Central Africa sometime during the last century. Its rapid spread was undoubtedly hastened by modern amenities, particularly air travel. In fact, its spread has been much more rapid to the wealthy industrialized nations in the Western Hemisphere than overland throughout Africa.

As noted above, HIV's primary mode of spread is through sexual contact. Hence, it follows the same epidemiologic pattern of all other sexually transmitted diseases (STDs), afflicting primarily young sexually active adults and increasing in incidence during time of social stress. Because it also contaminates blood, it can be efficiently spread through the exchange of blood — hence, the threat of contaminated blood transfusions, intravenous drug abuse or accidental injection. (HIV is an occupational hazard for all health care providers.) It cannot be spread in any other way (i.e., non-sexual or casual contact).

Not surprisingly, the first group in which HIV surfaced in the United States was among promiscuous homosexual men, the group in which the rate of sexually transmitted diseases (venereal diseases) has been highest in the United States for the past 20 years (the U.S. military was not far behind).

The next subgroup in which HIV infection (AIDS) has emerged is in urban intravenous drug abusers who share contaminated intravenous drug paraphernalia. The

relationship between drug abuse and promiscuous sex is of course close, especially in women. Thus, the stage is set for the inevitable spread throughout the active heterosexual U.S. population. This is a sobering thought when we consider the endemic equilibrium which existed for syphilis before the advent of penicillin, another sexually transmitted disease which contaminates blood. Approximately eight percent of the population of the United States was infected with syphilis before penicillin was introduced during World War II. How long it takes and what the endemic rate of HIV will eventually be is conjecture. But given the fact that human behavior has changed little over time, HIV is destined to influence modern day history in much the same way syphilis did. (Henry VIII, Sir Randolph Churchill, Ivan the Terrible and Ludwig van Beethoven were a few of the notable individuals who were infected with syphilis.)

By following HIV rates in prostitutes, the relentless spread of the epidemic across the world can be traced. In some urban areas in Central Africa, up to 90 percent are now infected; in some U.S. cities, as many as 50 percent are infected; and in Bangkok, Thailand, where only a handful of infected prostitutes were afflicted in the late 1980s, at least 15 percent are now infected!

The impact of HIV on a nation is similar to that of war. Young, productive, infected adults become disabled and dysfunctional, and die, leaving behind the very young and the old. Its devastating economic and political impact has already been felt in some African countries, and this unfortunate scenario is destined to be played out over and over again.

The virus kills in the most hideous of ways. It infects and eventually destroys the T-helper or CD4 cell, the very cell that is at the heart of our immune system. But it does so in a slow, relentless, steady manner over eight to 14 years. Thus, there is a long asymptomatic period during which the victim *feels well, looks well, performs well* and for all practical purposes *is well!* But, like the infamous Typhoid Mary, he/she is capable of spreading the infection. It is this infectious iceberg effect that makes the clinical diagnosis difficult and keeps the epidemic going. By focusing only on the end-stage of the disease (AIDS or WR Stages 5/6)² as the public health community has thus far been forced to do, what happened eight to 14 years earlier is revealed. It tells you nothing of the present infection rate, the threat lurking below the surface.

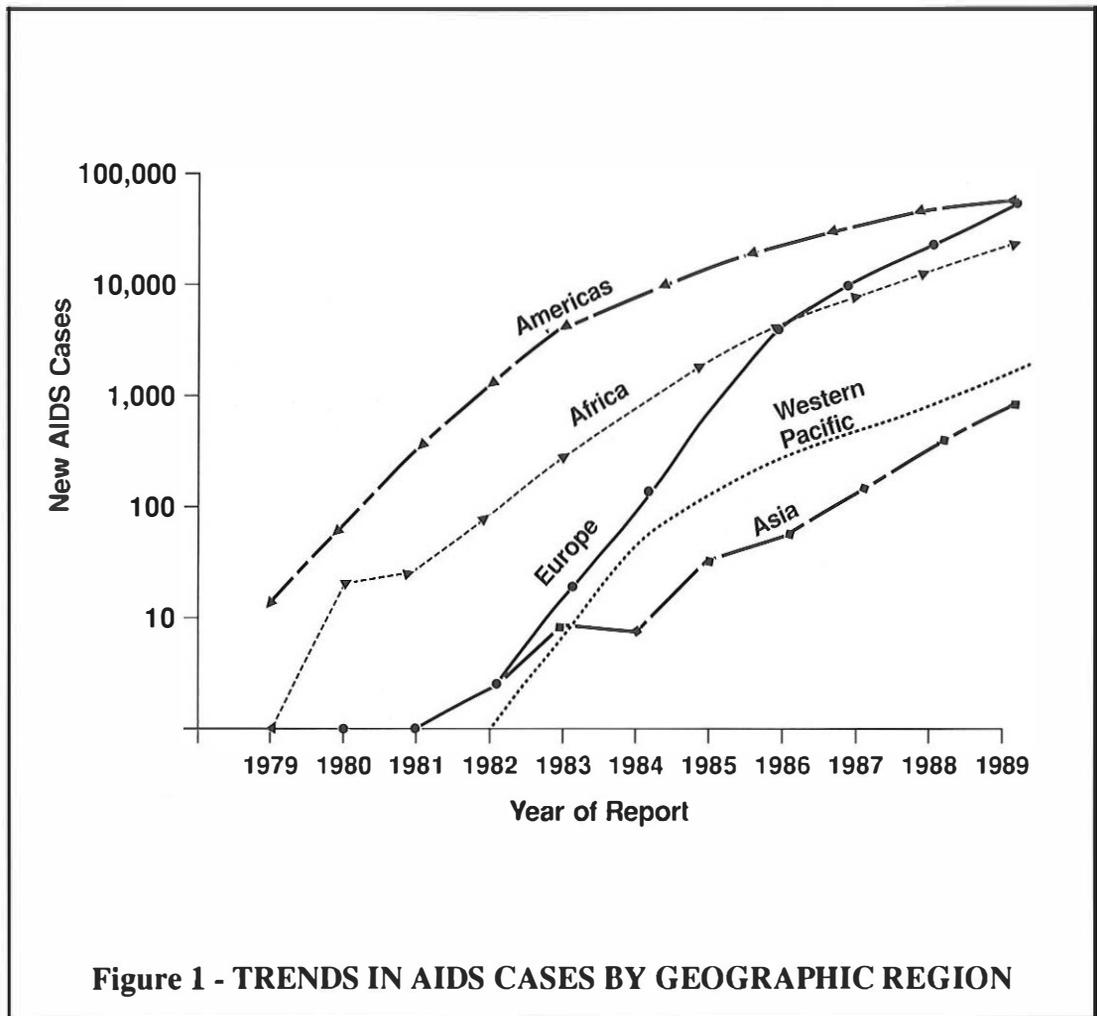
MILITARY CONCERNS

HIV infection potentially impacts the complete spectrum of military activities. It is becoming world-wide in distribution (Figure 1). Its burden on health care resources, especially in poor countries, will undermine and set back recent advances made in such vital areas as sanitation and public health. Its burden on the most productive portion of the population will reinforce the roots of poverty, despair, and dictatorial and despotic rule.

As the prevalence of HIV rises in the world, deployment of U.S. troops must be viewed in the context of its impact on strategic and tactical planning, especially with regard to landforces and their interaction with the local populace, be it buddy care or medical support to civilian casualties, protecting the blood supply, intimate civilian contact, unit morale or political concerns.

Sexually transmitted diseases have traditionally been two to three times higher in U.S. military troops than in their civilian counterparts (up to 100 times higher in wartime). HIV infection is a new threat set in this mode. All diseases carry a political

liability. But none as much as a sexually transmitted disease (social disease) that kills. In this regard, the military is caught in the classic catch-22 scenario; some foreign nations will view our military as the conduit that contaminates their populace (some countries have already stipulated that American troops are not welcome unless certified to be free of HIV); while the home front may view the military as the conduit that brings the problem home (many U.S. public health officials blamed the rise in penicillin-resistant gonorrhea in the 1980s on importation by military troops of such organisms from the Far East; most HIV disease in Cuba has been traced to Cuban soldier contact in Angola).



Furthermore, because HIV infects blood, a new dimension has been added. Modern warfare has stressed modern military medicine in many areas, but perhaps the most critical is the need to replace blood loss and correct blood clotting disorder with transfusions or uncontaminated freshly drawn blood. The requirement to reduce the risk of AIDS through blood transfusions to as low a level as possible (hopefully zero) is imperative. There simply are not enough blood reserves in our troops to cover transfusion requirements for more than just a few casualties and we must rely on fresh blood obtained from the local civilian populace. When as many as one in 10 or 20 is infected, the utility of that blood supply is obviously in question.

In addition, the rendering of care to civilian casualties would be severely compromised if even a small percentage were infected. Rendering medical assistance is important in winning their hearts and minds, and if callousness towards and withdrawing care from civilian casualties ensues, our morality is undermined. Thus, not only is our safe blood supply threatened, but the unit cohesiveness and trust necessary for an efficient combat force is undermined. In short, HIV potentially isolates us!

Finally, health care costs to the military, already stretched because of CHAMPUS costs, will be staggering. Even if no new cases were to occur, the 10-year projection in 1989 dollars for the Department of Defense (DoD) is \$1.7 billion to \$1.9 billion. At the present incidence rate of new cases, the cost is projected to be \$2.7 billion to \$3.0 billion. And these figures are based on only 60 percent of health care beneficiaries utilizing the military health care system (in other words, the potential 10-year cost is close to \$5 billion!).

THE ARMY (DOD) HIV RESEARCH PROGRAM

The Army, as “Lead Agent for Infectious Disease Research” for the DoD, has formed the framework for the military’s entire HIV policy since its inception in 1985. It is multifaceted and comprehensive, emphasizing early diagnosis (screening and testing), patient notification and counseling, contact tracing, health education, compassionate and modern medical management of cases and medical research. It is the latter that will have the greatest effect on reducing the impact of HIV on the military. It emphasizes two main thrusts, epidemiology (tracking the epidemic world-wide and within the Army) and prevention. Prevention research follows two different thrusts, the development of a vaccine or prophylactic drugs and means to improve effective education to decrease risk in the soldier and better equip commanders to deal with this ubiquitous infection (Table 1).

- * Identify risk factors (including OCONUS [outside the continental United States]) important to troop education (change behavior) and HIV transmission in military populations*
- * Test and evaluate vaccine and/or prophylactic drugs*
- * Test and evaluate drugs for early intervention*
- * Develop an efficient, highly reliable field test*
- * Evaluate the course of infection in military populations for defining DoD policies*

Table 1 - MILITARY HIV RESEARCH PROGRAM — PRIORITIES AND OBJECTIVES

Epidemiology

Tracking prevalence rates worldwide has an obvious benefit for military planning (Table 2). For example, cast in terms of recent events, it is recognized that infection rates in some Caribbean nations will soon approach those of Central Africa, about one in 10 young adults! Commanders must be equipped to address this largely invisible time-

bomb from every perspective. They must understand the risk, convey it effectively to their troops, and decrease high risk behavior, but they must maintain the delicate balance of respect and compassion for the local populace.

<i>REGION</i>	<i>COUNTRY</i>	<i>ORGANIZATION</i>
<i>East Asia</i>	<i>Philippines</i>	<i>US Navy</i>
	<i>Thailand</i>	<i>US Army</i>
	<i>Okinawa</i>	<i>US Navy</i>
<i>South America</i>	<i>Brazil</i>	<i>US Army</i>
	<i>Peru*</i>	<i>US Navy</i>
<i>Middle East</i>	<i>Egypt*</i>	<i>US Navy</i>
<i>Africa</i>	<i>Zambia*</i>	<i>USUHS</i>
	<i>Zaire</i>	<i>University of Paris</i>
	<i>Senegal</i>	<i>Harvard University</i>

**Directed by USAMRDC*

TABLE 2 - US MILITARY OCONUS RETROVIRUS RESEARCH PROJECTS*

By tracking the epidemic within the military, certain groups can and have been identified as being at a higher relative risk, which in turn allows us to modify and better direct our educational efforts at risk reduction. For example, the overall incidence rate in the Army over the past five years has fallen from 0.49/1,000 (one in 2,000) to 0.29/1,000 (one in 3,500) or 41 percent, but the rate in some minority subgroups and some military occupation skills has remained stable or increased. Why these subgroups have not been reached by Army educational programs thus far is unknown. To understand why will require intricate, sensitive and complicated research.

Furthermore, as part of this ongoing tracking effort within the Army, studies have been conducted regarding the performance of infected soldiers. Matching 573 infected soldiers with 2,292 uninfected soldiers with regard to age, military occupation, sex and length of service has revealed no differences in promotion rates, demotion rates, or disciplinary actions. Infected soldiers match their uninfected brethren; some are good soldiers, most are average and some are misfits. However, given the spectrum of bodily dysfunctions caused by HIV infection, are there specific tasks which can be adversely affected by HIV? For example, there have been studies that suggest that some of these patients develop a slowed reaction time as measured in fractions of a millisecond; or a decreased ability to hit a 95-miles-per-hour Roger Clemens fast ball! In other words, the practical input of these findings is unknown. Research to address relevant military specific tasks is ongoing.

Finally, the demographic data generated by the Army is unique in the free world and has provided our nation with invaluable information surrounding the epidemic, especially with regard to civilian applicants for military service (Figure 2). Although biased, it is the only organized glimpse at the epidemic on which to base future (10-year) projections. For example, the rate in women applicants 17 to 20 years old is the same as that in men applicants 17 to 20 years old (about one per 1,000 applicants) and heralds the changing demographic profile of HIV infections in our nation.

(NOTE: Because the ZIP Code is known for all civilian applicants, a computerized relief map can be generated. The peaks correspond to the highest incidence areas.)

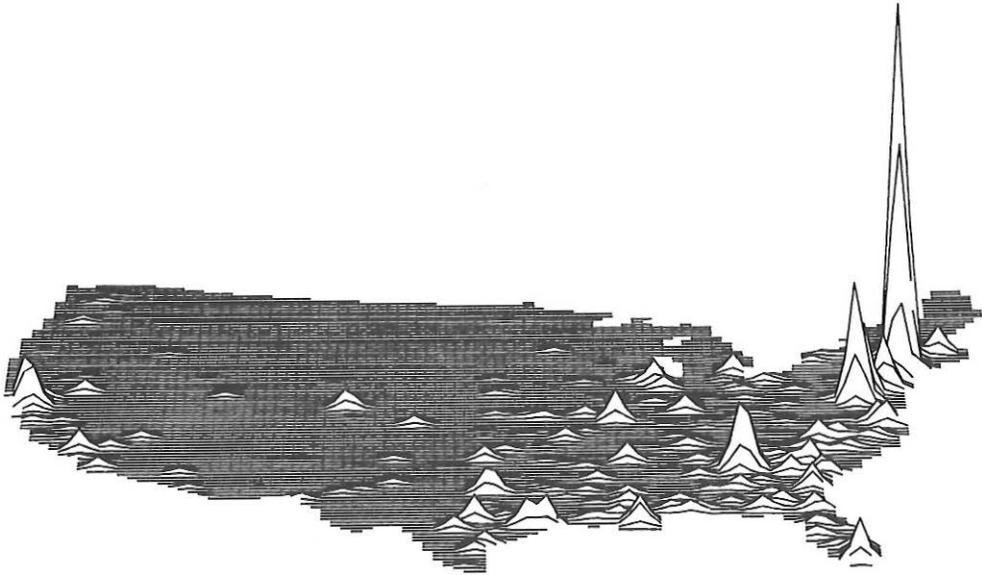


Figure 2 - COUNTY - SPECIFIC PREVELANCES, OCTOBER 1985 - MARCH 1990

Prevention

Reducing the risk to troops and making the Army safe requires a two-pronged approach: research efforts aimed at changing behavior of troops from high risk to low (zero) risk; and research efforts aimed at developing a vaccine or drugs to prevent the disease from occurring or which abate its lethal effects.

Based on past performances of our research efforts regarding other medical problems within the military, the former has been only moderately successful while the latter has been quite successful (the U.S. Army has been instrumental in the development of more vaccines than any other medical entity in the world). However, *effective education* that results in a change of behavior is all we have to offer at the present time, and given the complexity of the biology of the HIV infection, may be all we have to offer for some time to come. Effective education on the prevention of sexually transmitted diseases requires close cooperation between commanders and the Medical Department. Since effective education is a benchmark of effective leadership, leadership training must acquire an added dimension. But this requirement is extremely difficult and complex because it embraces cultural differences, social mores, and individual standards.

The commander must understand how HIV is acquired (sex and blood), what risks an infected individual poses to others (buddy care, civilian casualties), what to expect from infected persons (civilian or military), and what the chances of acquiring the infection are under different circumstances, but at the same time he/she must be caring, compassionate and committed to overcoming prejudices and biases towards HIV infected persons. For example, he/she must be able to articulate why the restrictions on OCONUS deployment are politically based and not medically driven. In short, commanders will be challenged to address their own sexuality on the one hand and to become surrogate public health proponents on the other. This should help commanders become more effective leaders by better understanding themselves and establishing the proper environment to maintain the requisite skills, knowledge and attitudes. Obviously, research that results in the development of truly effective means of behavioral change will be complicated, threatening and sensitive.

In contrast to behavioral research, biological research on HIV is less controversial but no less daunting. The Human Immunodeficiency Virus has an enormous repertoire to escape the time-honored means of developing an effective vaccine or drug treatment. (It integrates and becomes part of human cells and it destroys the very cell that is relied upon to combat and control infectious agents.)

Nevertheless, the United States Army Medical Research and Development Command (USAMRDC) has made significant strides (Table 3). It was the first research group to embrace the concept of immunotherapy as an innovative approach towards the development of an effective vaccine. This novel concept theorizes that a specific HIV vaccine can be given to *infected persons* that will augment or induce a protective immune response as evidenced by the induction of novel antibodies and augmented immunity that result in an alteration of the natural course of infection, with improved survivability and/or potential eradication of the virus. If the latter is accomplished in any way, an important step will have been taken towards developing a *protective vaccine* that can be given to all soldiers *before exposure*, be it sexual or post-wounding through contaminated blood. Early results have been extremely encouraging and have been extended to denovo protection in experimental animals!

- * *Established world's highest quality testing program*
- * *Established worldwide classification standard (Walter Reed Staging System)*
- * *First to focus on early diagnosis (now a national priority)*
- * *First to identify heterosexual transmission in USA population*
- * *Instituted research objectives of immunotherapy*
- * *Involved in testing of most promising drugs and vaccines, i.e., GP160*
- * *Provided scientific data base for and defended DoD policy on HIV (entry screening, earlier separation, troop education, no OCONUS assignment)*
- * *Provided country with most meaningful data on USA epidemic*

Table 3 - ARMY HIV RESEARCH PROGRAM ACCOMPLISHMENTS (1990)

However, because of the inherent long latency period from time of infection to full blown AIDS and death (eight to 14 years), it will take longer than that to prove true efficacy. Hence, even in terms of the most optimistic outlook, we are doomed to confront HIV for a long time!

Other

Less research investment, but just as intense efforts are ongoing in other areas; namely, the development of rapid diagnostic tests that can be used in the field and the testing of drugs that may be used as prophylaxis. The former is close to fruition and would have obvious enormous impact for medical personnel (buddy care) who could quickly determine whether a victim they are attending is infected or if a potential blood transfusion is contaminated.

The eventual development of prophylactic drugs is more problematic for the same reasons noted above for vaccine development. However, the development of a “transfusion or morning-after pill” would obviously alleviate much of our concern.

Finally, the advancements made thus far by the USAMRDC have already had an enormous impact. For example, over 4 million civilian applicants have been screened and over 4,000 infected applicants have been excluded from military service. This translates to over \$1 billion already saved! Furthermore, there have been no legal challenges with regard to a false or misdiagnosis. Our testing program runs efficiently and is cost effective (about \$3.00 per person). It simply is the best screening program in the world!

Nevertheless, some have questioned the utility of the military’s investment in AIDS research given the research efforts of the Department of Health and Human Services (HHS). But examination of the facts will convince the skeptics of the wisdom of the Army’s research program.

The primary emphasis of the Health and Human Services Department is on the treatment (prolonging of life) of late stage disease (AIDS or WR stage 5/6) (Table 4). This is an important, necessary and laudatory goal, but it fails to adequately address the military’s needs. In contrast, the military research effort is on prevention and treatment of early disease. Hence, the military focus to make the Army safe emphasizes early diagnosis and early intervention and has formed the framework upon which DoD policies from recruit screening to staging have been built.

<i>THRUST AREAS</i>	<i>MILITARY</i>	<i>HHS</i>
<i>Natural history</i>	<i>Military population</i>	<i>Subgroups only</i>
<i>Epidemiology</i>	<i>Early infection (WR 1-4)</i>	<i>AIDS (WR 5-6)</i>
<i>Diagnosis</i>	<i>Early infection (WR 1-4)</i>	<i>AIDS (WR 5-6)</i>
<i>Blood program</i>	<i>Rapid, Field</i>	<i>Time insensitive</i>
<i>Vaccines</i>	<i>Basic and applied research</i>	<i>Basic research</i>
<i>Drugs</i>	<i>Prophylaxis</i>	<i>Therapy</i>
<i>Change behavior</i>	<i>Military population</i>	<i>Subgroups</i>
<i>Data base</i>	<i>Military unique</i>	<i>None</i>

Table 4 - ARMY VS HHS PROGRAMS

Furthermore, unbridled from the protestation and radical stands of certain interest groups, the military has been able to address HIV as one would any other communicable or public health menace, and its program has become the blueprint for the rest of the nation to follow. For example, early diagnosis, once the lonely posture of the U.S. military, has now become a “National Public Health” priority. (Undoubtedly, over time, other public health priorities will come even closer to the military’s.)

Because HIV infects human beings, and human beings make up the military, overlap between the DoD and HHS research programs will occur. But only the military medical establishment will have as its objective addressing military relevant issues (worldwide surveillance, prevention, rapid field diagnosis, military unique education). It is doubtful that the present DoD Applicant Screening Program would be in place or be as successful had not the USAMRDC undertaken that mission.

SUMMARY

HIV infection (AIDS) burst upon the scene a decade ago. Because it is a sexually transmitted disease that infects blood and kills its victim, it is military relevant and will impact on all aspects of the military. The USAMRDC as “Lead Agent for Infectious Disease Research” in the DoD has developed a comprehensive approach to address military concerns: surveillance of infection rates (intelligence) around the world and in the military; behavioral research to develop more effective means of education to change behavior; and biological research to develop a quick and easy field test, and a vaccine or drug to prevent the disease from occurring despite exposure. Its success will influence the success of the Army in the future.

ENDNOTES

1. Ognibene, A., BG, *Military Medicine*, No. 152, 1987, p 14.

2. The Walter Reed Staging System classifies the infection based on the immunologic state of the patient. WR1 refers to the earliest stage when only antibodies are present; WR2, when a generalized enlargement of lymph nodes occurs (not seen in every patient); WR3, when the T4 helper lymphocyte count (CD4) falls below 400/ml; WR4, when the earliest functional immunologic defects can be seen, namely a decreased reaction to skin tests; WR5, when a fungal organism, *Candida albicans*, which normally lives conformably in our bodies, causes an infection; and WR6, when opportunistic infections develop. AIDS is WR5/6.

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3. Tramont, E.C., "AIDS, The Military and The Future." *Military Review*, No. 69, 1989, pp 48-58.