CANADIAN FORCES COLLEGE / COLLÈGE DES FORCES CANADIENNES
AMSC 6 / CSEM 6

Threats to Operational Force Health Protection

By /par LCol Jean-Robert Bernier

October 2003

Threats to Operational Force Health Protection

By/par LCol Jean-Robert Bernier

"…the tricks of marching and of shooting and the game called strategy constitute only a part – the minor, although picturesquely appealing part – of the tragedy of war. They are only the terminal operations engaged in by those remnants of the armies which have survived the camp epidemics. These have often determined victory or defeat before the generals know where they are going to place the headquarters mess."

H Zinsser[1]

INTRODUCTION

Force health protection is critical to operational success but, despite recent capability advances, is threatened in the Canadian Forces (CF) by societal developments and adverse command factors.

In most military operations throughout history, the majority of casualties (and often deaths) resulted from disease and non-battle injuries (DNBI) rather than from hostile action. The scale of DNBI casualties has often decided or strongly contributed to the outcome of conflicts.[2] Such casualties have continued to affect CF operations and those of our major allies in recent years, yet most are unnecessary and preventable. Over the past decade, several developments such as deployment-related health problems and the threat of nuclear, biological and chemical (NBC) weapons have helped re-focus attention on this old lesson, and major enhancements have been made to CF operational health protection capabilities and awareness. These have included better capabilities to protect CF members against infectious diseases, other environmental and industrial hazards, deployment-related stress, and NBC agents.[3] The primary role and importance of commanders in the application of health protection measures is also well recognised by the

senior CF leadership, but several problems persist or are developing that threaten the CF's ability to protect its members from deployment-related hazards. If not adequately mitigated or resolved, some of these problems could degrade or neutralise some health protection capabilities and potentially result in grave consequences to individual health and operational success.

It is generally accepted that armed forces should strive for casualty prevention rather than treatment after onset of illness or injury,[4] and it is to preventive measures that the term "health protection" will refer in this paper. Paradoxically however, command and staff attention to medical issues has historically tended to focus primarily on casualty treatment and evacuation rather than on prevention.[5] Casualties result not only in personnel loss, but also in the expenditure of limited medical and evacuation resources and a need to train, transport and integrate replacement personnel. Given the relatively small scale of many CF operations, the loss of key individuals or of single aircraft for medical evacuation (from a ship for example) may have a significant operational impact. This paper will assert the operational importance of force health protection and the ongoing consequences of inadequate command attention to its application. A summary of current CF health protection efforts and capabilities will be followed by a discussion of societal and command factors that hinder their effectiveness. Finally, a conclusion will summarize concerns and propose general measures to mitigate them.

IMPORTANCE

"…soldiers have rarely won wars. They more often mop up after the barrage of epidemics."

H Zinsser[6]

Force health protection is critically important for operational, strategic, and ethical reasons. Operationally, the CF has recently focussed on low-level chemical and radiological

exposures, but these hazards are usually of relatively low health significance.[7] Most operational casualties have been and continue to be caused by infectious diseases, temperature extremes, and physical injuries. [8] There is an extensive record of their disastrous effects on military operations and "the difficulty is not to find evidence, but to select from the dreadful abundance".[9] While many are aware that 80% of Napoleon's losses during his Russian campaign were caused by infectious diseases and exposure,[10] fewer know that Field Marshal Rommel's neglect of basic field hygiene and sanitation was a major contributor to his ultimate defeat in North Africa. The preventable diseases that plagued his Afrika Korps troops cost him temporarily or permanently a force equal to twice his average strength. General Slim commanding the British 14th Army in Burma, on the other hand, reversed the steady destruction of his army from disease by rigorously enforcing health protection measures and he ultimately inflicted on the Japanese army its greatest defeat. [11]

One might expect that the availability of modern field hygiene and prophylactic medications over the past few decades would effectively mitigate such operational hazards, but this has not been so in the absence of adequate command attention. In Vietnam, US forces suffered annual averages of about 400 DNBI casualties per 1,000 soldiers compared to 100 battle casualties per 1,000 soldiers. Egyptian forces suffered 20,000 heat-related deaths during the 1967 Six-Day War and inadequate British planning during the Falklands War contributed to 109 cold injuries out of 777 total casualties.[12] During the 1980s Soviet occupation of Afghanistan, poor field hygiene and sanitation resulted in 67% of the deployed force of 620000 being hospitalized at some point for disease.[13] Of the 28000 US troops hospitalized during the Gulf War, less than 1,000 were for combat-related injuries, and only 1000 of the 8000 medical evacuations were

combat-related.[14] Largely because of poor compliance with protective measures, the UK suffered very high malaria casualty rates during operations in Sierra Leone in 2000[15] and several major infectious disease outbreaks have afflicted the crews of allied warships in the past few years.[16] A severe viral respiratory disease rendered the British field hospital in Bagram non-functional during operations in Afghanistan in 2002[17] and 44% of US Marines who went ashore in Liberia in 2003 suffered a potentially life-threatening form of malaria.[18] This small sample, which does not include the long-term toll of suffering and personnel loss resulting from operational stress injuries, demonstrates the ongoing impact of DNBI and the need for careful attention to force health protection.

A few examples illustrate that the CF also continues to experience or risk suffering preventable operational casualties through inadequate command understanding of or attention to health protection issues. During the 2000 East Timor mission, 46% of the CF contingent in Dili were infected with potentially life-threatening Dengue fever.[19] This extremely high rate of mosquito-borne infection occurred because a medically-recommended preventive countermeasure was not applied by the commander and compliance with other recommended measures was inadequately enforced. Co-located foreign contingents had better compliance and did not suffer a single case.[20] During Op Apollo (Afghanistan) in 2002, planning and execution shortfalls led to the loss or non-application of important medical NBC defensive measures.[21] During the theatre activation phase of Op Athena (Kabul) in the summer of 2003, a deployed junior commander was aware that malaria prophylaxis was medically-recommended but advised other deploying personnel that it was not necessary.[22] Despite extensive support from the senior CF leadership for the establishment of a deployable industrial hygiene capability, its deployment

for the conduct of air quality and other health hazard assessments was initially opposed by elements of the Joint Staff.[23] The same summer, a gastro-intestinal disease epidemic struck a large proportion of the CF contingent deployed to Zgon, Bosnia.[24]

Strategic consequences may also result from inadequate health protection measures. If CF measures are inferior to those of major allies (for example against drug- or vaccine-preventable diseases), CF elements may be perceived as a weak link in a coalition to the extent that vulnerability would be increased and operational reliability reduced. Inadequate health protection against contagious diseases (natural or biological weapons) could also result in the unprotected force presenting a positive threat to allied forces, the host nation's population, and the homeland. In recent years, infected military personnel have imported various infectious diseases that could have or did present a threat to civilian populations.[25] If an imported infectious agent is contagious or is acquired by a suitable domestic insect or animal vector, it could result in the introduction and spread of a new disease to North America with general adverse health and economic consequences. In such circumstances, CF elements might be perceived as a public health threat by host nationals, allies, and Canadian health authorities.

Finally, it is morally, legally, and politically unacceptable to Canadians and to political and military leaders for CF members to be deployed with inadequate health protection measures.[26] This was reflected in the public debate concerning the availability of anthrax vaccine to CF elements deploying to the Persian Gulf during Op Determination in 1998, the findings and recommendations of the Croatia Board of Inquiry, and recent national interest in the adequacy of smallpox vaccine stocks and military vaccination policy. Unlike civilian workers, CF members

cannot refuse lawful orders to perform dangerous or deadly operational activities. Commanders therefore arguably have a greater moral duty than other employers to ensure that all possible measures are taken to mitigate health risks. General Slim noted "The most important thing about a commander is his effect on morale."[27] It is essential for morale, recruiting, retention, and general institutional credibility that CF members and the public perceive military commanders to be doing all that is possible to protect their subordinates from preventable illness and injury. It is also CF policy that commanders comply with the health and safety requirements of the Canada Labour Code except where precluded by operational exigencies.[28] Financially, the CF and government retain indefinite responsibility for the care and compensation of injured or ill members.[29]

BACKGROUND AND CURRENT CAPABILITIES

The CF has the potential to avoid most preventable DNBI since its technical health protection expertise and capabilities are now among the best of any armed forces.[30] This is, however, a recent development. During the Cold War, the focus on Western Europe and the infrequency of expeditionary missions to underdeveloped regions of the world presented few major industrial or environmental health hazards. There was thus a relatively limited preventive medicine capability requirement and much of the small health protection staff's efforts were directed at in-garrison and NBC health protection.[31] With the post-Cold War force reductions of the early 1990s, this small staff was further reduced. This coincided with a marked increase in expeditionary deployments to regions with significant industrial and natural environmental hazards such as tropical infectious diseases, poor transportation and industrial infrastructure, and

inadequate industrial contamination standards.[32] At the same time, this period was characterized by great interest in possible links between deployment-related exposures and ill health reported by veterans of the Gulf War other operations.

As invariably happens when preventive health efforts are neglected, a series of health concerns arose. These concerns contributed to the establishment of several independent reviews including the Chief of Review Services Report on the CF Medical Service, the McLellan Report, the Thomas Report, and the Report of the Croatia Board of Inquiry. Each identified significant health protection deficiencies and almost all of their recommendations are being funded and implemented through the Rx2000 project, an expanded Force Health Protection organisation, and the Environmental and Industrial Health Hazard Project.[33] These enhancements are providing the CF with a very high standard of expertise in health hazard assessment and mitigation, military operational medicine, health intelligence, health surveillance and epidemiology, health promotion, occupational and environmental health, communicable disease control, industrial hygiene, preventive medicine, and mental health screening and management. Medical staff, however, have no authority to enforce the application of many capabilities or health protection measures since most require command direction, non-medical administrative controls, or engineering mitigation measures. These are command prerogatives and responsibilities, and DCDS Directions for International Operations (DDIO) now include detailed policy direction concerning protection against health hazards.[34] A multi-disciplinary Environmental Health and Safety Committee (EHSC), appropriately chaired by J3 International, has also been established to determine and coordinate necessary health protection measures for deployed CF elements.

OBSTACLES

Despite these encouraging capability developments, several societal and command factors hinder their full application. Health protection is being progressively hindered or complicated by a cultural tendency in favour of the primacy of individual interests and privacy, health risk misperception, and suspicion and distrust of science and authority. It is also degraded by shortcomings in leader training and awareness, command authority, doctrine, and planning.

Societal Factors

Individual rights. Since the promulgation of the Charter of Rights and Freedoms, Canadian society is commonly perceived to emphasize more than ever informed consent for medical interventions and the supremacy of individual autonomy and rights over those of institutions or the collective interest. Even during a deadly contagious disease outbreak such as the recent SARS epidemic in Toronto, there was considerable public controversy over the violation of individual liberties (such as the imposition of quarantine) necessary to protect the public health. During the 2001-02 influenza season, the Ontario government declined to enforce mandatory influenza vaccination of defiant paramedics as authorized by the Ambulance Act even though infected unvaccinated personnel could pose a deadly hazard to vulnerable immune-suppressed patients.[35]

The culture from which CF members are now recruited is widely perceived to be relatively self-centred.[36] Military service is considered by many to be an occupation rather than a

vocation, and current CF training and orientation may not adequately instill military values such as self-sacrifice and the primacy of mission accomplishment.[37] The potential threat posed to the mission or to others by individual failure to accept or apply health protection measures (such as drugs or vaccines) may no longer be considered sufficient justification for making them mandatory. There may be a progressive reluctance to accept medical countermeasures against NBC or tropical disease since the threat and mission impact of exposure to such agents depend on unpredictable factors that cannot always be accurately quantified or predicted. Finally, the modification of the universality of service principle and the consequent retention of non- or partly-deployable personnel, while reasonable and compassionate, may result in a reduced personnel pool for sustainment. The potentially increased operational tempo for those who remain fully deployable may have an adverse effects on their morale, family stress, and mental health.

Privacy. To assess an individual's health risk or to determine if illness is related to preceding exposure, medical epidemiological staff routinely require access to individual health records, accurate exposure data, and accurate individual location- and time-specific deployment history. These are also necessary to permit the identification of unusual illness patterns among groups and their relationship to exposures or deployments. The identification of such patterns permits the implementation of appropriate exposure and illness prevention and control measures. The results of epidemiological health surveillance are necessary to assess the CF's general health status and to guide CF efforts and policies concerning health promotion, health protection, treatment, training, medical standards, and recruit screening. Trend identification may be

extremely urgent if a dangerous exposure results in a time-sensitive treatment window, such as a biological attack with a treatable but rapidly fatal disease agent.

Epidemiological research must comply with certain guidelines that include review of the protocol by an ethics board and, in some cases, study-specific informed consent of each person whose data is to be examined. Although this requirement does not currently apply to routine health surveillance, newly proposed Canadian health research guidelines may make such routine surveillance subject to the same requirements.[38] Should this occur, it will significantly delay and increase the difficulty with which deployment-related illness trends, patterns, and exposure-illness linkages could be assessed. It could reduce the CF's ability to identify, mitigate or eliminate harmful practices or exposures in a timely manner and to optimally tailor subsequent health protection and promotion efforts. Increasingly restrictive privacy regulations also hinder or delay epidemiological staff access to medical records and individual contact information.[39] This hinders health surveillance efforts and the assessment of exposure-illness relationships. It could also delay necessary medical interventions for those who previously experienced a deployment-related exposure that is subsequently linked to a health concern. Finally, the multitude of health-related questionnaires and surveys administered over the past few years has naturally led some commanders to wish to restrict the burden placed on their troops. While this provides some short-term relief to individual CF members, an inability to acquire health-related data will hinder the identification and assessment of physical and mental health trends and needs, as well as the appropriate modification of health protection and promotion efforts and policies.

"…there was the usual whispering campaign among troops that greets every new remedy – the drug would render them impotent – so, often the little tablet was not swallowed"

Field Marshal Viscount Slim[40]

Health risk misperception. Despite extensive evidence to the contrary and the consistent conclusions of all expert bodies that have examined the issues, many persons still believe that there is a unique Gulf War Syndrome caused by an unknown environmental exposure and that medical countermeasures such as anthrax vaccine or pyridostigmine bromide are unsafe.[41] The internet and mass media provide individuals with a multitude of instantaneous information sources (factual or otherwise) concerning health hazards. North Americans also generally tend to overestimate negligible health risks while underestimating severe ones, and there is a natural tendency to attribute unexplained symptoms to an unusual preceding exposure. The resulting misperceptions are often initiated or reinforced by uncritical, exaggerated and sensational media reporting that bears little relationship to the actual magnitude of the health hazard, does not distinguish between allegation and scientific evidence, or deliberately misleads.[42] Misperceptions can also be reinforced by judicial rulings on cause-and-effect relationships that, while legally reasonable if the court standard only requires the establishment of a subjective likelihood, are incongruent with scientific standards to demonstrate causation. Other authorities may assume causation unless proved otherwise. The US Congress has, for example, authorized ill veterans exposed to herbicides such as Agent Orange to be compensated without any causal link having been established between exposure and illness. While the objective scientific reality remains unchanged, many persons will accept contrary judicial, political, or media declarations.[43]

Distrust. Aggravating such misperceptions are the broader societal phenomena of distrust of objective science in favour of subjective assessments and feelings, an unrealistic

desire for and expectation of zero risk, and a distrust of institutional authorities.[44] Jon Franklin, a Pulitzer Prize-winning science writer in the United States, has written, "What we are seeing, in the press and in our society, is nothing less than the deconstruction of the Enlightenment and its principle institution, which is science."[45] Both the Croatia and Somalia inquiries noted the development of distrust of the CF leadership during the 1990s.[46] Particularly with respect to stress-related illness, some of this distrust was extended to CF medical authorities, who face the dilemma of being bound to do what is best for individual patients while at the same time having a duty to conform to potentially conflicting CF operational requirements.[47] Distrust among some has also been aggravated by the fact that several CF medical countermeasures against NBC or tropical disease threats, while authorized for use by Health Canada, are not licensed in Canada. This will necessarily continue because the Canadian market for such rarely used products is too small to make the considerable expense of obtaining a license worth the cost to pharmaceutical companies. Although they have well-established safety and efficacy data and are usually licensed in other western countries, a misperception exists among some that they are "experimental". There is also little recognition that perfect safety is unattainable for any medical product and that all medical interventions are based on a risk versus benefit assessment. These factors may feed a misperception that medical authorities recommend and command authorities mandate the use of countermeasures based primarily on their short-term contribution to mission accomplishment, and that their long-term health effects are but secondary considerations.

"If under public pressures of a permissive society, the government allows tampering with the disciplinary foundations of its Armed Forces, then whatever it spends on defence is useless waste of the taxpayers' money."

Lt-Gen GG Simonds[48]

Potential adverse effects of the trends listed above may include soldier non-compliance with force protection countermeasures and judicial or political decisions that restrict the CF leadership's authority to mandate them. There has already been a senate sub-committee proposal to review the CDS' authority to mandate medical countermeasures and a judicial decision in favour of a CF member's refusal to comply.[49] When a countermeasure with a misperceived health risk is mandated, morale may suffer through a paradoxical loss of confidence in the CF leadership's concern for individual health and disciplinary situations may arise. This was demonstrated by the refusal of Sgt Kipling to submit to anthrax vaccination during Op Determination (Persian Gulf) in 1998. Contrary to expert opinion and the assurances of US and Canadian national civilian and military health authorities, there were at the time sensational media reports of vaccine quality control concerns and possible links to symptoms reported by some Gulf War veterans. Despite the unanimous position of the vaccine expert scientific and medical communities, the judge at his widely-publicized court martial hearing ruled that the vaccine lot was unsafe, that ordering Sgt Kipling to receive it violated his Charter right to security of the person, and that the charge should not proceed.[50] The ruling was later overturned on appeal, but this received relatively little publicity. For some CF members, the initial ruling likely raised or confirmed suspicions that their health might be a secondary concern to senior CF command and health authorities, that government and scientific authorities in general cannot be trusted, and that a critical force protection countermeasure should (and could) be avoided. It also created a precedent whereby a CF member received judicial support for disobedience of a lawful command on the basis of his personal assessment of the hazard posed

by an operational force protection measure. Since military operations necessarily require acceptance of orders to perform activities that are far more hazardous than vaccination, and since there is no medical countermeasure for which there is not an opposition argument, a general application of the precedent would render any force operationally ineffective.

Misperception of health risk may also result in stress- or worry-related illness. It is well established that, regardless of actual exposure, the suspicion or belief that one experienced a harmful exposure can lead to the development or aggravation of (sometimes incapacitating) symptoms and illness.[51] There is also an extensive body of literature demonstrating that some persons who are treated like ill patients adopt such a role. The combat stress literature in particular indicates that soldiers treated in this manner and evacuated to rear medical facilities are highly unlikely to recover and return to duty.[52] There is thus a risk of contributing to the development of illness by overemphasizing or 'medicalizing' exposures of no health significance or distressing but non-pathological reactions to stress. The media in particular, though generally well-meaning in seeking to enhance the safety of CF members, may paradoxically contribute to illness and injury through exaggeration or dissemination of inaccurate health risk information that leads to unnecessary worry or to non-compliance with health protection measures. The stress-illness connection was further complicated in the 1990s by a reluctance of government and insurance compensation adjudicators to accept stress-related illness or mental health problems as eligible deployment-related outcomes.[53] Since objectively-demonstrable and codified physical causes were favoured, there would have been a strong practical and psychological incentive for ill CF members to establish that symptoms were related to an identifiable and concrete exposure (such as a drug, vaccine, air or ground contaminant, etc). These concerns emphasize the need for

a sound health risk assessment, pro-active communication of accurate information (particularly of negative findings), and a strong health surveillance capability to record exposures and detect adverse individual or group health outcomes.

Another adverse effect could result from commanders focusing primarily on avoidance of low-level chemical or radiological exposures (the main concerns of Gulf War and Op Harmony veterans and the subject of an ongoing national public debate) to the detriment of efforts to prevent the more significant threat posed by food-, water- or insect-borne infectious diseases. Although exposure to depleted uranium, for example, is of little or no health significance, there has been external pressure for the CF to devote limited pre-deployment training time to this misperceived but politically-popular issue. Risk assessment and mitigation of certain low-level chemical and radiological exposures are important to health and psychological well-being, and such hazards could potentially cause long-term health effects or heavy casualties in the event of large-scale accidental or deliberate exposure. Inadequate focus on the far greater hazards posed by infectious agents, injuries, and temperature extremes, however, is orders of magnitude more likely to result in casualties. Similarly, bivouac siting that avoids low-level chemical or radiological exposures of negligible health significance but that is tactically vulnerable may expose the force to a greater overall health threat from hostile action than from harmful contaminants.

Without strong leadership, health risk assessment, risk mitigation, and risk communication efforts, there may be a loss of confidence and compliance among CF members, increased potential for the development of psychosomatic illnesses, political concern and

intervention, and greater reluctance among CF legal and command authorities to support a mandatory policy for the use of medical countermeasures. The consequent toll in unnecessary and preventable casualties could, in some circumstances, threaten not only the safety of deployed personnel but also mission success. If a voluntary consent policy was to be internally adopted or externally imposed, some operational and medical-ethical questions would arise. Would the option of refusing medical countermeasures extend to the use of chemical-containing products such as insect repellents, sun screen, or even camouflage paint? Should medical staff deem as medically non-deployable those who refuse medical countermeasures necessary for protection against health threats in the theatre of operations? Should such persons be assigned geographic medical employment limitations and be administratively released because of limited deployability? Should and could acceptance of mandated medical countermeasures be made an explicit condition of enrolment and continued service? Is it ethical to make medical countermeasures voluntary if the threat assessment indicates that failing to have their protection may result in serious adverse consequences to individual health and to the mission? Would someone be held responsible if harm to others results or the mission fails due to the unnecessary loss of an unprotected individual incapacitated by a preventable illness?

Command Factors

"More than half the battle against disease is fought, not by doctors, but by the regimental officers…as all of us, commanders, doctors, regimental officers, staff officers, and N.C.O.s united in the drive against sickness, results began to appear."

Field Marshal Viscount Slim[54]

Command influence. Enforcement of the use of health protection measures is a command responsibility. Since General Slim's campaign in Burma, many others have illustrated the critical impact of command example and support (or lack thereof) on compliance with medical force protection measures. A recent example is the UK experience with voluntary anthrax vaccination during the 1998 Persian Gulf deployment. Units whose leaders clearly communicated the threat and strongly supported vaccination achieved 100% compliance. Those whose leaders did not had extremely poor compliance and would likely have suffered catastrophic casualties if an aerosolized anthrax attack had occurred.[55] Because of poor compliance with anti-malarial measures, UK forces suffered high malaria rates during their 2000 Sierra Leone operation,[56] as did an Australian battalion in East Timor in 2000[57] and US forces after their 1993 Somalia[58] and 2003 Liberia[59] missions. Conversely, commanders can have an extremely positive impact on health as did General Slim and a USAF Chief of Staff in the mid-1980s. After the latter simply indicated that he thought smokers should not be generals, the resulting reduction in smoking exceeded that of previous health promotion campaigns.[60] Finally, it has been well-established that strong leadership, unit cohesion, and realistic training are the most important factors in prevention and recovery of combat stress casualties.[61] These examples illustrate that, while competent medical capabilities and risk communication are critical to force health protection, they are supportive elements to the primary role of commanders and may be ineffective without active command support. Consistently effective application is hindered by shortcomings in middle and junior leader cadres, training, doctrine, and mission planning, as well as by the societal trends noted previously.

"The preservation of the soldiers health should be his (Commandant of a Regiment) first and greatest care...he must have a watchful eye over the officers of companies, that they pay the necessary attention to their men in those respects."

Major General Baron Von Stueben [62]

Leader training. Except for safety programs and theatre-specific pre-deployment health briefings, no general educational requirements have been established to ensure that deployed force health protection issues are understood at all command and staff levels. DNBI usually cause more casualties than any other operational threat and their prevention depends primarily on command influence, yet they are not included in initial training or later professional development programs. Extensive educational efforts are, however, devoted to some other topics that have no direct relevance to force protection or military operations in general.

The Croatia Board of Inquiry and other reports noted earlier greatly enhanced senior level awareness and led to much-improved health protection capabilities. The reports, DDIOs, and EHSC efforts do not, however, provide CF leaders an adequate understanding of many operationally-important health issues or how to. Senior, Junior, and Non-Commissioned Officers play the most important and direct role in influencing and enforcing compliance with health protection measures, but the examples noted earlier in this paper clearly suggest that increased awareness has not extended to some at the operational and tactical levels. Unless education on health protection issues and requirements becomes part of professional development, commanders may be unable to appropriately weigh occupational and environmental health hazards in their overall risk assessment and to ‘operationalize’ health protection advice, and appropriate health protection measures will not be consistently applied.

Command capability imbalance. The Pigeau-McCann command and control concept illustrates how command capability is dependant upon the right balance of competency, authority, and responsibility.[63] With regard to responsibility for health protection, DDIOs state "The chain of command continues to bear the entire responsibilities of soldiers' health under their command".[64] This ultimate degree of responsibility is not accompanied by an equal degree of competency and authority. Competency is limited by the absence of any general service officer training in basic health protection issues. Medical advisers do not fully compensate for this shortfall since they are not usually available to all subordinate commanders. Even where available at lower levels of command, junior MOs will generally have limited competence in military preventive medicine.

Authority is also limited given the extent of responsibility assigned. As noted above, commanders may exert an enormous positive or negative influence on health protection and many necessary measures are within their power to mandate or influence (such as general field hygiene and sanitation, hand washing, use of seat belts, enforcement of work-rest cycle and fluid intake, wearing long sleeves, use of mosquito protection, etc.). Only the CDS, however, may mandate the use of vaccines or drugs, and the societal factors noted above may progressively encourage an institutional reluctance to do so. Physical and mental stress resistance and health protection also depend on a commander's ability to influence a much broader variety of pre-, intra- and post-deployment factors such as screening and selection, adequate and realistic training, physical and mental fitness, the application of discipline, the development of trust between leader and led, quality of life and morale, and other factors related to the promotion and

maintenance of health. In addition to the detrimental affects of the societal trends noted earlier, the commander's ability to influence some of these may be further hindered by over-centralisation of authority in the conduct of operations and in personnel management as noted by some CF leaders. Distant centralized authorities and staffs can dictate policies and make individual personnel management decisions in areas that are relevant to the commander's ability to influence his command's health protection readiness. Commanders may as a result be seen as powerless by their subordinates, and the institution of oversight structures such as the Ombudsman's office may be perceived as questioning their integrity.[65] This may aggravate the distrust noted earlier, reduce the ability of commanders to influence or enforce compliance with health protection measures, and encourage direct appeals to central authorities if an objection to such measures arises.

"…where the surgeon saved the individual life, the physician, less dramatically, saved hundreds by his preventive measures"

Field Marshal Viscount Slim[66]

Doctrine. The key force protection role of preventive medicine is emphasized by the repeated lessons of history, the obvious advantages of prevention over treatment, the importance of medical countermeasures in defence against natural and NBC hazards, and the role of medical diagnostics and health surveillance in NBC attack detection and agent identification. Particularly for NBC individual protection, detection, and identification, certain medical countermeasures may provide greater defensive advantages than other non-medical measures. Effective vaccines, for example, can largely obviate the need to detect, identify, don individual and collective protection, and decontaminate in a biological threat environment.[67] This role is, however, reflected inconsistently or not at all in some key CF doctrine publications. The *Canadian Joint*

Task List, for example, does not include force health protection, preventive medicine, or any health protection reference under the protection task, but rather lists medical issues exclusively as sustainment functions. Preventive medical countermeasures are not listed in *Canadian Forces Operations* in the chapters on Force Protection or NBC Defence. Even the chapter on Health Service Support only lists evacuation, treatment and recovery in describing its contribution to personnel effectiveness. It makes a passing reference to preventive medicine without acknowledging the historically critical role of casualty prevention in operational success or failure.[68]

Contractor support. Doctrinal acceptance of contractor support for certain sustainment functions does not necessarily threaten force health protection. There is, however, potential for inconsistencies and inadequacies in contractor medical screening, hygiene training and application, food handling, water quality surveillance and maintenance, and food quality. Inadequacies in any of these could potentially incapacitate the force through infectious disease transmission. Food handlers in particular may not have the same extensive background in hygiene training and emphasis as CF cooks, and the health of the force is particularly vulnerable to their inadvertent or deliberate actions. There must thus be adequate medical input to the screening and qualifications of contracted personnel, the details and standards of contracted tasks, and the monitoring and auditing of contractor activities. Finally, stable operations may suddenly become unstable. This could result in the rapid repatriation of contracted personnel providing key health protection functions such as water quality maintenance, infectious agent vector control, or waste disposal.[69] The force's vulnerability to disease could increase pending the deployment of qualified uniformed personnel to assume these functions.

Another issue arises from an increased reliance on contracted civilian physicians for the provision of in-garrison health care in order to enhance continuity of care and to help relieve the effects of the MO shortage. In the absence of a military background, some of these physicians may have little understanding of the military importance of monitoring general unit health status and trends. They may also have little inclination to monitor such trends or to discuss individual or unit health status (as opposed to individual diagnoses) with commanders. Commanders have the ultimate responsibility for the health of their command and its operational effectiveness. They also have a unique ability to influence the employment of individuals and the application of and compliance with general health protection measures. It is therefore essential that, without violating medical confidentiality, they are kept aware of their unit's health readiness, adverse health trends and appropriate remedial actions, and measures to assist ill members return to duty.

"The epidemics get the blame for defeat, the generals the credit for victory. It ought to be the other way round…"

H Zinsser[70]

Operational planning. Late inclusion of medical staff in operational planning, inadequate consideration or understanding of preventive health issues, inadequate medical representation on reconnaissance, or late deployment of key medical elements can result in inadequate health protection. It seems generally understood that this can lead to DNBI from inadequate preventive preparations, the unavailability of key medical countermeasures, unresolved health concerns among deployed troops, and unforeseen deployment delays to ensure that adequate health protection measures are in place. Experience from the Gulf War in 1991 to Op Athena in 2003, however, indicate that some lessons have been recorded but not learned.

The CRS review of the Gulf War made observations on the inadequate consideration of medical issues in mission planning and reconnaissance.[71] Despite improvements with the frequent inclusion of clinical and preventive medicine staff on mission reconnaissance and the routine conduct of health hazard assessments during theatre activation, the Op Apollo Lessons Learned Staff Action Directive also noted inadequacies. The CF holds most of, or the only, national supply of several very expensive and difficult-to-obtain NBC medical countermeasures. The late deployment of medical elements to Op Apollo resulted in the spoilage of a significant portion of the national supply of one of them.[72] The force protection gaps that could result from inadequate supply of such products could lead to adverse operational, military strategic, and national consequences. DDIO-mandated medical countermeasure briefings were also not always provided to those deploying on this mission.[73] Had there been a need to use certain NBC medical countermeasures during the operation, it is likely that some would have been used incorrectly resulting either in inadequate protection or adverse effects. The CF would also not have been in full compliance with its obligations for the use of unlicensed products and might have lost Health Canada's authority to import key force protection capabilities in the future. Inadequate compliance with regulations concerning the use of an unlicensed product (Mefloquine) during the Somalia mission had significant negative repercussions on the CF.[74] A final example concerns the 2003 Joint Support Group deployment to a Turkish industrial area in support of Op Athena. Despite the possibility of industrial earthquake damage and preventive medicine concerns, the deployment initially proceeded without any form of occupational health hazard assessment.[75]

CONCLUSION

Throughout military history, DNBI have resulted in adverse (and often decisive) strategic, operational, and individual health consequences. They continue to cause most CF operational casualties during deployed operations and the adequacy of hazard identification and mitigation is increasingly important to morale. Command efforts to protect deployed CF elements are being complicated by such factors as the societal primacy of individual interests versus the collective good, risk misperception, barriers to the mandating of medical countermeasures, inadequate command awareness of and attention to health protection issues, and late or inadequate consideration of medical input to the planning process. Some of these factors might individually be considered limited hindrances to effective health protection, but others have already demonstrated detrimental effects to individual health and operational readiness.

Societal trends in favour of greater individual rights and autonomy have helped enhance institutional regard for CF members' quality of life, morale, health, and welfare. It is critical to health, morale, recruiting, retention, and ultimately to CF operational effectiveness that all possible measures be taken to protect CF members from health hazards. The CF's national obligation to protect society, however, often requires the performance of dangerous activities. No military can be effective if each member of the armed forces can choose which risks to accept and which to reject, since that decision may endanger the lives of others and the success of the mission. The CF's human resources strategy's "People First" focus is critically important, but its ethical principle of service to Canada before self must always prevail.[76] The focus on individual

interests and welfare over the past few years is welcome and necessary, but care must be taken that the pendulum does not swing excessively to the detriment of collective and institutional interests. As in all occupational health scenarios, a reasoned balance must be struck considering individual liberties, workplace health hazards, protective countermeasures, and the occupational mission. This balance must be based on objective scientific analysis of evidence, a balanced risk assessment, and mission considerations. It must never be skewed by unsubstantiated speculation. Current societal and institutional command trends must be resisted where they may unreasonably limit the ability of commanders to apply direct and indirect health protection measures in the general unit or mission interest. The societal threats to force health protection efforts may be managed through continued command support to pre-, intra-, and post-deployment health hazard assessment and mitigation efforts, timely and widespread health risk communication efforts, and enhancements to health surveillance capabilities. Individual compliance will depend largely on the effective communication of accurate information concerning health threats and countermeasures, the development of confidence in CF command and medical authorities, and strong command support.

Inadequate command attention to or knowledge of force health protection issues has been responsible for some failures in the past and may be in future if awareness and responsibility are not well communicated to CF leaders. Despite significant resource allocations that have dramatically increased the CF's health protection expertise and capability, its application remains almost entirely dependant on the will, leadership, and attention of command a079 Tc -0.31 3prean opieancemae1

health protection issues should be an important part of all levels of command and staff training. Formal educational requirements would improve command capability competence and planning and would ultimately contribute to greater confidence in CF leaders. Education should be progressive and appropriate to the level of responsibility, with junior leaders focussing on health threats and technical hygiene and sanitation measures and senior leaders studying the organisational, planning, policy, legal, and political health protection issues. Operational contractor support that might affect health must be carefully planned and monitored to ensure that adequate standards are met. Contingency plans should also always be in place to permit rapid assumption of the relevant contracted duties by qualified CF personnel. Doctrinal publications should universally include preventive health measures as force protection tasks rather than uniquely as sustainment tasks. The CF should vigorously defend its authority to mandate the use of medical countermeasures, conduct realistic training, and any other measure necessary to enhance operational fitness, protect individual health, protect the force from operational hazards, and ensure mission success. Unit, formation, and mission contingent commanders should, within consistent national standards and policies, be given whatever authority and support is necessary to implement measures that directly or indirectly enhance force health protection.

Finally, history teaches us that we often do not learn from history with respect to preventive health efforts. Although low injury and disease rates are usually the fruit of persistent and prolonged health protection and promotion efforts, their achievement is often seen as justification to scale back such programs. The reforms that have been initiated to enhance health protection in response to the Croatia Board of Inquiry and other reports will not be fully

implemented for years. Should the CF's current commitment to these efforts wane as recent problems recede from memory, the cycle will predictably repeat itself.

NOTES

[1] Zinsser H: *Rats, Lice and History*. (Boston: Little Brown & Co., 1935), 152.
[2] Zinsser, 150-165. *and*
John English. Chapter 2: "The Operational Art: Developments in the Theories of War". In *The Operational Art: Developments in the Theories of War*, Edited by BJC McKercher and Michael A Hennessy. (Westport, CT: Praeger, 1996), 11. *and*
Canada, Dept of National Defence, Director General Health Services*: Concept for the CF Health Protection Capability.* (Ottawa, Dept of National Defence, March 2001), 10. *and*
CG Cook. "Influence of Diarrhoeal Disease on Military and Naval Campaigns". *Journal of the Royal Society of Medicine*, Vol 94 , (February 2001), 95-97. *and*
United States Army, *Force Health Protection in a Global Environment*. Field Manual 4-02 (FM 8-10). (Washington: Department of the Army, 2003), 1-2. *and*
Kurt A Sanftleben. *The Unofficial Joint Medical Officers Handbook*. (Bethesda: Uniformed Services University of the Health Sciences, 1995), 10-11. *and*
Arthur M Smith. "The Influence of Medicine on Strategy", Naval War College Review. 41, no 2 (Spring 1988), 30.
[3] Canada, *Concept*, 1-2.
[4] Canada, Department of National Defence, *Final Report: Board of Inquiry - Croatia*. (Ottawa: Dept. of National Defence, 2000), 5. *and*
Llewellyn J Legters and Craig H Llewellyn. Chapter 71:"Military Medicine". In *Public Health & Preventive Medicine* 13th ed . Edited by Last, John & Wallace, Robert. (Norwalk CT, Appleton & Lange, 1992), 1148, 1150-1153.
[5] Canada, Department of National Defence, B-GG-005-004/AF-000 *Canadian Forces Operations* (Ottawa: Dept of National Defence, 2000), 19-1. *and*
Canada, *Croatia*, 26-27, 28-31, 41-43. *and*
Canada, *Concept*, 1-16.
[6] Zinsser, 153.
[7] Ottoboni, M. Alice. *The Dose Makes the Poison: A Plain-Language Guide to Toxicology*, 2nd Edition (Indianapolis, Wiley Publishing, 1996).
[8] Legters, 1150, 1154. *and*
Sanftleben, 1-2.
[9] Zinsser, 153.
[10] United States, Department of Defense. "Implement Preventive Medicine Measures" in *Medical Environmental Disease Intelligence and Countermeasures* CD-ROM. (Fort Detrick: Armed Forces Medical Intelligence Center, 2001), 1.
[11] Benjamin G Withers. "Slim, Rommel, and Preventive Medicine." *Infantry.* Vol 85 no. 1 (Jan-Feb 1995): 21-22. *and*
Ronald F Bellamy and Craig H Llewellyn. "Preventable Casualties: Rommel's Flaw, Slim's Edge." *Army*. 40 no. 5 (May 1990): 52-56.
[12] United States "Implement", 1-4.
[13] Lieutenant Colonel Lester W Grau and Major William A Jorgensen. "Beaten by the Bugs - The Soviet-Afghan War Experience". *Military Review.* Vol 77 No 6 (Nov-Dec 1997), 30-37.
[14] Canada, Dept of National Defence, CFMG ACOS Ops*. The Consequences of Ignoring Operational Medical Advice*. (Ottawa, Dept of National Defence, 2001), 2.
[15] Wing Commander Andy Green. "Malaria Sitrep - UK Armed Forces". Presentation to Interagency Working Group for Antimalarial Chemotherapy, 16 April 2002.
[16] BK Bohnker and S Thornton. " Explosive outbreaks of gastroenteritis in the shipboard environment attributed to Norovirus". *Military Medicine*, 165(5) (May 2003), iv. *and*

KC Earhart, *et al*. "Outbreak of influenza in highly vaccinated crew of U.S. Navy ship." *Emerging Infectious Diseases*. 7(3) (May-Jun 2001), 463-5. *and*
BK Bohnker, *et al*. Explosive outbreak of gastroenteritis on an aircraft carrier: an infectious disease mass casualty situation. *Aviation, Space and Environmental Medicine*. 64(7) (Jul 1993), 648-50. *and*
C Ziebold, *et al*. "An outbreak of rubella aboard a ship of the German Navy". *Infection*. 31(2) (Jun 2003), 136-42.
[17] United States Dept of Health and Human Services, Centers for Disease Control. " Outbreak of acute gastroenteritis associated with Norwalk-like viruses among British military personnel--Afghanistan, May 2002." *Morbidity and Mortality Weekly Report*. 51(22) (Jun 7 2002), 477-9.
[18] Brown, David. "Malaria Outbreak Blamed on Troops". *Washington Post*. October 18 2003, A20
[19] Canada, Dept of National Defence. *Report -Medical Theatre Assistance Visit - East Timor 13-23 February 2000*. (Ottawa: Dept of National Defence, 29 Feb 2000).
[20] Canada, *Report -Medical Theatre Assistance Visit - East Timor.*
[21] Canada, Dept of National Defence, *Operation Apollo Lessons Learned Staff Action Directive*. (Ottawa: Dept of National Defence, April 2003), B-21 - B-22.
[22] Major RJA Tremblay, CFMG National Leader/Deployable Health Hazard Assessment Teams, Personal communication. Ottawa, July 2003.
[23] Author's personal experience as CFMG section head for Occupational and Environmental Health, summer 2003.
[24] Lieutenant-Commander IM Fleming. Task Force Bosnia-Herzegovina Surgeon. E-mail to CFMG Headquarters Ottawa 08 Sep 2003 17:43:43 -0400 (EDT).
[25] TH Tulchinsky, *et al*. "Measles during the Gulf War: a public health threat in Israel, the West Bank, and Gaza". *Public Health Review*. 20(3-4), (1992-93), 285-96. *and*
RA Gasser Jr., *et al*. "The threat of infectious disease in Americans returning from Operation Desert Storm". *New England Journal of Medicine*. 324(12), 21 (1991), 859-64. *and*
VL Laurel, *et al*. "An outbreak of influenza a caused by imported virus in the United States, July 1999". *Clinics in Infectious Diseases*. 32(11) (Jun 1 2001), 1639-42. *and*
AF Trofa, *et al*. "Dengue fever in US military personnel in Haiti". *Journal of the American Medical Association*. 277(19), (May 21 1997), 1546-48. *and*
SC Craig, *et al*. "Rubella outbreak, Fort Bragg, North Carolina, 1995: a clash of two preventive strategies". *Military Medicine*. 164(9), (Sep 1999), 616-8. *and*
JS Lee, *et al*. " Outbreak of vivax malaria in areas adjacent to the demilitarized zone, South Korea, 1998". *American Journal of Tropical Medicine and Hygiene*. 66(1), (Jan 2002), 13-17.
[26] Canada, *Concept,* 2-3. *and*
Canada, *Croatia*, 53.
[27] Field Marshal William Slim. *Defeat into Victory – Battling Japan in Burma and India 1942-1945*. (New York: Cooper Square Press, 2000), xi.
[28] Canada, Dept of National Defence, C-02-040-009/AG-001 *General Safety Program – General Safety Standards*. (Ottawa: Dept of National Defence, 2000), Chapter 1 paragraph 4.
[29] Canada, *Concept*, 2-3.
[30] Colonel DA Salisbury. CFMG DCOS Force Health Protection. Personal communication. Ottawa, January 2003.
[31] Lieutenant Colonel Greg Cook. CFMG D Med Pol/Public Health. Personal communication. Ottawa, June 2002.
[32] Canada, *Concept*, 5.
[33] Ibid, 2-3. *and*
Canada, Dept of National Defence, *Rx2000 Project Charter.* (Ottawa: Dept of National Defence, 2000).
[34] Canada, Dept of National Defence*, DCDS Instruction 02/2000 - DCDS Direction for International Operations (DDIO)*, (Ottawa: Dept of National Defence, 2000), Chapter 18.
[35] Martin O'Malley, *et al*. "You and the flu". *CBC News Backgrounder*. October 2002 available from http:www.cbc.ca/news/features/flu.html; Internet; accessed October 13 2003.
[36] Paul Vitz. *Psychology as Religion – The Cult of Self-Worship*. (Grand Rapids: Eerdsmans Publishing, 1994), 84-94.
[37] GE Sharpe and Allan D English. "The Decade of Darkness" paper written for the CF Leadership Institute, (2003), 14. *and*
Les Perreaux. "No room for individuals in forces - commander". *Halifax Herald*, September 25 2003. *and*
GE Sharpe and Allan D English. *Principles for Change in the Post-Cold War Command and Control of the Canadian Forces*. (Winnipeg: Canadian Forces Leadership Institute, 2002), 57-59.

[38] George Radwanski. "Privacy in Health Research: Sharing Perspectives and Paving the Way Forward". Address given to the Canadian Institutes on Health Research Privacy Conference, November 14 2002; available from http:www.privcom.gc.ca/speech/02_05_a_021114_e.asp; Internet; Accessed October 11 2003.
[39] Jeff Whitehead. Personal communication, January 2003.
[40] Slim, 180.
[41] United States. National Academy of Sciences Institute of Medicine. *Gulf War and Health. Report of the Institute of Medicine*. Edited by Fulco, Carolyn, *et al*. (Washington: National Academy of Sciences Institute of Medicine, 2000). *and*
United States. *Presidential Advisory Committee (PAC) on Gulf War Illnesses Final Report* (Washington: December 1996), 112-114; available from http:www.gwvi.ncr.gov/toc-f.html. Accessed May 2001. *and*
United States. National Academy of Sciences Institute of Medicine. *Health Consequences of Service During the Persian Gulf War: Recommendations for Research and Information Systems*. (Washington, National Academy of Sciences Institute of Medicine, 1996) 49-55, 100; available from http://books.nap.edu/books/0309055369/html/1.html; accessed May 2001. *and*
United States. "The Persian Gulf Experience and Health, National Institutes of Health Technology Assessment Workshop Panel", *Journal of the American Medical Association*, Vol 272, No. 5 (August 3, 1994), 391-395; available from http://text.nlm.nih.gov/ftrs/tocview. *and*
Canada. Dept of National Defence. Health Study of Canadian Forces Personnel Involved in the 1991 Conflict in the Persian Gulf. (Ottawa: Goss-Gilroy Inc., 1997).
[42] Michael Gochfeld. Chapter 16 "Toxicology" in *Public Health & Preventive Medicine* 13th ed . Edited by Last, John & Wallace, Robert. (Norwalk CT, Appleton & Lange, 1992), 336. *and*
Aerospace Medical Association editorial. "Protecting the Health of US Military Forces: A National Obligation". *Aviation, Space and Environmental Medicine.* Vol 71 No 3 (March 2000), 6.
[43] Ibid, *and*
Gochfield, 324.
[44] Ottoboni. *and*
Ernest Small. "Scholarly Publishing: Survive and Thrive in the Electronic Information Age". Presentation at National Research Council Press workshop. (Ottawa, 4 November 2001). *and*
Phil Brown. "Addressing Public Distrust-Siting Hazardous Waste Treatment facilities: The NIMBY Syndrome / The Fail-Safe Society".*Technology Review*. 95(5) (1992), 68-70.
[45] Eve Savory. "Science and media: bridging the gulf". available from http://www.publicaffairs.ubc.ca/ubcreports/1999/99mar18/99mar18for.html; accessed October 10 2003.
[46] Sharpe. "The Decade of Darkness", 4-6, 17-18. *and*
Sharpe, *Principles for Change*, 58.
[47] Canada, *Canadian Forces Health and Lifestyle*, 7, 53. *and*
Allan D English. "Leadership and Operational Stress in the Canadian Forces". *Canadian Military Journal*, (Autumn 2000), 34. *and*
Canada, *Canadian Forces Operations*. 19-1. *and*
Sharpe, GE. *Croatia Board of Inquiry - Leadership (and Other) Lessons Learned*. (Winnipeg: Canadian Forces Leadership Institute, 2002), 38. *and*
Canada, *Croatia*, 40.
[48] Lieutenant-General GG Simonds. Chapter 9: "Commentary and Observations". In *The Canadian Military - A Profile*, Edited by Hector J Massey. (Toronto : Copp Clark, 1972), 289.
[49] Cook, Personal communication. Ottawa, November 2001. *and*
Canada, Dept of National Defence. *Minutes of Proceedings, Standing Court Martial, Her Majesty the Queen versus Sgt (Retired) Michael Kipling*, (Ottawa: Dept of National Defence, 2000).
[50] Ibid. *and*
Canada, Dept of National Defence. Memorandum Of Fact And Law Of The Appellant In The Court Martial Appeal Court Of Canada Between Her Majesty The Queen and Sergeant (Retired) Michael Kipling. (Ottawa: Dept of National Defence 23 October 2000).
[51] CJ Clements. " Mass psychogenic illness after vaccination." *Drug Safety*. 26(9), (2003), 599-604. *and*
JP Struewing and GC Gray. "An epidemic of respiratory complaints exacerbated by mass psychogenic illness in a military recruit population." *American Journal of Epidemiology*. 132(6) (Dec 1990), 1120-29. *and*
CC Engel Jr. " Outbreaks of medically unexplained physical symptoms after military action, terrorist threat, or technological disaster." *Military Medicine*. 166(12 Suppl), (Dec 2001), 47-48. *and*

Jeff Doan. "Doctors predict 'hysteria' outbreaks - Dramatic illness at U.S. school blamed on mass anxiety". *The Ottawa Citizen.* 13 January 2000.
Kenneth C Hyams, *et al*. "War Syndromes and Their Evaluation: From the U.S. Civil War to the Persian Gulf War". *Annals of Internal Medicine*. Vol. 125 No. 5, (1 September 1996). *and*
United States. Agency for Toxic Substances and Disease Registry. *Report of the Expert Panel Workshop on the Psychological Responses to Hazardous Substances*. Edited by Tucker, Pamela (Washington: Agency for Toxic Substances and Disease Registry, September 1995).
[52] Allan D English, "Leadership and Operational Stress", 35.
[53]Sharpe, *Croatia Board of Inquiry - Leadership*, 51.
[54] Slim, 180.
[55] NATO. *Report of the 3rd meeting of the NATO Biological Medical Defence Advisory Committee* (The Hague: NATO, 18-19 May 1999).
[56] Lieutenant Colonel Jeremy Tuck, *et al*. "Falciparum Malaria: An Outbreak in a Military Population on an Operational Deployment". *Military Medicine*. Vol 8, (August 2003), 639-642.
[57] Stephen P Frances, *et al*. "Survey of Personnel Protection Measures Against Mosquitoes Among Australian Defence Force Personnel Deployed to East Timor". *Military Medicine*. Vol 168 no 3, (March 2003), 227-230.
[58] JA Newton Jr. " Malaria in US Marines returning from Somalia". *Journal of the American Medical Association*. 272(5), (August 3 1994), 397-9.
[59] Brown, "Malaria Outbreak", A20
[60] Salisbury, Personal communication. Ottawa, 7 Oct 2003.
[61] Allan D English, 36. *and*
Legters, 1153.
[62] Major General Baron Silas D Von Stueben."Instructions for the Commandant of a Regiment". in *Regulations for the Order and Discipline of the Troops of the United States*. (Continental Congress, 29 March 1779).
[63] Ross Pigeau and Carol McCann. "Re-conceptualizing Command and Control". *Canadian Military Journal*. Vol 3, No 1 (Spring 2002), 53-63.
[64] Canada, *DCDS Direction for International Operations*, 18-8, 18-9.
[65] Sharpe, *Principles for Change*, 61-62. *and*
Sharpe, "The Decade of Darkness", 18-19. *and*
Canada, *Croatia*, 49.
[66] Slim, 179.
[67] Lieutenant Colonel Susanne J Clark. "Striking at the US Army's Strength: Soldiers. The Imperative of Biotechnology for Force Health Protection", (Carlisle Barracks: US Army War College Strategy Research Project, 7 April 2003), 16-18.
[68] Canada, *Canadian Forces Operations*, Chapters 19, 21, 24.
[69] Colonel Darryl Bradley. ""Prime Vendor Support - The Wave of the Future",(Toronto, Canadian Forces College Advanced Military Studies Course 5 Paper, 2000), 16-17.
[70] Zinsser, 153.
[71] Canada, Dept of National Defence, *Chief of Review Services Report on Canadian Forces Participation in the Persian Gulf War*. (Ottawa: Dept of National Defence, 1992), 36, 40, 43, 44.
[72] Canada, *Operation Apollo*, B-21 - B-22.
[73] Ibid, B-22.
[74] Canada, *Report of the Commission of Inquiry into the Deployment of Canadian Forces to Somalia* . (Ottawa: Canadian Government Publishing, 1997).
[75] Author's personal experience as CFMG section head for Occupational and Environmental Health, summer 2003
[76] Canada, Dept of National Defence, *Military HR Strategy 2020 - Facing the People Challenges of the Future*. (Ottawa: Dept of National Defence, 2002), 3-4.

BIBLIOGRAPHY

Aerospace Medical Association editorial. "Protecting the Health of US Military Forces: A National Obligation". *Aviation, Space and Environmental Medicine.* Vol 71 No 3, (March 2000), 1-11.

Bellamy, Ronald F. and Craig H Llewellyn. "Preventable Casualties: Rommel's Flaw, Slim's Edge." *Army*. 40 no. 5 (May 1990): 52-56.

Bohnker BK and S Thornton. " Explosive outbreaks of gastroenteritis in the shipboard environment attributed to Norovirus". *Military Medicine*, 165(5) (May 2003), iv.

Bohnker BK, et al. Explosive outbreak of gastroenteritis on an aircraft carrier: an infectious disease mass casualty situation. *Aviation, Space and Environmental Medicine*. 64(7) (Jul 1993), 648-50.

Bradley, Darryl (Colonel). "Prime Vendor Support - The Wave of the Future", Toronto, Canadian Forces College Advanced Military Studies Course 5 Paper, 2000.

Brown, David. “Malaria Outbreak Blamed on Troops”. *Washington Post*. October 18 2003.

Brown, Phil. "Addressing Public Distrust-Siting Hazardous Waste Treatment facilities: The NIMBY Syndrome / The Fail-Safe Society". *Technology Review*. 95(5) (1992), 68-70.

Canada, Dept of National Defence. *Canadian Forces Health and Lifestyle Information Survey*. Ottawa: Dept of National Defence, 2000.

Canada, Department of National Defence, B-GG-005-004/AF-000 *Canadian Forces Operations.* Ottawa: National Defence, 2000.

Canada, Dept of National Defence, *Chief of Review Services Report on Canadian Forces in the Persian Gulf War*. Ottawa: Dept of National Defence, 1992.

Canada, Dept of National Defence, Director General Health Services*: Concept for the CF Health Protection Capability.* Ottawa, Dept of National Defence, March 2001.

Canada, Dept of National Defence, CFMG ACOS Ops. *The Consequences of Ignoring Operational Medical Advice*. Ottawa: Dept of National Defence, 2001.

Canada, Dept of National Defence. *DCDS Instruction 02/2000 - DCDS Direction for International Operations (DDIO)*, Ottawa: Dept of National Defence, 2000.

Canada, Dept of National Defence. *Director Strategic Human Resources News*. Vol 1 Ottawa: Dept of National Defence, 2003.

Canada, Department of National Defence. *Final Report: Board of Inquiry - Croatia*. Ottawa: Dept. of National Defence, 2000.

Canada, Dept of National Defence. C-02-040-009/AG-001 *General Safety Program – General Safety Standards*. Ottawa: Dept of National Defence, 2003.

Canada, Dept of National Defence. *Health Study of Canadian Forces Personnel Involved in the 1991 Conflict in the Persian Gulf.* Ottawa: Goss-Gilroy Inc., 1997.

Canada, Dept of National Defence. Memorandum Of Fact And Law Of The Appellant In The Court Martial Appeal Court Of Canada Between Her Majesty The Queen and Sergeant (Retired) Michael Kipling. Ottawa: Dept of National Defence, 23 October 2000.

Canada, Dept of National Defence. Minutes of Proceedings, Standing Court Martial, Her Majesty the Queen versus Sgt (Retired) Michael Kipling. Ottawa: Dept of National Defence, 2000.

Canada, Dept of National Defence. *Military HR Strategy 2020 - Facing the People Challenges of the Future.* Ottawa: Dept of National Defence, 2002.

Canada, Dept of National Defence. *Operation Apollo Lessons Learned Staff Action Directive*. Ottawa: Dept of National Defence, April 2003.

Canada, Dept of National Defence. *Report -Medical Theatre Assistance Visit - East Timor 13-23 February 2000*. Ottawa: Dept of National Defence, 29 Feb 2000.

Canada, Dept of National Defence, Director General Health Services. *Rx2000 Project Charter.* Ottawa: Dept of National Defence, 2000.

Canada, *Final Report of the Commission on the Future of Health Care in Canada (Romanow Report).* Ottawa: Canadian Government Publishing, 28 Nov 2002.

Canada, *Report of the Commission of Inquiry into the Deployment of Canadian Forces to Somalia*. Ottawa: Canadian Government Publishing, 1997.

Clark, Lieutenant Colonel Susanne J. "Striking at the US Army's Strength: Soldiers. The Imperative of Biotechnology for Force Health Protection", Carlisle Barracks: US Army War College Strategy Research Project, 7 April 2003.

Clements CJ. " Mass psychogenic illness after vaccination." *Drug Safety*. 26(9), (2003), 599-604.

Cook GC. "Influence of Diarrhoeal Disease on Military and Naval Campaigns". *Journal of the Royal Society of Medicine*, Vol 94 , (February 2001), 95-97.

Craig SC, et al. "Rubella outbreak, Fort Bragg, North Carolina, 1995: a clash of two preventive strategies". *Military Medicine*. 164(9), (Sep 1999), 616-8.

Doan, Jeff. "Doctors predict ‘hysteria’ outbreaks - Dramatic illness at U.S. school blamed on mass anxiety". *The Ottawa Citizen.* 13 January 2000.

Earhart KC, et al. "Outbreak of influenza in highly vaccinated crew of U.S. Navy ship." *Emerging Infectious Diseases*. 7(3) (May-Jun 2001), 463-5.

Engel CC Jr. " Outbreaks of medically unexplained physical symptoms after military action, terrorist threat, or technological disaster." *Military Medicine*. 166(12 Suppl), (Dec 2001), 47-48.

English, Allan D. "Leadership and Operational Stress in the Canadian Forces". *Canadian Military Journal*, (Autumn 2000), 33-38.

English, John. Chapter 2: "The Operational Art: Developments in the Theories of War". In *The Operational Art: Developments in the Theories of War*, Edited by BJC McKercher and Michael A Hennessy. Westport, CT: Praeger, 1996.

Frances, Stephen P, et al. "Survey of Personnel Protection Measures Against Mosquitoes Among Australian Defence Force Personnel Deployed to East Timor". *Military Medicine*. Vol 168 no 3, March 2003, 227-230.

Gasser RA Jr, et al. "The threat of infectious disease in Americans returning from Operation Desert Storm". *New England Journal of Medicine*. 324(12), 21 (1991), 859-64.

Gochfeld, Michael. Chapter 16 “Toxicology” in *Public Health & Preventive Medicine* 13th ed . Edited by Last, John & Wallace, Robert. Norwalk CT: Appleton & Lange, 1992.

Grau, Lieutenant Colonel Lester W and Major William A Jorgensen. "Beaten by the Bugs - The Soviet-Afghan War Experience". *Military Review.* Vol 77 No 6 (Nov-Dec 1997), 30-37.

Green, Wing Commander Andy. "Malaria Sitrep - UK Armed Forces". Presentation to Interagency Working Group for Antimalarial Chemotherapy, 16 April 2002.

Hyams, Kenneth C, et al. "War Syndromes and Their Evaluation: From the U.S. Civil War to the Persian Gulf War". *Annals of Internal Medicine*. Vol. 125 No. 5, (1 September 1996).

Laurel VL, et al. "An outbreak of influenza a caused by imported virus in the United States, July 1999". *Clinics in Infectious Diseases*. 32(11) (Jun 1 2001), 1639-42.

Lee JS, et al. " Outbreak of vivax malaria in areas adjacent to the demilitarized zone, South Korea, 1998". *American Journal of Tropical Medicine and Hygiene*. 66(1), (Jan 2002), 13-17.

Legters, Llewellyn J and Craig H Llewellyn. Chapter 71:"Military Medicine". In *Public Health & Preventive Medicine* 13th ed . Edited by Last, John & Wallace, Robert. Norwalk CT: Appleton & Lange, 1992.

NATO. *Report of the 3rd meeting of the NATO Biological Medical Defence Advisory Committee* The Hague: NATO, 18-19 May 1999.

Newton JA Jr. " Malaria in US Marines returning from Somalia". *Journal of the American Medical Association*. 272(5), (August 3 1994), 397-9.

O'Malley, Martin et al. "You and the flu". *CBC News Backgrounder*. October 2002 available from http:www.cbc.ca/news/features/flu.html; Internet.

Ottoboni, M. Alice. *The Dose Makes the Poison: A Plain-Language Guide to Toxicology*, 2nd Edition, Indianapolis : Wiley Publishing, 1996.

Perreaux, Les. "No room for individuals in forces - commander". *Halifax Herald*, September 25 2003.

Pigeau, Ross, and Carol McCann. "Re-conceptualizing Command and Control". *Canadian Military Journal*. Vol 3, No 1 (Spring 2002), 53-63.

Popper SE, et al. "Improving readiness and fitness of the active military force through occupational medicine tenets". *Journal of Occupational and Environmental Medicine*. 41(12) Dec 1999, 1065-71.

Public Health & Preventive Medicine 13th ed . Edited by Last, John & Wallace, Robert. Norwalk CT, Appleton & Lange, 1992.

Radwanski, George. "Privacy in Health Research: Sharing Perspectives and Paving the Way Forward". Address given to the Canadian Institutes on Health Research Privacy Conference, November 14 2002; available from http:www.privcom.gc.ca/speech/02_05_a_021114_e.asp; Internet.

Sanftleben, Lieutenant Colonel Kurt A. *The Unofficial Joint Medical Officers Handbook*. Bethesda: Uniformed Services University of the Health Sciences, 1995.

Savory, Eve. "Science and media: bridging the gulf". available from http://www.publicaffairs.ubc.ca/ubcreports/1999/99mar18/99mar18for.html.

Sharpe, GE. *Croatia Board of Inquiry - Leadership (and Other) Lessons Learned*. Winnipeg: Canadian Forces Leadership Institute, 2002.

Sharpe, G.E. and Allan D English. “The Decade of Darkness” paper written for the CF Leadership Institute, 2003.

Sharpe, G.E. and Allan D English. *Principles for Change in the Post-Cold War Command and Control of the Canadian Forces*. Winnipeg: Canadian Forces Leadership Institute, 2002.

Simonds, Lieutenant-General GG. Chapter 9: "Commentary and Observations". In *The Canadian Military - A Profile*, Edited by Hector J Massey. Toronto : Copp Clark, 1972.

Slim, Field Marshal William. *Defeat into Victory – Battling Japan in Burma and India 1942-1945*. New York: Cooper Square Press, 2000.

Small, Ernest. "Scholarly Publishing: Survive and Thrive in the Electronic Information Age". Presentation at National Research Council Press workshop. Ottawa: 4 November 2001.

Smith, Arthur M, "The Influence of Medicine on Strategy", *Naval War College Review*. 41, no 2 (Spring 1988), 22-36.

Struewing JP and GC Gray. "An epidemic of respiratory complaints exacerbated by mass psychogenic illness in a military recruit population." *American Journal of Epidemiology*. 132(6) (Dec 1990), 1120-29.

Trofa AF, et al. "Dengue fever in US military personnel in Haiti". *Journal of the American Medical Association*. 277(19), (May 21 1997), 1546-48.

Tuck, Lieutenant Colonel Jeremy, et al. "Falciparum Malaria: An Outbreak in a Military Population on an Operational Deployment". *Military Medicine*. Vol 8, (August 2003), 639-642.

Tulchinsky TH, et al. "Measles during the Gulf War: a public health threat in Israel, the West Bank, and Gaza". *Public Health Review*. 20(3-4), (1992-93), 285-96.

United States, Agency for Toxic Substances and Disease Registry. *Report of the Expert Panel Workshop on the Psychological Responses to Hazardous Substances*. Edited by Pamela Tucker. Washington: Agency for Toxic Substances and Disease Registry, September 1995.

United States Army, Field Manual 4-02 (FM 8-10) *Force Health Protection in a Global Environment*. Washington: Department of the Army, 2003.

United States, Department of Defense. "Implement Preventive Medicine Measures" in *Medical Environmental Disease Intelligence and Countermeasures* CD-ROM [CD-ROM]. Fort Detrick: Armed Forces Medical Intelligence Center, 2001.

United States, Dept of Health and Human Services, Centers for Disease Control and Prevention. "Outbreak of acute gastroenteritis associated with Norwalk-like viruses among British military personnel--Afghanistan, May 2002." *Morbidity and Mortality Weekly Report*. 51(22) (Jun 7 2002), 477-9.

United States, National Academy of Sciences Institute of Medicine. *Gulf War and Health. Report of the Institute of Medicine*. Edited by Carolyn Fulco, et al. Washington: National Academy of Sciences Institute of Medicine, 2000.

United States, National Academy of Sciences Institute of Medicine. *Health Consequences of Service During the Persian Gulf War: Recommendations for Research and Information Systems*. Washington: National Academy of Sciences Institute of Medicine, 1996; available from http://books.nap.edu/books/0309055369/html/1.html.

United States, "The Persian Gulf Experience and Health, National Institutes of Health Technology Assessment Workshop Panel". *Journal of the American Medical Association*, Vol 272, No. 5 (August 3, 1994); available from http://text.nlm.nih.gov/ftrs/tocview.

United States, *Presidential Advisory Committee (PAC) on Gulf War Illnesses Final Report.* Washington: December 1996; available from http:www.gwvi.ncr.gov/toc-f.html.

Vitz, Paul. *Psychology as Religion – The Cult of Self-Worship*. Grand Rapids: Eerdsmans Publishing, 1994.

Von Stueben, Major General Baron Silas D."Instructions for the Commandant of a Regiment". in *Regulations for the Order and Discipline of the Troops of the United States*. Continental Congress, 29 March 1779.

Withers, Benjamin G. "Slim, Rommel, and Preventive Medicine." *Infantry.* 85 no. 1 (Jan-Feb 1995), 21-22.

Ziebold C et al. "An outbreak of rubella aboard a ship of the German Navy". *Infection*. 31(2) (Jun 2003), 136-42.

Zinsser H: *Rats, Lice and History*. Boston: Little Brown & Co., 1935.