

FORCE MEDICAL PROTECTION IN THE SAF

By LTC(DR) Idu Jion, CPT(DR) Andrew Tan & CPT(DR) Sean Ong Wei Xiang

ABSTRACT

Force Medical Protection in the military has been a well-established concept since antiquity. Force Medical Protection Command (FMPC) is committed to medical protection against chemical, biological, radiological and occupational health hazards, with the end goal of enhancing the Singapore Armed Forces' (SAF) operational readiness. FMPC has adopted three key thrusts – comprehensive prevention, early detection and effective medical response against chemical, biological and radiological (CBR) threats. The Biodefence Centre (BDFC) identifies and institutes appropriate interventional measures for biological threats. It also manages infectious disease outbreaks and ensures that environmental and public health standards are maintained. The Medical Response Force (MRF) provides frontline medical support to SAF troops during CBR incidents. The key accomplishments of FMPC include eliminating Malaria risk from Pulau Tekong in 2007, formulating the SAF pandemic response plan during the 2009 H1N1 outbreak in Singapore and managing the Zika virus outbreak in August 2016. Partners such as the Centre for Infectious Disease Epidemiology and Research (CIDER) also contribute to the SAF's ability to diagnose, detect and respond to infectious disease and biological threats. The evolving complexity of the operating environment requires FMPC to remain vigilant and at the forefront of its field through research and development and collaborations with partner military and non-military organisations.

INTRODUCTION

Force Medical Protection is an important aspect of the military, aimed at safeguarding the health of our soldiers, minimising non-combatant losses and thereby optimising our operational capabilities. The concept of Force Medical Protection is not a new one. It has been in practice in ancient militaries such as that of the Roman Empire which, as early as the first two centuries already had a professional medical corps 'to ensure the general health of the soldier by a continuous stress of hygiene.'¹ The effect is evident from the success of the Roman armies and contrasted with the disastrous casualty rates due to disease transmission in both the French and British

armies during the start of the Crimean War.² With the increase in non-conventional threats that we face today, Force Medical Protection is even more important.

CHEMICAL, BIOLOGICAL, RADIOLOGICAL AND EXPLOSIVE (CBRE) THREATS AND FORCE MEDICAL PROTECTION

Current Threats to the SAF

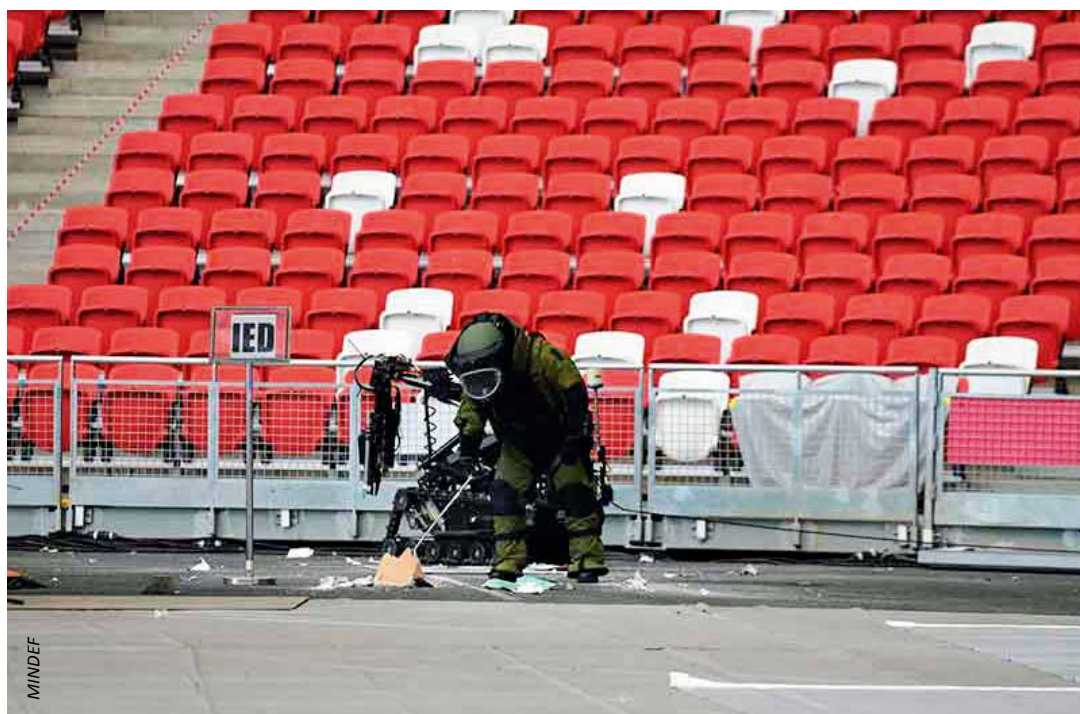
Warfare in the 21st century has represented a new paradigm in stark contrast to wars of the recent and distant past. Since the shock of the September 11 attacks at the dawn of the new century, governments and security agencies all over the world have adjusted

their priorities, with a new focus on non-conventional threats. The increase in ease of access to weapons of mass destruction, combined with the proliferation of subnational and international terrorist organisations, has resulted in a heightened risk of populations being exposed to CBR threats, even during a peacetime setting. To address this, the Chemical Biological Radiological and Explosives Defence Group (CBRE DG) within the SAF was inaugurated in October 2002 to build up the SAF's capability to deal with a broad range of security threats.

On top of looming security threats, the 21st century has also brought with it changing patterns of infectious diseases. Globalisation has continued at an unfettered pace, bringing different countries closer with increasing connections and interactions between populations. This has result in rapid the spread of infectious diseases during pandemics, such as the Severe Acute Respiratory Syndrome (SARS) and the Middle East Respiratory

Syndrome Coronavirus (MERS-CoV). Even diseases previously known to be localised in certain continents, such as Ebola, have spread beyond Africa to become a serious global threat. There is therefore a need for adequate resources and capacity to handle such threats.

The increase in ease of access to weapons of mass destruction, combined with the proliferation of subnational and international terrorist organisations, has resulted in a heightened risk of populations being exposed to CBR threats, even during a peacetime setting.



The Explosive Ordnance Disposal team from the CBRE DG rendering the Improvised Explosive Device safe in the Singapore Sports Hub during Exercise Northstar 9.

INTRODUCTION TO FORCE MEDICAL PROTECTION COMMAND AND ITS ROLE IN COMBATING CURRENT THREATS

FMPC was established in 2008 and brought together the Preventive Medicine and CBRD (Chemical, Biological and Radiological Defence) Branches from Headquarters Medical Corps (HQMC) and the Medical Response Force (MRF) from the SAF Medical Training Institute (SMTI). This unified command was entrusted with the mission of providing medical protection against chemical, biological, radiological and occupational health hazards, with the aim of enhancing the SAF's operational readiness.

Biodefence Centre

One of the Biodefence Centre's (BDFC) primary roles is to identify biological threats that the SAF may encounter in peacetime operations, and instate the appropriate interventional measures. The aim is to reduce the incidence of infectious diseases and ensure force preservation.

BDFC is responsible for monitoring infectious diseases within the SAF, as well as managing infectious disease outbreaks. It also develops vaccination, screening and pre-deployment policies and advisories. BDFC works closely with strategic partners such as Clinical Diagnostic Services Laboratory, Defence Science Organisation (DSO) National Laboratories and the CIDR, National University of Singapore to collaborate on research and development efforts to enhance the SAF's biosurveillance and biodefence capabilities. CIDR was established in 2011 in conjunction with the National University of Singapore's Saw Swee Hock School of Public Health, to conduct epidemiological research related to the SAF. To this end, it has played a pivotal role in enhancing the SAF's early warning biosurveillance system.

BDFC also ensures that environmental and public health standards are maintained at the highest level throughout the SAF. This includes the conduct of comprehensive camp audit inspections, especially with regard to vector control to mitigate the ongoing threat of arboviruses (e.g. Dengue, Zika and



The SAF Team meeting with the Commanding Officers of USNS Mercy and Ex Pacific Partnership Mission leaders. As part of our contribution to Pacific Partnership, the SAF team was in Timor Leste to provide primary medical and dental healthcare and to engage the Timorese to build capability in preventive medicine, infection control and laboratory diagnostics.

Chikungunya). A significant achievement for the SAF was the successful elimination of Malaria in Pulau Tekong in 2007. The SAF developed and implemented the Four Rings of Defence which comprised: (1) Prevention of Import of Malaria (8-week quarantine on return from Malaria endemic countries), (2) Prevention of Human to Mosquito Transmission (Early Detection Protocol and Vector Surveillance and Control system), (3) Prevention of Mosquito to Human Transmission (Vector Surveillance and Control system Personal Protection Measures); and (4) Arrest of Cycle of Transmission (Malaria Contingency Plan).³

Medical Response Force

MRF is an elite medical unit that was formed in 2002. It is a High Readiness Core (HRC) unit of specially trained combat medics and medical officers. The MRF is responsible for providing medical support to SAF troops during CBR incidents. An MRF response team is capable of not only providing a level of

medical care equivalent to a standard Battalion Casualty Station, but also CBR-specific decontamination and treatment capabilities. This unique capability allows the SAF to respond more effectively to non-conventional threats, and more importantly, preserve the lives of our soldiers.

Although MRF's main role is to support SAF troops, the MRF is also operationally ready to respond to national level CBR incidents as part of the wider Singapore Civil Defence Force (SCDF) response when activated. Notably, MRF has been tasked to provide CBR medical support for major national events such as National Day Parade. The MRF also provides CBR medical training to selected SAF medical centre personnel.

Comprehensive Framework of Early Warning, Protection, Detection and Diagnosis, Containment and Recovery

FMPC's approach to CBR threats is organised within a comprehensive framework of five key



The Medical Response Force Platoon administering treatment on the casualties affected by the nerve agent during Exercise NorthStar 9.

thrusts, namely Early Warning, Protection, Detection and Diagnosis, Containment and Recovery. These five key thrusts also represent the different response phases to emerging threats and outbreaks and guide our research and development roadmap.

Early Warning systems comprise comprehensive surveillance programmes such as the Acute Respiratory Infections biosurveillance programme to monitor disease trends which may signal potential outbreaks such as the 2009 H1N1 outbreak. This is essential at the SAF level, and also serves to monitor disease trends at the national level.

FMPC's approach to CBR threats is organised within a comprehensive framework of five key thrusts, namely Early Warning, Protection, Detection and Diagnosis, Containment and Recovery.

Protection is another key thrust of this framework, which serves to prevent and mitigate disease spread. For example, the Annual Influenza Vaccination Exercise has resulted in an estimated 80% reduction in influenza infections and helped to reduce operational and training downtime.

The detection and diagnosis of CBR threats helps to identify unknown or novel threats early, so that specific and treatment, containment and recovery measures can be instituted (some of which may also be time-critical), so as to limit the impact of the outbreak.

RESPONDING TO THE CHALLENGES OF EVOLVING THREATS, NOVEL DISEASE OUTBREAKS AND SUCCESSFUL EFFORTS AT MITIGATING EPIDEMICS

The Zika virus outbreak in August 2016 is a good example of how BDFC manages emerging infectious disease threats with the aim of force protection and preservation. After the notification of the first case of Zika virus infection in an SAF serviceman, immediate containment and response measures were taken to mitigate the impact of Zika virus in our SAF camps. This included a review of medical records to conduct a 'look-back' screening of possible Zika cases within the same camp, environmental audits of affected camps, enhanced vector control measures, and education of outreach to all commanders and servicemen.

These responses built upon the already-existing capabilities developed over the years in managing the dengue virus as outlined in the SAF vector control plan. As such, BDFC was able to successfully prevent the spread of Zika virus within the SAF camps. This in turn contributed to the national efforts of curbing the spread of the Zika virus. This outbreak emphasised the importance of developing the relevant contingency response plans, so as to respond swiftly to new emerging threats.

PREPAREDNESS PROGRAMMES AGAINST NOVEL DISEASE PANDEMICS

To achieve this goal, BDFC has developed the SAF contingency response plans to Influenza pandemics and has also implemented pandemic preparedness programmes for Medical Centres to deal with outbreaks. The contingency plans outline different levels of preventive and mitigation measures that have to be taken in response

to different Disease Outbreak Response System Condition (DORSCON) levels. The SAF pandemic response plan was called into action during the 2009 H1N1 outbreak in Singapore which also affected SAF camps and personnel. During the outbreak, BDFC implemented measures such as ring prophylaxis and pandemic vaccination to contain the outbreak and maintain the operational readiness of the SAF.⁴

When the threats of MERS-CoV and Ebola virus emerged on the global front, BDFC reviewed these preparedness plans, and enhanced surveillance and containment measures at all medical centres. Interventions ranging from comprehensive screening (e.g. cohorting and management of servicemen presenting with febrile respiratory illnesses), environmental decontamination (hygiene and disinfection), to ensuring adequate personal protection (respirator masks and personal protective equipment) were put in place. Simulation exercises were also carried out in various camps to ensure that all the staff on the ground was familiar with the implementation of these measures.

ESTABLISHMENT OF A COMPREHENSIVE AND INTEGRATED SYSTEM TO MEET THE OPERATIONAL REQUIREMENTS OF THE SAF

Way ahead, with a strong force medical protection framework in place, BDFC will continue to collaborate with our partner agencies such as CIDER and DSO to establish a comprehensive and integrated biosurveillance and biodefence system to handle any emergent infectious disease threats. Early warning systems will be built into the frontline medical centres through automated natural language processing algorithms in the clinical management system (Patient Care Electronic System - PACES), to detect unusual patterns in disease burden and distribution. This system,



The MRF Decontamination Deployable Rapid Assembly Shelter (DRASH), with a medic in the MOPP-4 in front, and another in a water impermeable protective suit behind. The yellow bins are for biohazardous materials, such as the casualties' contaminated clothings.

coupled with regular surveillance systems to monitor respiratory and gastro-intestinal pathogens, will trigger early warning of potential outbreaks or novel pathogens.

Way ahead, with a strong force medical protection framework in place, BDFC will continue to collaborate with our partner agencies such as CIDER and DSO to establish a comprehensive and integrated biosurveillance and biodefence system to handle any emergent infectious disease threats.



Decontamination of a simulated chemical casualty by a Medical Response Force Medic in a water impermeable protective suit.

Interventions can then be implemented immediately to ensure force protection and limit the spread of potential outbreaks. Rapid diagnostic capabilities can identify specific causative pathogens early. Hence, tailoring the interventions is required to stop the pathogen and improve treatment outcomes. Over the years, BDFC has built up and translated research capabilities for rapid Polymerase Chain Reaction (PCR) sequencing technologies to DSO, with the establishment of the Clinical Diagnostic Services Laboratory, which can use PCR sequencing to identify specific pathogens with rapid turnaround time.

RISE OF GLOBAL TERRORISM AND NON-CONVENTIONAL WARFARE

In the light of increasing security uncertainty, ongoing conflicts with evidence of possible CBR agent use, and the new global norm of threatened peace, the preparation for

a CBR incident response has to be stepped up to serve the SAF and also Singapore.

This has resulted in a conceptual shift in the way MRF deals with CBR threats. The MRF's concept of operations has been revised to enable MRF to respond faster and to meet different operational requirements. There is a greater need to ensure an integrated response against CBR threats, requiring SAF units and external agencies to work together during the management of a CBR incident. In addition, soldiers will need to be better prepared for CBR incidents, which includes enhanced personal protection as well as self and buddy aid.

The use of chemical warfare agents in terrorism first gained prominence following the Sarin attacks in Matsumoto city (1994) and the Tokyo subway system (1995) causing up to 5,500 injuries and 12 deaths.⁵ This was subsequently followed by the 2001 anthrax

attacks in the United States which led to 5 fatalities. While there has not been any major CBR terror attacks since then, chemical weapons have been used in the ongoing conflict in Syria (2011-present).⁶ As such the MRF will need to remain vigilant and ready to respond as part of the SAF integrated CBR response force when the need arises.

THE WAY FORWARD – FORCE MEDICAL PROTECTION

Enhanced Detection, Diagnosis, and Response through Research and Development

Continual research and development with our partner agencies CIDER and Clinical Diagnostic Services Laboratory (CDSL) will ensure that the SAF remains at the forefront of force medical protection. This article spans the entire spectrum of the comprehensive framework from early warning and detection to containment and response. In the area of detection and diagnosis, there is work being conducted on the development of rapid diagnostic techniques using genetic sequencing to rapidly identify and diagnose specific toxins and causative pathogens for a wide range of different medical conditions.

There is a greater need to ensure an integrated response against CBR threats, requiring SAF units and external agencies to work together during the management of a CBR incident.

This continued focus on research and development ensures that the SAF enhances our capabilities and improves our responses to all types of emerging threats.

CONCLUSION

With the new environment of naturally occurring, accidental or intentional CBR threats as a new norm, force medical protection has become even more important to ensure the well-being and operational readiness of our soldiers. This will ensure that the SAF is ready to respond to a wide spectrum of threats.

ENDNOTES

1. Gabriel, Richard A., and Karen S. Metz. *A History of Military Medicine, Volume 1: From Ancient Times to the Middle Ages, Volume 2: From the Renaissance through Modern Times*. No. 124. Greenwood Press, 1992.
2. Fee, Elizabeth, and Mary E. Garofalo. "Florence Nightingale and the Crimean War." *Am J Public Health* 100, no. 9 (2010): 1591.
3. Vernon J. Lee et al. "Elimination of Malaria Risk through Integrated Combination Strategies in a Tropical Military Training Island" *Am J of Tropical Med and Hyg*. 2010 Jun:1024-1029
4. Vernon J. Lee et al "Oseltamivir Ring Prophylaxis for Containment of 2009 H1N1 Influenza Outbreak" *NEJM*, June 2010;362:2166-2174
5. K.Ganesan et al. "Chemical Warfare Agents" *J Pharm Bioallied Sci*. 2010 Jul-Sep;2(3):166-178
6. Rene Pita and Juan Domingo, "The use of Chemical Weapons in the Syrian Conflict", *Toxics* 2014, 2(3),391-402.