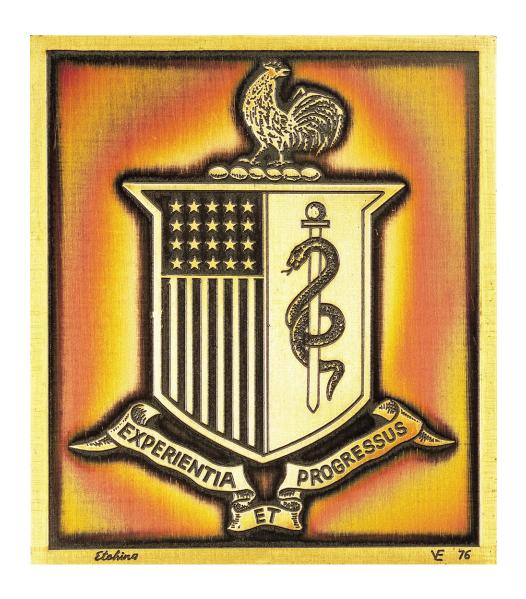
OCCUPATIONAL HEALTH AND THE SERVICE MEMBER



The Coat of Arms 1818 Medical Department of the Army

A 1976 etching by Vassil Ekimov of an original color print that appeared in *The Military Surgeon*, Vol XLI, No 2, 1917

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Taken July 2009 by Army Photographer Pfc Andrya Hill.

OCCUPATIONAL HEALTH AND THE SERVICE MEMBER

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Foreword

The first Textbook of Military Medicine on occupational health for the Soldier and workers in the military industrial base was published in 1993. It described the development of occupational and environmental health and occupational medicine in the Army from 1775 until 1990. This follow-on volume covers 1990 to 2015, a period during which the United States was involved in prolonged warfare. In these operations, deployed Soldiers encountered multiple potentially harmful environmental exposures and reported postdeployment adverse health effects they often related to these exposures. The exposures included impressively large sandstorms; emissions from burning oil wells in Kuwait; chemical agents released during the destruction of chemical weapons caches; hexavalent chromium from a damaged industrial site; sulfur gases from a large, prolonged sulfur mine fire; and emissions from the destruction of all types of waste in large burn pits over many years. The absence of timely, reliable exposure data that could be directly linked to the Soldiers exposed, and the absence of defined symptom complexes that could be used to diagnose postdeployment illnesses, led to anxiety and frustration for the service members affected and those caring for them.

In response, Veterans' groups and Congress called for the Department of Defense (DoD) to document potentially harmful exposures related to deployment, and to identify the adverse health outcomes that might result. Registries were initiated to record and archive exposures of concern and Veterans' maladies, and the Army was required to identify and evaluate Soldiers previously exposed to chemical warfare agents during deployment. Epidemiologic resources to study deployment-related illnesses included considerable amounts of area sampling data from deployed areas, archived predeployment and postdeployment health questionnaires, administrative health encounter data in the Defense Medical Surveillance System (DMSS), and sera stored in the DoD Serum Repository (DoDSR). Efforts were made to secure deployment-related data in large databases, such as the Defense Occupational and Environmental Health Readiness System, for future reference and study, to use the DMSS for deployment-related epidemiologic studies, and to investigate the possible use of the DoDSR predeployment and postdeployment specimens to identify and study deployment-related exposures.

The National Research Council of the National Academy of Sciences recommended that the DoD significantly improve its capability to identify exposures and perform exposure assessments. In response, the DoD undertook an effort to explore alternatives to environmental and breathing zone sampling with the use of wearable sensors, and to assess the use of biomarkers to identify exposures in the deployed environment using DoDSR sera. The rapidly evolving field of biomarker technology showed promise in determining the internal doses after environmental exposures and identifying biomarkers of effect.

This volume documents the services' support for workers in the military industrial base, which remains a critical mission that cannot be neglected. It also archives information on exposures of concern among deployed service members, documenting the development of data repositories and registries as well as studies done with this data. Additionally, it identifies innovations in exposure identification and assessment for future efforts. This volume should be useful to practitioners of Military Medicine and those involved in military occupational and environmental health research, so that avoidable exposures among service members and civilian staff can be avoided, and adverse health effects stemming from military service can be treated with the best available knowledge and procedures.

Lieutenant General Nadja Y. West, MD The Surgeon General US Army

Washington, DC March 2019

Preface

Decades have passed since doctors Llewellyn J. Legters and Craig H. Llewellyn of the Uniformed Services University of the Health Sciences, in Bethesda, Maryland, taught that military medicine was occupational medicine because its practice encompasses the treatment and prevention of injuries and diseases related to work in military occupations and military operational environments. Over the last quarter century, health-related events associated with war and other deployments have served to support the Legters-Llewellyn concept. A variety of exposures with the potential to cause harm to our Service Members are described in this volume, as are the problems encountered in identifying and defining these exposures, and performing exposure assessments in military operational environments. Unfortunately, timely, informed medical evaluations of those exposed has not commonly occurred. The authors hope that familiarity with the contents of this volume will instill in military medical providers the importance of taking an occupational history and seeking consultation when an unusual event is suspected or a possible exposure-related clinical case is encountered.

Support for uniformed members is only one side of military occupational medicine. The other side is support for the military industrial base, which provides the warfighters with the equipment and supplies needed to complete their missions. Some of our depots and arsenals are similar to civilian industrial sites, but many are unique in the operations they conduct. The importance of their sustained operations in supporting our military forces cannot be overstated. Any breakdown in productivity in the military industrial base means a breakdown in the supply chain to those facing our enemies. Equally important is the need for flexibility in the base so that production may be increased to meet the needs of the warfighters. All of this underscores the requirement for a healthy, fit workforce. This volume contains essential information for the healthcare teams supporting the industrial base workforce.

This volume of the Textbooks of Military Medicine, published in hardcopy and electronic formats, will be a valuable reference for providers who need to address unique hazards on military installations and during deployments, as well as the occupational hazards in our military industrial base. I hope readers find it a useful update to the first textbook dedicated to the practice of occupational medicine in the Army, which was published in 1993. The US Navy and Air Force occupational health programs have been included in this update. Additionally, the content has been significantly expanded to cover a wide range of topics, including beryllium, aerospace medicine, undersea medicine, diving and the physiology of divining, ergonomics, ionizing and non-ionizing radiation, respiratory protection, workers' compensation programs, deployment surveillance, and biomonitoring.

This book became a reality due to the commitment and hard work of many people, the encouragement of my wife, Ilona Mallon; the administrative and editorial assistance of Ms. Nicole S. Chavis, and Johanna L. Gribble and mentorship of Colonel (Retired) Joel C. Gaydos

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