

## ABBREVIATIONS AND ACRONYMS

### A

AA: arachidonic acid  
AC: hydrogen cyanide  
ACGIH: American Conference of Governmental Industrial Hygienists  
Ach: acetylcholine  
AChE: acetylcholinesterase  
ADMS: assistant director of medical services  
AEF: American Expeditionary Forces  
AEGL: acute exposure guidance level  
AML: area medical laboratory  
AMN: atropine methylnitrate  
AR: Army Regulation  
ARC: American Red Cross  
ARDS: acute respiratory distress syndrome  
ATCA: 2-aminothiazoline-4-carboxylic acid  
ATNAA: antidote treatment nerve agent autoinjector  
ATP: adenosine triphosphate  
aTSP: active topical skin protectant  
A-V: atrial-ventricular

### B

BA: bromoacetone  
BAL: British anti-Lewisite (dimercaprol)  
BALF: bronchoalveolar lavage fluid  
BAS: battalion aid station  
BBC: bromobenzyl cyanide  
BChE: butyrylcholinesterase  
BEF: British Expeditionary Forces  
BMZ: basement membrane zone  
BTX: batrachotoxin  
BZ: 3-quinuclidinyl benzilate

### C

CA: bromobenzyl cyanide  
CaE: carboxylesterase  
CAI: chemical accident or incident  
CAIRA: chemical accident or incident response and assistance  
cAMP: adenosine 3',5'-cyclic monophosphate  
CANA: convulsive antidote, nerve agent  
CAS: Chemical Abstracts Service  
CB: chemical-biological  
CBIRF: Chemical/Biological Incident Response Force  
CBR: chemical, biological, and radiological  
CBRN: chemical, biological radiological, and nuclear  
CBRNE: chemical, biological, radiological, nuclear, explosive  
CBRR: chemical biological rapid response team  
CDC: Centers for Disease Control and Prevention  
CEA: cultured epidermal autograft  
cGMP: current Good Manufacturing Practice  
CHASE (Operation): Cut Holes and Sink 'Em  
ChE: cholinesterase  
CK: cyanogen chloride  
CN<sup>-</sup>: cyanide anion  
CN: chloroacetophenone  
CNO<sup>-</sup>: cyanate  
CNS: central nervous system  
COLPRO: collective protection  
CP EMEDS: collectively protected expeditionary medical support

CPRP: chemical personnel reliability program  
CR: dibenz(*b,f*)(1,4)oxazepine  
CS: *o*-chlorobenzylidene malononitrile  
CSA: The Covenant, the Sword, and the Arm of the Lord  
CSEPP: Chemical Stockpile Emergency Preparedness Program  
CSF: colony-stimulating factor  
CSMSPD: chemical surety medical support program director  
Ct: concentration (C) of agent vapor or aerosol in air multiplied by time (*t*) of exposure  
CWA: chemical warfare agent  
CWC: Chemical Weapons Convention (1993)  
CWS: US Army Chemical Warfare Service

### D

DA PAM: Department of the Army pamphlet  
DA: diphenylchloroarsine  
DC: diphenylcyanoarsine  
DCE: defense coordinating element  
DEET: N,N-diethyl-meta-toluamide  
DEPMEDS: deployable medical system  
DFP: diisopropyl phosphorofluoridate  
DHHS: Department of Health and Human Services  
DHP: diisopropylfluorophosphate  
DHS: Department of Homeland Security  
DM: diphenylaminoarsine  
4-DMAP: 4-dimethylaminophenol  
DMS: director of medical services  
DNA: deoxyribonucleic acid  
DoD: Department of Defense  
DOE: Department of Energy  
DOJ: Department of Justice  
DOT: Department of Transportation  
DVA: Department of Veterans Affairs

### E

ECG: electrocardiogram  
EDTA: ethylenediaminetetraacetate  
EEG: electroencephalogram  
EKG: electrocardiogram  
EMEDS: expeditionary medical support  
EMS: emergency medical service  
EMT: emergency medical technician  
EOC: emergency operations center  
EPA: Environmental Protection Agency  
Eq: equine  
ER: endoplasmic reticulum  
Er: YAG: erbium: yttrium-aluminum-garnet  
ESF: emergency support function

### F

FBI: Federal Bureau of Investigation  
FBS: fetal bovine serum  
FCC: federal coordinating center  
FDA: Food and Drug Administration  
FEMA: Federal Emergency Management Agency  
FHP: force health protection  
FOC: full operational capability  
FRC: forward resuscitation care

## G

GA: tabun  
GABA(A): gamma-aminobutyric A  
GB: sarin  
GD: soman  
GF: cyclosarin  
GK-11: gacyclidine  
GM1: monosialotetrahexosylganglioside  
GSA: General Services Administration  
GSH: glutathione

## H

H: mustard  
H<sub>2</sub>O<sub>2</sub>: hydrogen peroxide  
H<sub>2</sub>S: hydrogen sulfide  
HAZMAT: hazardous materials  
HAZWOPER: hazardous waste operations and emergency response  
HC: hexachloroethane  
HCN: hydrogen cyanide  
HD: mustard (distilled)  
HE: high explosives  
HHS: Department of Health and Human Services  
HN2: nitrogen mustard  
HSS: health service support  
Hu PON1: human paraoxonase 1  
HWA: Heereswaffenamt

## I

ICAM: improved chemical agent monitor  
ICG: indocyanine green  
ICS: incident command system  
IDLH: immediately dangerous to life or health  
IgG: immunoglobulin  
IL: interleukin  
IM: intramuscular  
IMA: installation medical authority  
IND: investigational new drug  
IOC: initial operational capability  
IOT&E: initial operational test and evaluation  
IP: intraperitoneal injection  
IPE: individual protective ensemble/equipment  
IV: intravenous

## J

JFO: joint field office  
JPEO: joint program executive office  
JPEO-CBD: Joint Program Executive Office for Chemical Biological Defense  
JPMO: joint product management office  
JSGPM: joint service general purpose mask  
JSLIST: joint service lightweight integrated suit technology  
JSMILT: joint service mask leakage tester  
JSPDS: joint service personnel skin decontamination system  
JTF: joint task force

## K

KCN: potassium cyanide  
K<sub>m</sub>: a measure of the strength of binding of a substrate to an enzyme

## L

LC<sub>50</sub>: the vapor or aerosol exposure that is lethal to 50% of the exposed population  
LD<sub>50</sub>: median lethal dose  
LDPI: laser Doppler perfusion imaging  
LHON: Leber hereditary optic neuropathy  
LPS: lipopolysaccharide  
LSD: lysergic acid diethylamide

## M

MAC: multiagency coordination  
MANAA: medical aerosolized nerve agent antidote  
MCE: maximum credible event  
MDMA: 3, 4-methylene-dioxymethylamphetamine  
MEDCOM: medical command  
MEDEVAC: medical evacuation  
MITS: medical identification and treatment systems  
MO: medical officer  
MOPP: mission-oriented protective posture  
MPE: most probable event  
MRI: magnetic resonance imaging  
MRT: mean residence time  
MRT: medical response team  
MS C LRIP: milestone C low rate initial production  
MT: metric ton  
MTF: medical treatment facility  
MULO: multipurpose overboot

## N

N<sub>2</sub>O: nitrogen oxide  
N<sub>2</sub>O<sub>4</sub>: nitrogen tetroxide  
NAAG: N-acetyl-aspartyl-glutamate  
NaCN: sodium cyanide  
NAD<sup>+</sup>: nicotinamide adenine dinucleotide  
NaNO<sub>2</sub>: sodium nitrite  
NATO: North Atlantic Treaty Organization  
NBC: nuclear, biological, chemical  
NCO: noncommissioned officer  
NCS: National Communications System  
NDA: new drug application  
NDMS: National Disaster Medical System  
NF: number facility  
NIMS: National Incident Management System  
NIOSH: National Institute for Occupational Safety and Health  
NMDA: N-methyl D-aspartate  
NO: nitric oxide  
NO<sub>2</sub>: nitrogen dioxide  
NORTHCOM: Northern Command  
NRP: National Response Plan  
NSAID: nonsteroidal antiinflammatory drug  
NSP: neurotoxic shellfish poisoning

## O

OC: oleoresin capsicum  
OH: hydroxyl radical  
OP: organophosphorus  
OPCW: Organization for the Prohibition of Chemical Weapons  
OPIDN: organophosphorus ester-induced delayed neurotoxicity  
Ops: operations  
OSHA: Occupational Safety and Health Administration

**P**

PADPRP: poly(adenosine diphosphate-ribose) polymerase  
 PAF: platelet-aggregating factor  
 2-PAM Cl: 2-pralidoxime chloride  
 2-PAM: 2-pralidoxime  
 PAPP: p-aminopropiophenone  
 PARP: poly(ADP-ribose) polymerase  
 PATS: protection assessment test system  
 PB: pyridostigmine bromide  
 PBN: alpha-phenyl-N-tert-butyl-nitron  
 PBN: N-tert-butyl-alfa-phenyl-nitron  
 PbTx: brevetoxin  
 PCP: phencyclidine  
 PFIB: perfluoroisobutylene  
 pHu: plasma-derived human  
 PKC: protein kinase C  
 PLA<sub>2</sub>: phospholipase A<sub>2</sub>  
 pMo: plasma-derived mouse  
 2-PMPA: 2-pentanedioic acid  
 POM: program objective memorandum  
 PPE: personal protective equipment  
 PR: protective ratio  
 PS: chloropicrin  
 PTSD: posttraumatic stress disorder  
 PTX: palytoxin

**R**

RADS: reactive airways dysfunction syndrome  
 RBC-ChE: red blood cell cholinesterase  
 RCA: riot control agent  
 RD<sub>50</sub>: dose required to cause a 50% decrease in respiration  
 REM: rapid eye movement  
 RH: relative humidity  
 rHu BChE: recombinant human butyrylcholinesterase  
 RNA: ribonucleic acid  
 RPM: respiratory rate, pulse, and motor function  
 RSDL: Reactive Skin Decontamination Lotion

**S**

SCN<sup>-</sup>: thiocyanate  
 SE: status epilepticus  
 SERPACWA: skin exposure reduction paste against chemical warfare agents  
 SMART: special medical augmentation response team  
 SNS: strategic national stockpile  
 SRBD: seizure-related brain damage  
 SS: Schutzstaffel  
 START: simple triage and rapid treatment  
 STEL: short-term exposure limit  
 STM: Sacco triage method  
 STX: saxitoxin

**T**

TBSA: total body surface area  
 TEN: toxic epidermal necrosis  
 TIC: toxic industrial chemical  
 TIM: toxic industrial material  
 TNF: tumor necrosis factor  
 TRP: transient receptor potential  
 TTX: tetrodotoxin  
 TWA: time-weighted average

**U**

UN: United Nations  
 USACHPPM: US Army Center for Health Promotion and Preventive Medicine  
 USAMRICD: US Army Medical Research Institute of Chemical Defense  
 USAMRIID: US Army Medical Research Institute of Infectious Diseases  
 USDA: US Department of Agriculture  
 USJCOM: US Joint Forces Command  
 USMC: US Marine Corps

**V**

V/Q: ventilation perfusion ratio  
 VAC: Vacuum-Assisted Closure Therapy  
 VR1: vallinoid receptor subtype 1

**W**

WBGT: wet-bulb globe temperature  
 WMD: weapons of mass destruction



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# Dedicated to the Memory of Brennie E. Hackley, Jr, and Frederick R. Sidell



## **DR BRENNIE E. HACKLEY, JR**

Chemist, Teacher, Scientific Advisor

July 29, 1924 – November 5, 2006

Dr Hackley received a BS in chemistry from Wilberforce University in 1946. Following graduation, he enlisted in the US Army and was later commissioned as an officer. After more than 30 years' service, he retired from the US Army Reserve Corps in 1981 at the rank of colonel. Dr Hackley began his civilian career in 1952 as an organic research chemist in the Medicinal Chemistry Branch of the Army Chemical Center and went on to earn advanced degrees in chemistry from the University of Delaware, including a PhD in 1957. During his career, Dr Hackley studied the relationship between chemical structures and chemotherapeutic activity in reference to efficacy against toxic agents. He contrib-

uted to the elucidation of mechanisms of reactions of nucleophiles with organophosphorus compounds and synthesized a number of oximes, for which he held 18 patents. One oxime synthesized by Dr Hackley, toxogonin, was adopted as an antidote against chemical nerve agents by the US Air Force.

In 1984 Dr Hackley was designated Chief Scientist and Scientific Advisor to the Commander of the US Army Medical Research Institute of Chemical Defense (USAMRICD). During Operation Desert Storm, Dr Hackley responded to emergency calls by combat divisions for predeployment briefings on medical management of chemical casualties, initiating a traveling training program that prepared deploying medical personnel to treat soldiers on the battlefield if chemical weapons were employed. As an instructor and course director for USAMRICD's Medical Management of Chemical and Biological Casualties course, Dr Hackley delivered lectures in Saudi Arabia; Johnston Island, Hawaii; Okinawa, Japan; and Germany on pulmonary agents, cyanide, vesicants, and nerve agent threats.

While serving as chairman of the Scientific Steering Committee on Nerve Agent Antidotes, he advised the Command that one of the precursors for the then current synthesis of the oxime HI-6, under consideration as a replacement for the fielded 2-PAM chloride, was carcinogenic and would not pass scrutiny by the Food and Drug Administration. Additionally, Dr Hackley convinced the Command that HI-6 wasn't cost effective, and that its effectiveness compared to 2-PAM chloride was not great enough to justify its replacement.

Dr Hackley represented the US Army Medical research program competently and effectively for almost 6 decades. His efforts significantly improved communication and relationships between the Chemical and Medical Corps and strengthened USAMRICD's image as the lead laboratory for the development of medical countermeasures for chemical threat agents.



**DR FREDERICK R. SIDELL**

Physician, Teacher, Scientist

July 27, 1934 – February 14, 2006

No physician has contributed more to the US Army Medical Department's chemical defense training and education programs than Dr Frederick Sidell. Dr Sidell graduated from Marietta College in Marietta, Ohio, in 1956, and also later from the New York University School of Medicine. He completed his internship and residency in internal medicine at Cleveland Metropolitan General Hospital. Dr Sidell initially served 2 years on active duty with the Army Medical Corps in the rank of captain. He was stationed at Edgewood Arsenal in Maryland, an assignment that would determine his future in medicine and lead to his subsequent employment with the Department of Defense. While with the Department of Defense Dr Sidell became one of the world's leading experts and educators in the field of medical effects of chemical warfare agents. He retired in 1995 after 30 years in government service.

In the late 1960s, when training in medical chemical defense was very limited, Dr Sidell and some of his colleagues recognized the need for specialty training and developed a course for military medical personnel on the medical management of chemical agent casualties. Dr Sidell guided the development of this new training

program and served as the course director for many years. Eventually, such training was expanded to additional courses for nonmedical personnel and military leaders. Dr Sidell also prepared and updated detailed educational materials addressing nerve agents, vesicants, cyanide, and pulmonary agents, and provided education and training for the Chemical Stockpile Emergency Preparedness Program and the Domestic Preparedness Program.

Dr Sidell's expertise was nationally and internationally recognized, and he was often called upon for highly sensitive assignments that required technical expertise. These included a trip to southeast Asia in 1979 to investigate the alleged use of "yellow rain" against the Hmong in Laos. In 1988, he examined Kurdish civilian casualties who were victims of chemical warfare in their homeland. He traveled to Japan in 1995 to assist and advise Japanese physicians on the care of casualties from a terrorist-led sarin nerve agent incident in the Tokyo subway system.

Dr Sidell was the lead editor of the first edition of *Medical Aspects of Chemical and Biological Warfare*, published in 1997, contributing to many of the chapters on chemical warfare agents. His research and studies have been published in over 100 reports and articles, and he also wrote several handbooks on the treatment of chemical casualties. Following his official retirement, Dr Sidell continued providing education and training in the management of chemical agents and casualty treatment to civilian first responders, including many emergency medical treatment units throughout the United States.

In addition to the many achievement awards and commander's medals received by Dr Sidell, a new building at the Edgewood area of the Aberdeen Proving Ground was named the Sidell Learning Center in 2002 in recognition of his great contribution to medical education and training. In 2003 Dr Sidell was inducted into the Marietta College Hall of Honor, becoming one of only 24 people to be so recognized at that time. Dr Sidell's knowledge, experience, and dedication contributed greatly to the development of the outstanding medical training programs throughout the Department of Defense today. His insight and pragmatic views have guided the development of medical policy against weapons of mass destruction and medical research on safe and effective medical countermeasures against current and future chemical threats facing the military.