Introduction to the DoD Serum Repository

Meeting of the Research Advisory Committee on Gulf War Veterans' Illnesses
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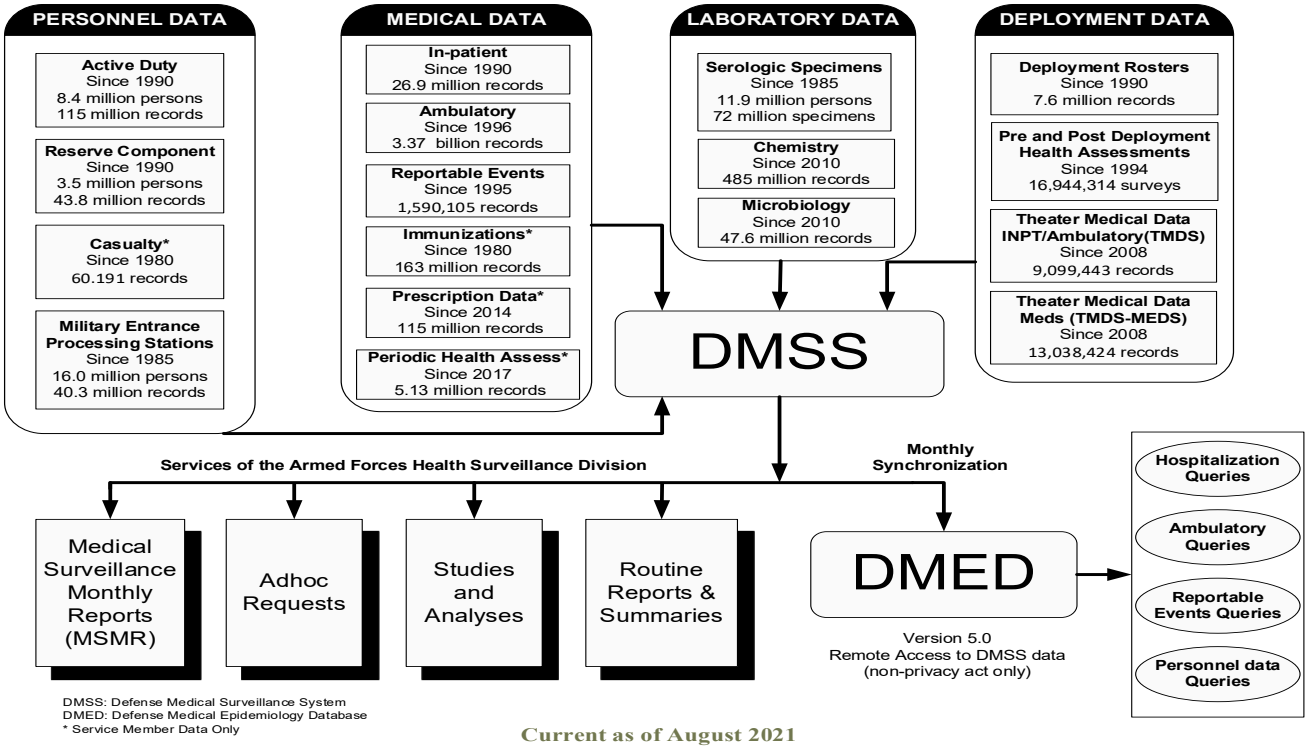
Overview

Defense Health Agency (DHA) Public Health	Defense Centers for Public Health Falls Church
Armed Forces Health Surveillance Division (AFHSD): *comprehensive health surveillance support to the Joint Staff, Combatant Commands, and Military Service*	DoD Serum Repository (DoDSR): provides support to clinical, operational, and research studies (but does not conduct research)
	Defense Medical Surveillance System (DMSS): provides the sole link between medical surveillance data (e.g., personnel, military experience, medical outcomes) and specimens in DoDSR

Defense Medical Surveillance System (DMSS)



Current as of August 2021

DMSS Data Limitations

Data not available:

- Smoking status (except for PHA/deployment health forms)
- Height/Weight or BMI (except at accession < 2021, and on PHA)
- Immunization data on dependents
- Immunization data prior to military service
- Environmental exposure data (except for deployment health forms)
- Provider notes
- Demographic data on dependents
- Pharmaceutical data prior to Sep 2013

ICD-9/10 code limitations:

- Administrative data – does not indicate severity
- Miscoding or missing codes

History of the DoDSR

- Began in 1985 after the start of universal mandatory screening for HIV in all military applicants and service members
  - Purpose was to study and refine HIV screening methods, establish epi risk factors, and study other infectious diseases
  - Initially, the Services maintained their own separate repositories
- In 1989, the Army and Navy/Marine Corps repositories were combined at WRAIR
- In 1994, the responsibility of the combined repository was transferred to AMSA and linked to the DMSS
- Air Force was added in 1996

Serum Collection and Processing

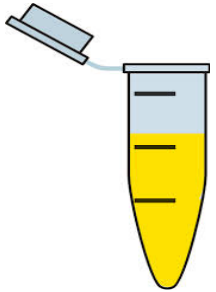
- DoD uniform HIV testing policy introduced in 2004 to conduct repeat HIV testing every 2 years
- Programs for pre- and post-deployment specimen collection began in 1997
- Specimens are collected in a wide variety of settings, then are aggregated, sent to the nearest medical facility laboratory, and eventually shipped to the designated HIV testing center
- Every ~6 weeks, DoDSR staff retrieve specimens from the consolidated testing centers using –30°C refrigerated truck

Serum Collection and Processing (cont.)

- Once retrieved, samples are inspected and accessioned into DMSS
- Specimens are maintained at –30°C in their original tube until they need to be aliquoted
- When being aliquoted, specimens are thawed in refrigerator overnight and then aliquoted into 4 aliquots of 0.5ml each and re-frozen at –30°C
- Aliquots needed for a study are packaged into insulated containers for shipping
- ~600 specimens can be pulled and ~450 aliquoted per day

DoDSR Specimens

- Central archive of U.S. military serum specimens
  - Periodic routine mandatory HIV screening
  - Pre- and Post-deployment sera collection
- Collected for medical surveillance purposes to support force health protection, disease prevention & health program policy
- Over 72 million serial specimens from over 12 million individuals



- Specimens stored in precisely documented locations in large walk-in –30°C freezers
- Linked to demographic, military, and medical information via DMSS
- Last aliquot reserved for Service Member's needs
- No lab work conducted at AFHSD
- Payment agreement required for studies requesting >100 aliquots; $25 per aliquot

Approved Uses

- Research
  - At least 1 DoD PI/Co-I
  - Protocol reviewed at AFHSD Research Protocol Review (RPR) meeting
  - Letter of support will be issued if protocol approved
  - Institutional Review Board (IRB) approval and DHA Data Sharing Agreement required
  - Informed consent required for release of personally identifiable information (PII)
- Patient care
  - Limited to treating clinician
- Public health/force health protection
- Criminal investigations
  - Very rare
  - Requires judge-issued court order and approval by ASD (HA)

Examples of Use

Operational Health Surveillance

- Prevalence, incidence & risk factors for Arthropod-Borne infections (including JEV, DENV, ZIKV & CHIKV)
- Melioidosis exposure in Darwin, Australia
- Risk of JEV infections among Soldiers in Korea
- TBE Surveillance support to EUCOM
- Environmental Exposures during SWA deployment

Research Support

- Cancer "Moonshot" studies
- Influenza vaccine effectiveness, immunogenicity & antibody persistence studies

Patient Care

- Q fever testing following deployment
- Investigation of vaccine adverse events

Environmental Exposures

Efforts to quantify utility of the DoDSR in addressing environmental exposures (particularly during deployment):

- Detection of Serum microRNAs from 30 samples (*Woeller et al, 2016*)
  - Successfully quantified over 200 potential biomarkers of occupational exposure
  - Correlation of miRNA with Cotinine, Cytokine, and PAH Levels
  - Powerful tool for biomarker discovery

- Detection of free benzo(a)pyrene (BaP) and high-resolution metabolomics from 30 samples (*Walker et al, 2016*)
  - DoDSR samples are of sufficient quality for chemical profiling of DoD personnel and identification of the BaP-associated metabolic perturbations

DoDSR Supported Publications (1985-2021)

PLOS ONE

The DoD Serum Repository, 1985-2012

Table 4. Number of publications stratified by types of health outcomes studied using specimens from the DoD Serum Repository and the analytes investigated in those studies.

Health Outcome	Antibodies	Regulatory molecules and Biomarkers	Chemical compounds	Human DNA	Nutrient	Total
Infectious diseases	28	1			1	30[a]
Neoplasms	3	4	3		1	11
Chronic metabolic	1				1	2
Autoimmune disorders	17	2			1	20[b]
Non-specific "war syndrome"	1		1			2
Vaccine-induced immunity	4					4[a]
Physical injury					1	1
Neurological				1		1
Mental illness	3	2		1	2	8
Total	57[a]	8[b]	4	2	7	76

a. Two publications [18, 74] addressed both the incidence of acute infection (as indicated by the presence of pathogen-induced antibody) and vaccine-induced antibody. In the table, this affects the row and columns totals but not the grand total.

b. One publication [59] assayed for an autoantibody as well as the presence of disease progression markers (various cytokines and chemokines). In the table, this affects the row and columns totals, but not the grand total.

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THANK YOU