

Annual Historical Report - AMEDD Activities, CY 2000
U.S. Army Medical Research Institute of Infectious Diseases
Fort Detrick, Frederick, Maryland 21702-5011

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SECTION I

USAMRIID MISSION STATEMENT

The mission of USAMRIID is to conduct basic and applied research to develop products, information, procedures, strategies and training programs for medical defense against biological warfare agents and naturally occurring infectious diseases of military significance that require biological containment. The Institute is the lead laboratory in the Medical Biological Defense Research Program and participates in crucial aspects of the Infectious Disease Research Program.

SPECIAL MISSIONS

1. Provides the following special functions based on the organization's worldwide responsibilities in support of the Biological Defense Program:
 - a. Responsible for the Special Vaccine and Drug Development Programs required to support the DoD and other organizations on a worldwide basis.
 - b. Operates a medical treatment facility (Ward 200) to provide inpatient medical support to human-use protocol patients and to individuals contracting or suspected of having been exposed to work-related infectious disease. Supports patients on protocol and other entitled military and civilian personnel within the professional capabilities of the Institute. Medical technical supervision for quality assurance and credentialing is conducted through Walter Reed Army Medical Center.
 - c. Provides high-containment evacuation capability for persons exposed to high-hazard infectious agents.
 - d. Provides a high-containment treatment and hospitalization area for the DoD.
 - e. Provides a high-containment postmortem laboratory to support the DoD.
 - f. Operates Medical Biological Reaction Teams for worldwide deployment.
 - g. Assists in terrorist biological threat assessment for DoD and other government agencies.
 - h. Conducts a course on medical management of biological warfare casualties.

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SECTION II

ORGANIZATION

(See Appendix B for organizational structure)

1. USAMRIID, a subordinate element of the U.S. Army Medical Research and Materiel Command, a major subordinate command of the U.S. Army Medical Command, is a tenant activity at Fort Detrick. Support agreements exist with the Headquarters, U.S. Army Garrison, Fort Detrick, and the Walter Reed Army Medical Center, Washington, D.C., for certain administrative, logistical, and medical support.
2. Three buildings provide 334,000 square feet with approximately 15 percent of the laboratory space capable of operations at Biosafety Level 3 (containment) and approximately 3 percent capable of operations at Biosafety Level 4 (maximum containment). These containment laboratories are a unique international resource for the safe study of highly hazardous disease agents. Other unique facilities include a 16-bed clinical research ward; high containment patient care facility and support functions; contained dynamic aerosol laboratory exposure systems; cell culture and hybridoma laboratory; and electron microscopy equipment.

SECTION III

PERSONNEL

(See Appendix B for Personnel Authorization and Assigned Strength)

1. The following personnel arrived/departed from USAMRIID.

a. Staff Departees:

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b. New Arrivals:

- 1.
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- 4.
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(b)(6)

SECTION IV

EVENTS

3 January 2000 - (b)(6) Deputy Commander for Clinical Support, 3rd Medical Command visited USAMRIID and received a brief and tour by COL Parker.

7 January 2000 - (b)(6) AMEDD Liaison to the United Kingdom and CPT (b)(6) Health Care Operations, Office of the Surgeon General visited USAMRIID and received a brief and tour by COL Parker.

19-21 January 2000 - VC Consultants meeting was held at USAMRIID. COL Parker participated.

20 January 2000 (b)(6) provided brief and tour to (b)(6) CEB Director, and three additional individuals from the United Kingdom.

21 January 2000 - COL Parker provided brief and tour to (b)(6) President and Chief Officer, TriWest Health Care.

23-27 January 2000 - COL Parker attended the USAMRMC Commander's Conference, Leesburg, Virginia.

7-9 February 2000 - COL Parker participated in the 6th National Symposium on Biosafety in Atlanta, GA.

10 February 2000 - COL Parker traveled to New York to participate in a roundtable panel on Bioterrorism for Attorney General Janet Reno.

15 February 2000 - COL Parker attended the TARA Meeting held in Crystal City, Virginia.

22 February 2000 - USAMRIID received visitors from Kirtland Air Force Base. COL Parker provided a brief and tour. (b)(6) assisted with this visit.

24-25 February 2000 - USAMRIID held off-site Strategic Planning Conference at the Xerox Center, Leesburg, Virginia.

3 March 2000 - The Frederick County Board of Commissioners along with Economic and Community Development Commission, Office of Economic Development and Job Training

Agency visited USAMRIID for a brief and tour provided by COL Parker. (b)(6) assisted.

7 March 2000 - (b)(6) Chief of Technology and Logistics, IDF, along with several staff members were provided a brief and tour by COL Parker.

8 March 2000 - COL Parker traveled to New York City to meet with (b)(6) Director, Office of Emergency Management.

14 March 2000 - (b)(6) Office of the Surgeon General of the Japanese Air Force, (b)(6) Office of the Surgeon General Japanese Navy, and (b)(6) Department of Military and Emergency Medicine, USUHS, were provided a brief and tour by COL Parker.

18 March 2000 - COL Parker provided a brief and tour to The National Commander of the American Legion, (b)(6) arranged this visit.

21 March 2000 - COL Parker provided a USAMRIID overview for a United Kingdom Vaccines Group. Approximately 10 individuals attended.

23-27 March 2000 - COL Parker traveled to San Antonio, Texas to attend the Council of Army Veterinarians conference and the U.S. Army 2000 Military Veterinary Medical Seminar.

28 March 2000 - (b)(6) Director General of Health & Medical Affairs, Japan Defense Agency, and several staff members visited USAMRIID and received a brief and tour. COL Eitzen participated in this visit.

3 April 2000 - (b)(6) Assistant Judge Advocate General for Civil Law & Litigation, visited USAMRIID and received a brief and tour by COL Parker.

4 April 2000 - The Industrial College of the Armed Forces Biotechnology Study Group and Agribusiness Study Group visited USAMRIID. COL Parker provided an overview of USAMRIID mission and role in counterterrorism preparedness. (b)(6)

(b)(6) assisted with the group. (b)(6) coordinated this visit.

6 April 2000 - (b)(6) Senate Committee on Government Affairs, visited USAMRIID. After much discussion related to West Nile Virus, COL Parker provided a walking tour. Those participating in discussion included (b)(6) (b)(6)

7 April 2000 - COL Parker provided brief and tour to (b)(6) Chief Operational Command, Central Military Hospital, Ukraine, and several staff members.

11 April 2000 - COL Parker provided brief and tour to (b)(6) United Kingdom Surgeon General. In addition, the following individuals participated: (b)(6) Military Assistant; (b)(6)

Staff Officer; and (b)(6) British Liaison Officer Medical. Lunch was provided at USAMRIID for the group.

17 April 2000 - COL Parker provided a walking tour to (b)(6) Deputy Assistant Secretary of the Army for Research and Technology and (b)(6) Deputy Director for S&T Program Integration.

24 April 2000 - (b)(6) provided brief and tour to (b)(6) (USA RET), Vice President for Membership and Meetings, Association of the United States Army.

26 April 2000 - COL Parker attended a luncheon at AFMIC with (b)(6) Director for Intelligence, Joint Staff (J2).

27 April 2000 - COL Parker provided brief and tour to (b)(6) Commander, 18th NBC Battalion and (b)(6) NBC Analyst, from Slovenia.

28 April 2000 - COL Parker provided brief and tour to a group of Egyptian visitors. Those attending included (b)(6) (b)(6) (b)(6) from the AMEDD Center and School joined for the brief and tour.

1-2 May 2000 - (b)(6) The Surgeon General and (b)(6) visited USAMRMC. COL Parker participated in this visit and provided a short briefing on key accomplishments along with other USAMRMC Commanders. A luncheon was held at Ceresville Mansion.

5 May 2000 - A group from FEMA Emergency Preparedness was given a brief and tour of USAMRIID. (b)(6) assisted.

6 & 9 May 2000 - COL Parker welcomed and provided a USAMRIID overview to the Medical Management of Chemical and Biological Casualties Course attendees.

8 May 2000 - COL Parker participated in a Sub-Panel of the Defense Science Board on Defense Against Biological Weapons held in Arlington, Virginia.

9 May 2000 - COL Parker provided brief to Assistant Secretary of State O. J. Sheaks. (b)(6) (b)(6) assisted with touring.

12 May 2000 - A tour of USAMRIID was provided to Russian dignitaries by COL Parker. (b)(6) (b)(6) assisted.

16 May 2000 - COL Parker provided brief and tour for Group (b)(6) Defense Equipment Capability, NBC and several additional British staff members.

17-18 May 2000 - The Spring Research Festival was held at Fort Detrick. Participants from USAMRIID included (b)(6)

(b)(6) coordinated this event for USAMRIID.

30 May 2000 - (b)(6) Senior Advisor, DTRA along with key staff members visited USAMRIID for a brief and tour given by COL Parker.

1 June 2000 - COL Parker presented the "Lab of the Year" presentation for USAMRIID in Crystal City, Virginia.

5 June 2000 - COL Parker provided brief and tour to visitors from the Czech Republic.

19 June 2000 - COL Parker provided brief and tour to (b)(6) Professor of Occupational Medicine at University of Newcastle & UK Ministry of Defense. Others attending were (b)(6)

22 June 2000 - (b)(6) Canadian Forces Assistant Defence Attache for Health Affairs (Outgoing and Incoming personnel) were provided a brief and tour by COL Parker.

22 June 2000 - A USAMRIID tour was provided to the 902nd MI Group attendees. All personnel receiving the tour were Special Agents of U.S Army Counterintelligence. CPT (b)(6) handled this visit.

28 June 2000 - (b)(6) hosted visitors from the Johnson Space Center, Jet Propulsion Laboratory and Ames Research Center. A briefing and tour were provided.

28-30 June 2000 - COL Parker attended the First Food Safety Council Meeting held in Fort Sam Houston, Texas.

6 July 2000 - COL Parker provided brief and tour to (b)(6) Chair, Infectious Diseases, St. Jude Children's Research Hospital.

7 July 2000 - COL Parker traveled to Bioport, Lansing, Michigan to attend a meeting.

11 July 2000 - (b)(6) provided brief and tour to (b)(6) Office, Chief of Army Reserves; (b)(6) HQ, U.S. Army National Guard and (b)(6) Medical Command, Reserve Affairs, Office of the Surgeon General.

14 July 2000 - USAMRIID Change of Command Ceremony was held. Outgoing Commander COL Parker relinquished command to COL Eitzen.

19 July 2000 - (b)(6) provided brief and tour to Frederick County teachers.

20 July 2000 - COL Eitzen greeted the USAMMA Internship Program students. (b)(6) provided brief and tour.

27 July 2000 - COL Eitzen attended the Defense Science Board Meeting in Arlington, Virginia.

31 July 2000 - (b)(6) provided brief and tour to a group of physicians, nurses, and others attending the Tropical Medicine Course at West Virginia University.

1 August 2000 - COL Eitzen attended meetings at Bioport in Lansing, Michigan.

3 August 2000 - COL Eitzen provided brief and tour to (b)(6) Commanding General, Walter Reed Army Medical Center and the North Atlantic Regional Medical Command.

7 August 2000 - (b)(6) provided brief and tour to cadets (b)(6)
(b)(6)

11 August 2000 - (b)(6) provided brief and tour to (b)(6) Assistant Surgeon General for Force Projection/Chief, Army Nurse Corps and (b)(6) Deputy Assistant Surgeon General for Force Projection.

25 August 2000 - COL Eitzen provided brief and tour to Air National Guard group (b)(6) and (b)(6) assisted.

31 August 2000 - COL Eitzen participated in the Association of Politics in Life Sciences Meeting held in Washington, DC.

8 September 2000 - COL Eitzen participated at the Aerospace Medicine Association meeting held in Bethesda.

11 September 2000 - COL Eitzen and (b)(6) attended the Lab of the Year awards ceremony.

12 September 2000 - COL Eitzen attended the AFEB Meeting held at WRAIR.

13 September 2000 - COL Eitzen presented at the CSIS CBRN Terrorism Task Force Meeting held in Washington, DC.

18 September 2000 - COL Eitzen provided briefing to (b)(6) Commander, Joint Task Force, Civil Support (JTF CS). (b)(6) assisted with the tour.

19 September 2000 - COL Eitzen provided brief and tour to (b)(6) IDF/Home Front Command, Head of Medicine Department and (b)(6) IDF/Home Front Command, Head of Doctrine and Development Department, Israel.

20-21 September 2000 - COL Eitzen participated in the United States/Republic of Korea Technological Cooperation Sub-Committee Meeting (Medical) held at Fort Detrick. USAMRMC hosted this meeting. COL Eitzen provided a presentation and attended social functions with the group.

26 September 2000 - (b)(6) provided briefing and tour to a group from the Japanese Ministry of Defense.

16 October 2000 - COL Eitzen attended the Association of the United States Army Meeting held in Washington, DC.

18 October 2000 - COL Eitzen attended the 2nd Primary Care Symposium, 3rd Annual Anthrax/Allergy/Immunization/Asthma Updates conference in Alexandria, VA.

18 October 2000 - (b)(6) provided brief and tour to visitors (including the mayor and other officials) from Frederick's "sister city" of Schifferstadt, Germany.

22-25 October 2000 - COL Eitzen participated at the American College of Emergency Physicians meeting held in Philadelphia, PA.

29 October 2000 - COL Eitzen provided a briefing at the Society of Medical Consultants meeting held in Bethesda, MD.

31 October 2000 - COL Eitzen provided a walking tour to (b)(6) Chief, Medical Service Corps Branch and (b)(6) Deputy, Medical Service Corps Branch Personnel Command.

7 November 2000 - (b)(6) provided brief to a group from the DIA and (b)(6) assisted with the tour.

7 November 2000 - COL Eitzen participated in the Joint Medical Committee Weapons of Mass Destruction Symposium held in Washington, DC.

9 November 2000 - NBC/Discovery News interviewed COL Eitzen. (b)(6) assisted with the visit and tour.

13-16 November 2000 - COL Eitzen participated in the American College of Toxinology meeting held in San Diego, CA.

16 November 2000 - (b)(6) provided brief and tour to (b)(6)

17 November 2000 - (b)(6) provided USAMRIID overview and tour to House and Senate Congressional Staffs. Several staff members assisted with this group.

27 November 2000 - COL Eitzen attended the Consultants Meeting held in Crystal City, VA.

28-29 November 2000 - COL Eitzen participated in the 2nd National Symposium on Medical and Public Health Response to Bioterrorism held in Washington, DC.

30 November 2000 (b)(6) provided brief and tour to (b)(6) Head, Nuclear Biological Chemical Branch, Israeli Defence Force.

4 December 2000 - COL Eitzen greeted (b)(6) Education Department, Chemical School, JGSDF and several staff members. (b)(6) provided brief and tour.

4 December 2000 - COL Eitzen provided brief and tour to (b)(6) Director, Veterans Affairs Medical and Regional Office Center.

6-7 December 2000 - COL Eitzen attended the Medical Defense Against Bioterrorism Efficacy and Safety of New Products Meeting held in Bethesda, MD.

SECTION V

FACILITIES

Medical Maintenance Branch:

- a. New personnel arrivals (b)(6) This is a newly created position, the Work Order Equipment Control Clerk, which replaces the MRV at the Work Order Desk.
- b. Loss of personnel during 2000: one military MRV, (b)(6)
- c. We took advantage of several training opportunities in 2000. Three repairmen were trained on the repair and maintenance of M.J. Research thermal cyclers, 2 repairmen were trained on Forma incubators, 2 technicians on Olympus microscopes and 2 technicians received basic level training on Waters HPLC systems. This represents savings to the Institute by servicing equipment in-house. Two technicians attended GLP refresher training.
- d. Two multiple option year contracts were brought about, Hitachi (electron microscope) and Getinge/Castle (autoclaves).
- e. Continued use of the IMPAC card has allowed the Branch to reduce the inventory of stocked parts and also helped to produce a slight reduction in the Work Order backlog (45).
- f. Medical Maintenance Branch assumed responsibility for management and supervision of the Property Section.
- g. The AMSCO, 24x36x48 autoclave in the basement of building 1412 was replaced with a Getinge/Castle unit.
- h. 1923 work orders were received and 2114 were completed resulting in a reduction of work orders in backlog. 9112 preventive maintenance services (PMCS) were scheduled and 98% were completed.

Property Section:

- a. New arrivals during 2000 included two Supply Technicians, (b)(6) (b)(6) and one Warehouse Technician, (b)(6)
- b. Loss of personnel during 2000 was one Supply Technician, (b)(6)

- c. A total of 1,788 new items were added to the Property Book; this is an increase of 255% over CY 99 (701 processed).
- d. A total of 2,755 Excess turn-ins were processed, a 52% increase over CY 99 (1802 processed).
- e. Received and issued items from eight lease contracts.

Materiel Control Branch:

- a. The Materiel Control Branch processed 23,136 line items in FY 00 compared to 22,943 in FY 99.
- b. Outgoing shipments, i.e., infectious, documents, and diagnostics processed by the Materiel Control Branch decreased to 815 for FY 00 compared to 822 in FY 99.
- c. The Materiel Control Branch offices were painted and new carpeting and furniture installed.
- d. Personnel arrivals: [b)(6)] previously with the logistics property book section, transferred to the Materiel Control Branch.
- e. Personnel departures: [b)(6)] transferred to the property book section. [b)(6)] transferred to the Human Resources Division.

SECTION VI

PUBLICATIONS AND ABSTRACTS

Publications:

Bray M, J Driscoll, JW Huggins. 2000. Treatment of lethal Ebola virus infection with a single dose of an A-adenosyl-L-homocysteine hydrolase inhibitor. *Antivir Res* 45:135-147.

Bray M, M Martinez, DF Smee, D Kefauver, E Thompson, JW Huggins. 2000. Cidofovir (HPMPC) protects mice against lethal aerosol or intranasal cowpox virus challenge. *J Infect Dis* 181:10-19.

Byrne MP, LA Smith. 2000. Development of vaccines for prevention of botulism. *Biochimie* 82:955-966.

Byrne MP, R Titball, J Holley, LA Smith. 2000. Fermentation, purification, and efficacy of a recombinant vaccine candidate against botulinum neurotoxin type F from *Pichia pastoris*. *Protein Expression Purif* 18:327-337.

Cieslak TJ, GW Christopher, MG Kortpeter, JR Rowe, JA Pavlin, RC Culpepper, EM Eitzen Jr. 2000. Immunization against potential biological warfare agents. *Clin Infect Dis* 30:843-850.

Cieslak TJ, EM Eitzen Jr. 2000. Bioterrorism: agents of concern. *J Pub Hlth Manage Prac* 6:19-29.

Clayton J, JL Middlebrook. 2000. Vaccination of mice with DNA encoding a large fragment of botulinum neurotoxin serotype A. *Vaccine* 18:1855-1862.

Dohm DJ, ED Rowton, PG Lawyer, M O'Guinn, MJ Turell. 1998. Laboratory transmission of Rift Valley fever virus by *Phlebotomus duboscqi*, *Phlebotomus papatasi*, *Phlebotomus sergentii*, and *Sergentomyia schwetzi* (Diptera:Psychodidae). *J Med Entomol* 37:435-438.

Fritz DL, P Vogel, DR Brown, D DeShazer, DM Waag. 2000. Mouse model of sublethal and lethal intraperitoneal glanders (*Burkholderia mallei*). *Vet Pathol* 37:626-636.

Geisbert TW, LE Hensley, TR Gibb, KE Steele, NK Jaax, PB Jahrling. 2000. Apoptosis induced in vitro and in vivo during infection by Ebola and Marburg viruses. *Lab Invest* 80:171-186.

- Gilligan K, M Shipley, B Stiles, TL Hadfield, MS Ibrahim.** 2000. Identification of *Staphylococcus aureus* enterotoxins A and B genes by PCR-ELISA. *Molec Cell Probes* 14:71-78.
- Hail AS, CA Rossi, GV Ludwig, BE Ivins, RF Tammariello, EA Henchal.** 1999. Comparison of noninvasive sampling sites for early detection of *Bacillus anthracis* spores from rhesus monkeys after aerosol exposure. *Milit Med* 164:833-837.
- Hawley RJ, PR Pittman, JA Nerges.** 2000. Maximum containment for researchers exposed to biosafety level 4 agents, pp 35-53, Chap 3. *In* JY Richmond (ed), *Anthology of Biosafety: II. Facility Design Considerations*. Publication Committee of the American Biological Safety Association, Mundelein, IL.
- Henchal EA, MS Ibrahim.** 2000. Evaluation of polymerase chain reaction assays for identifying biological agents pp 239-249. *In* PJ Stopa, MA Bartoszcze, ed, *Rapid Methods for Analysis of Biological Materials in the Environment*, Kluwer Academic Publishers, Amsterdam, The Netherlands.
- Henchal EA, J Teska, JW Ezzell.** 2000. Bioterrorism response: a role for the clinical laboratory. *Clin Lab News* 26:14-18.
- Higgins JS, MS Ibrahim, FK Knauert, GV Ludwig, TM Kijek, JW Ezzell, BC Courtney EA Henchal.** 2000. Sensitive and rapid identification of biological threat agents. *NY Acad Sci* 894:130-148.
- Hooper JW, DM Custer, CS Schmaljohn, AL Schmaljohn.** 2000. DNA vaccination with vaccinia virus L1R and A33R genes protects mice against a lethal poxvirus challenge. *Virology* 266:329-339.
- Jahrling PB, GM Zaucha, JW Huggins.** 2000. Countermeasures to the reemergence of smallpox virus as a agent of bioterrorism, pp 187-200. *In* WM Scheld, WA Craig, JM Hughes, *Emerging Infections 2000*, ASM Press, Washington DC.
- Kijek TM, CA Rossi, D Moss, RW Parker, EA Henchal.** 2000. Rapid and sensitive immunomagnetic electrochemiluminescent detection of staphylococcal enterotoxin B. *J Immunol Meth* 236:9-17.
- Kortepeter MG, JA Pavlin, JC Gaydos, JR Rowe, PW Kelley, G Ludwig, KT Mckee, EM Eitzen.** 2000. Surveillance at US military installations for bioterrorist and emerging infectious disease threats. *Milit Med* 165:ii-iii.
- Krakauer T.** 2000. Coordinate suppression of superantigen-induced cytokine production and T-cell proliferation by a small non-peptidic inhibitor of class II major histocompatibility complex and CD4 interaction. *Antimicrob Agents Chemother* 44:1067-1069.

Ludwig GV 2000. Role of the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) as a component of the military public health laboratory system: a historical perspective (Abstract No. 7). *Milit Med* 165(suppl 2):71.

Macintyre AG, GW Christopher, E Eitzen Jr, R Gum, S Weir, C DeAtley, K Tonat, JA Barbera. 2000. Weapons of mass destruction events with contaminated casualties. Effective planning for health care facilities. *JAMA* 283:242-249.

Martinez MJ, MP Bray, JW Huggins. 2000. A mouse model of aerosol-transmitted orthopoxviral disease. *Arch Pathol Lab Med* 124:362-377.

McClain DJ, P Summers, S Harrison, AL Schmaljohn, CS Schmaljohn. 2000. Clinical evaluation of a vaccinia-vectored Hantaan virus vaccine. *J Med Virol* 60:77-85.

Meyer BC, C Schmaljohn. 2000. Accumulation of terminally deleted RNAs may play a role in Seoul virus persistence. *J Virol* 74:1321-1331.

Meyer BC, C Schmaljohn. 2000. Persistent hantavirus infections: characteristics and mechanisms. *Trends Microbiol* 8:61-67.

Montgomery VA, RS Makuch, JE Brown, DC Hack. 2000. The immunogenicity in humans of a botulinum type f vaccine. *Vaccine* 18:728-735.

Pittman PR, JA Mangiafico, CA Rossi, TL Cannon, PH Gibbs, GW Parker, AM Friedlander. 2000. Anthrax vaccine: increasing intervals between the first two doses enhances antibody responses in humans. *Vaccine* 19: 213-6.

Poli MA, SM Musser, RW Dickey, PP Eilers, S Hall. 2000. Neurotoxic shellfish poisoning and brevetoxin metabolites: a case study from Florida. *Toxicon* 38:981-993.

Sheets JT, CA Rossi, BJ Kearney, GE Moore. 1999. Evaluation of a commercial enzyme-linked immunosorbent assay (ELISA) for detection of *Borrelia burgdorferi* exposure in dogs. *J Am Vet Med Asso* 216:1418-1422.

Stiles BG, ML Hale, J-C Marvaud, MR Popoff. 2000. *Clostridium perfringens* iota toxin: binding studies and characterization of cell surface receptor by fluorescence-activated cytometry. *Infect Immun* 68:3475-3484..

Tardei G, S Ruta, V Chitu, CA Rossi, TF Tsai C Cernescu. 2000. Evaluation of immunoglobulin M (IgM) and IgG enzyme immunoassays in serologic diagnosis of West Nile virus infection. *J Clin Microbiol* 38:2232-2239.

Turell MJ, JW Jones, MR Sardelis, DJ Dohm, RE Coleman, DM Watts, R Fernandez, C Calampa, TA Klein. 2000. Vector competence of Peruvian mosquitoes (Diptera: Culicidae) for epizootic and enzootic strains of Venezuelan equine encephalomyelitis virus. *J Med Entomol* 37:835-839.

Turell MJ, M O'Guinn, J Oliver. 2000. Potential for New York mosquitoes to transmit West Nile virus. *Am J Trop Med Hyg* 62:413-414.

Ulrich RG. 2000. Evolving superantigens of *Staphylococcus aureus*. *FEMS Immunol Med Microbiol* 27:1-7.

Vaughn JA, M Trpis, MJ Turell. 1999. *Brugia malayi* microfilariae (Nematoda:Filaridae) enhance the infectivity of Venezuelan equine encephalitis virus to *Aedes* mosquitoes (Diptera:Culicidae). *J Med Entomol* 36:758-763.

Vlach KD, BG Stiles, JW Boles. 2000. Telemetric evaluation of temperature and physical activity as predictors of impending mortality in a murine model of staphylococcal enterotoxic shock. *Comp Med* 50:160-166.

Wilson JA, M Hevey, R Bakken, S Guest, M Bray, AL Schmaljohn, MK Hart. 2000. Epitopes involved in antibody-mediated protection from Ebola virus. *Science* 287:1664-1666.

Wu SJ, H Paxton, B Hanson, CG Kung, TB Chen, C Rossi, DW Vaughn, GS Murphy, CG Hayes. 2000. Comparison of two rapid diagnostic assays for Detection of Immunoglobulin M antibodies to dengue virus. *Clin Diag Lab Immunol* 7:66-110.

Yashina LN, NA Patrushev, LI Ivanov, RA Slonova, VP Mishin, GG Kompanezev, NI Zdanovskaya, II Kuzina, PF Safonov, VE Chizhikov, C Schmaljohn, SV Netesov. 2000. Genetic diversity of hantaviruses associated with hemorrhagic fever with renal syndrome in the far east of Russia. *Virus Res* 70:31-44.

Abstracts:

Amemiya K, D Waag. 2000. Characterization of the cellular immune response to *Burkholderia mallei* in BALB/c mice used in the development of a vaccine candidate against glanders infection. Submitted for presentation at the 100th Annual Meeting of the American Society for Microbiology, Los Angeles, May.

Andrews G, J Adamovicz, C Bolt, H Heine, S Welkos, S Tobery, L Pitt, T Chanh, WR Byrne. 2000. Antibody to the F1-v plague vaccine candidate passively protects mice against lethal parenteral challenge by *Yersinia pestis*. Submitted for presentation at the 100th Annual Meeting of the American Society for Microbiology, Los Angeles, May.

Boles JW, MW West, VA Montgomery, RF Tammariello, LA Smith, LM Pitt. 2000. Efficacy of recombinant C fragment of heavy chain botulinum neurotoxin serotype B against lethal aerosol challenge of botulinum B in rhesus monkeys. Submitted for presentation at the Annual Meeting of the Society of Toxicology, March.

Bray M, J Huggins. 2000. Studies of the pathogenesis of filovirus infection using a mouse-adapted variant of Ebola Zaire virus. Submitted for presentation at the Symposium on Marburg and Ebola viruses, Institute fur Virologie, Marburg, Germany, October.

Bray M, P Jahrling, J Huggins. 2000. Experimental therapy of Ebola virus infection. Submitted for presentation at the 2000 keystone Symposia: Biological Threats and Emerging Diseases, Breckenridge, CO, April.

Byrne WR, HS Heine, DM Waag. 2000. Antibiotic treatment of inhaled *Burkholderia mallei* (glanders) in mice. Submitted for presentation at the International Scientific Workshop entitled "Problems of Biological and Radiological Safety", dedicated the 5th Anniversary of SRCAM-ISTC Co-operation, Oblensk, Moscow, Russia, May.

Christensen DR, MS Frye, SB Kerby, LJ Hartman, TR Gibb, EA Henschal, DA Norwood. 2000. Design and optimization of fluorogenic 5'nuclease assays for *Bacillus anthracis* and *Yersinia pestis*. Submitted for presentation at the Joint Conference on Point Detection for Chemical and Biological Defense, Williamsburg, VA, October.

Christopher GW. 2000. Medical aspects of a biological attack. Submitted for presentation at the Annual Meeting of the of the American Association for the Advancement of Science (AAAS): Innovation Exposition 2000, Washington DC, February. To be published in the AAAS 2000 Program Book.

Cieslak TJ. 2000. Medical consequences of biological warfare: the ten commandments of management. Submitted for presentation at the meeting on Psychological Casualties from Weapons of Mass Destruction, Bethesda, MD, July.

Cieslak TJ, GW Christopher, EM Eitzen. 1999. The "Slammer": isolation and biocontainment of patients exposed to biosafety level 4 (BL-4) pathogens. Submitted for presentation at the Annual Meeting of the Infectious Disease Society of America, Philadelphia, November.

Clayton M, J Crouch, J Hochman. 2000. GLPs: the legend, the myth, the reality. Submitted for presentation to the 4th Annual Fort Detrick/NCI-FCRDC Spring Research Festival, Frederick, MD, May.

Coyne SR, PD Craw, JD Teska, JW Ezzell, EA Henschal, FK Knauert. 2000. A procedure for preparing PCR-amplifiable DNA from *Bacillus anthracis* spores in soil samples. Submitted for presentation at the First Joint Conference on Point Detection for Chemical and Biological Defense, Williamsburg, VA, October.

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SECTION VII

RESEARCH ACCOMPLISHMENTS

Introduction

As the Department of Defense's lead laboratory for medical aspects of biological warfare (BW) defense, the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID), under the U.S. Army Medical Research and Materiel Command, develops vaccines, diagnostics, and therapeutics for laboratory and field use. This program focuses on biological agents that have been identified by the warfighter and intelligence communities as validated BW threats. USAMRIID also provides a critical capability to the Army's infectious disease research program as the only DoD laboratory equipped to study highly hazardous viruses that require maximum containment at Biosafety Level 4 (BSL-4).

In addition to medical countermeasures, information is a key "product" of USAMRIID research. The Institute plays a steadily increasing role in the interagency counterterrorism effort, providing reference laboratory capabilities and specialized medical and scientific consultation on bioterrorism issues around the United States. In addition, USAMRIID is the sole provider of DoD professional training in the medical management of biological casualties.

While the Institute's primary focus is on protecting military service members, its research programs have applications that benefit society as a whole. USAMRIID investigators actively contribute to advances in scientific knowledge and collaborate with the Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), the National Academy of Sciences, and academic centers of excellence worldwide.

The following narrative is summary in nature, and the accomplishments described are merely highlights of the Institute's numerous scientific achievements for the year.

Bacteriology

Anthrax vaccine efforts are one of the highest DoD priorities in biowarfare defense. Efforts are aimed at developing a new vaccine as well as improving the dosage schedule of the current licensed product. The Institute published data and had previously briefed the FDA on results of a clinical study suggesting that the second dose (at 2 weeks) of the current licensed vaccine immunization schedule could be eliminated without affecting the immune response as measured at the 24-week point. The CDC has been given the mission to conduct a much larger pivotal immunogenicity study that will employ USAMRIID personnel to assist in one of the five clinical trials locations, as well as to provide consultative support.

USAMRIID's next generation of anthrax vaccine completed manufacture this past year and will soon be bottled for human use in Phase I safety trials. This USAMRIID-developed vaccine candidate has substantial advantages over the currently licensed product, including a safer manufacturing process and a more highly characterized product that is simply a purified

protective antigen (PA) from *Bacillus anthracis*, derived from a recombinant protein expression system.

This program is a model of cooperation between federal agencies, with the National Institute of Allergy and Infectious Diseases (NIAID) underwriting some of the manufacturing costs and planning to conduct the human clinical trials. The DoD's prime systems contractor for biological defense products, Dynport, LLP, will become the sponsor and license holder for this vaccine, which has been shown to be highly effective for prevention of disease following inhalation challenge in vaccinated rabbits and nonhuman primates.

This effort was nominated as a Defense Technology Objective (DTO) in FY00 and completion of all science and technology efforts is expected at the end of FY01. USAMRIID has completed a number of critical studies to move this product to advanced development.

USAMRIID experts continued to provide extensive support to the Anthrax Vaccine Immunization Program (AVIP) and to the Joint Program Office for Biological Defense (JPO-BD) to further scientifically elucidate and demonstrate the safety profile and immunogenicity of the current licensed anthrax vaccine. Institute scientists consulted regularly on questions relating to anthrax and the animal studies conducted at USAMRIID. Others assisted in developing the critical potency test procedures to permit eventual re-licensure of anthrax vaccine from the newly refurbished manufacturer, BioPort Corporation.

Virology

Venezuelan equine encephalitis virus, strain IA/B, has caused significant natural outbreaks in humans and horses in South and Central America, and is also known to be a biological threat agent. An existing vaccine, TC-83, is highly reactogenic, poorly characterized and must be produced under biological containment conditions. USAMRIID's new VEE vaccine candidate is based on an infectious clone strategy where the entire genome of the RNA virus is reverse transcribed and cloned into a DNA vector. Attenuating mutations inserted in the clone were tested for a range of properties in several animal models and the most desirable mutations selected to produce a highly characterized and reproducible vaccine candidate. The vaccine has been produced and evaluated in mice, hamsters and monkeys, and demonstrated to be safe, well-characterized and highly protective. Approval of this product for continued development was obtained at a Milestone I review in 1999.

Hantaviruses are pathogens of known military importance. USAMRIID is continuing efforts to develop vaccines that protect against six of these viruses, including four hantaviruses that cause hemorrhagic fever with renal syndrome (HFRS), and two that cause a highly lethal cardio-pulmonary disease known as hantavirus pulmonary syndrome (HPS). Hantaviruses are carried by rodents and have caused epidemics in Europe, Asia, and the Americas. Korean hemorrhagic fever, a disease caused by one of the hantaviruses, was responsible for over 3,000 cases of illness and death in U.S. troops during the Korean conflict. USAMRIID's focus is on developing hantavirus vaccines using a naked DNA approach, which involves vaccination with plasmid DNA that encodes a specific hantavirus gene. When the plasmid DNA is introduced into the cells of a vaccine recipient, using a device called a "gene gun," the cloned gene is expressed and presented to the immune system. During 2000, USAMRIID instituted a plan to complete the product development of these vaccine candidates and to secure an advanced development path to licensure. Scale-up manufacture and Phase I clinical trials are expected to begin in FY01 and continue through FY02.

Smallpox has been eradicated as a naturally occurring disease, but the smallpox virus is a major concern as an agent of BW or terrorism. The current smallpox vaccine is no longer being manufactured and existing quantities are limited. To protect against this threat, USAMRIID developed a replacement smallpox vaccine that is derived from the old vaccine but is made with more modern cell culture techniques and is more highly purified. The Institute has conducted clinical trials in conjunction with JVAP that compare the immune response induced by the new vaccine with that induced by the old vaccine. In other smallpox research, Institute scientists have been evaluating a number of drugs for antiviral efficacy against smallpox and have identified several promising compounds. All work with infectious variola is performed at the CDC.

Toxinology

Botulinum neurotoxin, the most toxic biological substance known, is the same toxin that causes food-borne botulism. In an aerosol form, the likely route of exposure in a biological attack, as little as 72 nanograms would cause muscular paralysis, breathing disturbances and death. The existing vaccine is an Investigational New Drug (IND) product that protects against five of the seven serotypes of botulinum toxin (designated A-G). However, it is a toxoid vaccine, which entails growing very large quantities of the hazardous bacterium, *Clostridium botulinum*, to produce the toxin, and then inactivating the material with formalin.

The next generation botulinum product developed by USAMRIID is derived from a recombinant cell binding domain of the toxin, devoid of the enzymatically active part of the holotoxin. This non-toxic protein fragment is expressed in a safe host system such as yeast. The purified vaccine product is highly protective, much better characterized, and can be produced without growing *C. botulinum* or working with the active neurotoxin at all. Recombinant proteins are now available for botulinum serotypes A, B, C, and F.

In September 1999, USAMRIID had a successful Milestone I review and transitioned the four recombinant botulinum toxin vaccine candidates to the JVAP. USAMRIID has already presented documentation to the FDA that included a manufacturing process, a validated potency assay, safety studies in animals, and demonstration of efficacy in nonhuman primates against aerosol challenge with botulinum toxin. USAMRIID also has provided critical input to the vaccine manufacturer for this product, Covance, Inc., identifying processes to use for improving scale-up manufacture and purification.

USAMRIID demonstrated proof of concept for complementary pre-treatment and treatment approaches to botulinum toxin therapy. *Pre-treatments* are chemotherapies that inhibit catalytic activity of the toxin protease domain, or act as selective antagonists of toxin receptor binding and endocytosis. These compounds effectively block the active site of the toxin so it would be rendered harmless even if internalized. *Treatments* attempt to restore the function of intoxicated cholinergic neurons, thereby "rescuing" the cell. The treatment approach includes transporters linked to selective anti-toxins for delivery of therapeutic modalities into cholinergic nerves, and/or replacement of cleaved target proteins with toxin-resistant proteins using emerging protein/DNA technologies. The next phase is animal testing.

Diagnostic Systems

Diagnostics are a critical part of USAMRIID's mission. In addition to vaccines and therapeutics, the Institute develops diagnostic assays for biological threat agents and infectious diseases. The ability to diagnose infection immediately after exposure is critical to determining appropriate treatments and may be important in establishing proof of biological weapons use. The Institute's Diagnostic Systems Division (DSD) continued to develop state-of-the-art technologies and critical reagents, protocols, and devices to support rapid and confirmatory identification of biological warfare and endemic disease threat agents in clinical specimens. Over 50 assays have been developed and optimized during the past several years for 26 different biological threats that may confront our warfighters.

USAMRIID collaboration with industry, other government agencies and academia has resulted in the demonstration of third generation portable, battery-powered devices capable of independent programmable gene amplification that can detect biological warfare (BW) agent nucleic acids in less than 40 minutes after sample processing in a field deployable laboratory. Rapid specimen processing of whole blood has been demonstrated in less than 30 minutes using a portable automated device. These findings suggest that transition to advanced development of a portable device capable of detecting and identifying nucleic acids from a broad range of infectious diseases and BW agents in clinical specimens can be accomplished.

DSD also continued efforts to identify and evaluate automated systems for bacterial agent identification and to evaluate improved methods of specimen processing. For example, scientists successfully tested commercial "off the shelf" technology that can break down *Bacillus anthracis* spores in 15 seconds, compared to one hour using standard methods. In other work, DSD demonstrated automated sample preparation methods for the rapid analysis of nucleic acid gene targets that allows a threefold increase in throughput during a 24-hour period.

Reagent and device development form only some of the important elements of a medical diagnostic assay capability. In FY00, for example, USAMRIID demonstrated that the most important noninvasive sample after exposure to VEE was swab sampling of the throat. Swab samples were more effective than any other sampling method and provide a rapid means of surveying troops and civilian populations after exposure to biological threats.

Multiagent Vaccine Development

Combined multiagent vaccines are a potential answer to the challenges posed by developing and administering multiple biological defense vaccines that are specific to a single threat agent. Currently there are 16 BW vaccines in development. USAMRIID has initiated an effort to develop multiagent vaccine(s) that are analogous to commercial combined vaccines such as Diphtheria, Pertussis and Tetanus (DPT) or Measles, Mumps and Rubella (MMR). This effort would reduce the requirement for the number of stockpiled vaccines, and could lead to fewer injections for service members, simpler immunization schedules, reduced logistical burden, easing of time constraints required to field a protected force, decreased production costs, and regulatory streamlining of such vaccines.

USAMRIID is evaluating two multiagent platforms for vaccine(s) development. The first is naked DNA in a gene gun in which the gene(s) of interest is encoded into DNA, as described above for hantaviruses. The second approach is the Venezuelan equine encephalitis virus replicon system. In this system pioneered by USAMRIID, the infectious cDNA gene from VEE

is cloned and inserted into a replicon construct so that its structural genes (nucleocapsid and glycoprotein) are replaced with a different gene of interest for immunization purposes, such as anthrax PA. The new construct of VEE non-structural genes combined to this new gene can be packaged into particles that look exactly like VEE virus by co-infecting cells with RNA fragments that produce the structural components of the VEE virus. This allows assembly of new particles, or replicons, that cannot replicate viable virus, but can express the new immunogen, such as PA. To date, proof of concept has been demonstrated in recombinant replicons of a broad range of viruses, toxins and bacterial agents.

Educational Initiatives

The Satellite Distance Learning Course for Medical Management of Biological Casualties is an award winning, one-of-a-kind program that was pioneered by USAMRIID in 1997. Over the past four years, USAMRIID's Operational Medicine Division (OMD) has continued to take the lead in training military and civilian healthcare providers to recognize and treat biological casualties. The demand is steadily increasing among civilian healthcare providers concerned about bioterrorism. USAMRIID's 2000 satellite broadcast, "Biological Warfare and Terrorism: The Military and Public Health Response," trained more than 13,500 healthcare professionals at over 700 downlink sites, both domestic and overseas, for a total of over 56,000 personnel trained over the four years of the program.

The fully accredited program, which was funded by the U.S. Army Office of the Surgeon General and co-sponsored by the CDC, featured instructors from USAMRIID, CDC, and the public health community. Attendees included medical care providers in DoD (Army, Air Force, Navy, and Marine Corps), the Public Health Service, Department of Veterans Affairs, Environmental Protection Agency, Department of Health and Human Services, U.S. Department of Agriculture, search and rescue teams, medical centers, universities, and colleges. The program reached personnel in nine other countries (Canada, Australia, Greece, Saudi Arabia, Italy, Iceland, Guam, Japan, and Germany).

This live interactive educational experience provided information needed to prevent, diagnose, and treat biological casualties in both military warfare and civilian bioterrorism scenarios at a program cost of \$4.29 per continuing medical education (CME) credit hour, compared to classroom teaching methods with a cost per student of approximately \$1,000.

Counterterrorism Support

Both the Diagnostic Systems Division and the Operational Medicine Division provided increased support to the interagency counterterrorism effort throughout 2000. DSD provided round the clock coverage to evaluate environmental samples for possible indicators of biological terrorism collected during the Republic and Democratic National Conventions as well as the Presidential Inauguration.

DSD's Special Pathogens Sample Test Laboratory analyzed several hundred samples in support of counterterrorism and counterproliferation efforts. Customers included DoD, federal law enforcement agencies and the intelligence community. Many of the samples were from letters that purportedly contained anthrax, but each sample had to be logged in and handled carefully to maintain chain of custody. The number of these samples has more than doubled each year since 1996. USAMRIID has developed Memoranda of Understanding with the

Federal Bureau of Investigation, the Centers for Disease Control and Prevention, and the Secret Service for this type of support. The Institute also supported counterterrorism efforts by initiating a program to provide critical diagnostic reagents to state public health laboratories.

In addition to serving as the Department of Defense reference laboratory for biological threat agents and endemic infectious diseases, the Institute lent its diagnostic expertise to evaluating specimens received from Federal agencies investigating a number of potential biological terrorism incidents. Fortunately, all have been hoaxes to date. The Diagnostic Systems Division took the lead for the development of Joint Medical Diagnostic Systems, which combine and integrate medical diagnostic developments in Army, Navy and USAF laboratories.

USAMRIID also provided medical consultation for interagency work groups developing government-wide plans for dealing with bioterrorism.

Clinical Trials

USAMRIID developed or assisted in the development of several clinical trials for anthrax-related vaccination programs. Human use protocols have been developed for studies to evaluate the immune response to the anthrax vaccine once the full-fledged vaccination program is re-initiated by the DoD.

In addition, USAMRIID supports an ongoing clinical trial for the use of the antiviral drug Ribavirin to treat certain viral hemorrhagic fevers in locations worldwide. Consultation and treatment were provided to sick service members in Korea where the drug has been required for a number of years. More recently, it was used to treat several soldiers in Bosnia.

Product Development and Regulatory Affairs

USAMRIID's Office of Product Development and Regulatory Affairs (OPDRA) provided regulatory support to USAMRIID as a whole, and the Special Immunizations Program in particular. The Quality Assurance unit within OPDRA is responsible for auditing clinical trials, non-clinical safety studies, and contract manufacturing processes. OPDRA prepares and/or reviews regulatory documents to include protocols, final reports, drug master files, standard operating procedures, study specific procedures, and milestone packages, as well as read-ahead packages for the U.S. Food and Drug Administration (FDA). OPDRA also provides training in Good Laboratory Practices (GLP), Good Manufacturing Practices (GMP), and Good Clinical Practices (GCP), as well as training on specific topics such as assay validation.

To cater to the growing need for regulatory compliance expertise in the Frederick-Washington-Baltimore area, USAMRIID scientists and Hood College established a new master's degree program in the Biomedical Sciences Department with a concentration in Regulatory Compliance, as well as a certificate program in Regulatory Compliance. Coursework includes instruction in Good Laboratory Practices (GLP), Good Clinical Practices (GCP), and Product Development. USAMRIID experts teach three of the five new courses.

Support to the Field

USAMRIID's Diagnostic Systems Division developed an augmentation package of integrated diagnostic technologies for handoff to the 520th Theater Army Medical Laboratory (TAML). Division personnel train the TAML soldiers assigned to USAMRIID in the latest diagnostic approaches, and as each assay matures, technologies are transferred to the TAML for

testing and evaluation in the field. In addition, USAMRIID provides PROFIS officers to the TAML.

In 2000, USAMRIID continued to be a highly requested resource supporting the warfighters in Southwest Asia. USAMRIID personnel deployed on numerous missions to Bahrain and Kuwait to provide biodefense training to U.S. military personnel, as well as to allied medical providers in the host nations. USAMRIID provided critical proficiency testing and reach back capability to medical surveillance laboratories in CENTCOM. This important function maintains CENTCOM readiness to respond to biological threats. The CENTCOM Commander in Chief (CINC) has personally noted these efforts and requested USAMRIID's continued support.

In addition to the CINC, assistance was provided to both the Kingdom of Saudi Arabia and Yemen through CENTCOM and State Department coordination in the form of vaccines to help contain the first-ever outbreak of Rift Valley fever in humans and animals outside of the African continent.

In the PACOM theater, USAMRIID was chosen to train and support the establishment of an enhanced laboratory capability at Osan, Korea, for the identification of biological threats. The Institute was chosen for its expertise and successful fielding of diagnostic approaches. As with CENTCOM, USAMRIID provides critical proficiency testing and reach back capability to medical surveillance laboratories on the peninsula.

Annual Historical Report - AMEDD Activities, CY 2000
U.S. Army Medical Research Institute of Infectious Diseases
Fort Detrick, Frederick, Maryland 21702-5011

SECTION VIII

PROBLEM AREAS

Military Personnel:

We are continuously under strength in qualified 91KP9 enlisted personnel. A top priority this year and the next is to train our 91B and 91C soldiers to transition to the 91W MOS. SIDPERS III has problems at the unit level with major difficulties in fixing data entries. The inaccurate data in SIDPERS III impacts negatively at our level and throughout the system.

Civilian Personnel:

There are some worries from civilians about the Laboratory Personnel Demonstration Project, but they are adapting to this system and the complaints are fewer. The use of contractors to supplement the workforce has increased and there is a negative morale impact due to inequitable salaries. Contractors are paid more due to market value than their government civilian counterparts for the same duties. In recruiting qualified government civilians, we continue to use Contingent or Term hiring instead of permanent appointment procedures for the majority of our personnel actions.

U.S. ARMY MEDICAL RESEARCH INSTITUTE OF INFECTIOUS DISEASES
MANPOWER AUTHORIZATIONS AND ASSIGNED STRENGTH
AS OF 31 DECEMBER 2000

ACTIVITY	OFFICERS		ENLISTED CADRE		MRVS		CIVILIANS			TOTAL	
	AUTH	ASSIGNED	AUTH	ASSIGNED	AUTH	ASSIGNED	AUTH	FTP**	TPT	AUTH	ASSIGNED
HQS	7	6	7	6			28	43	1	42	56
LOG DIV	1*	1*	7	7			26	28	1	34	37
VM DIV	8	9	15	12			13	20		36	41
BIMD	1	0	3	0			5	2		9	2
BACT DIV	6	6	11	7			22	24		39	37
DSD	6	8	14	10			17	22	1	37	41
MED DIV	8	5	11	14			4	8		23	27
PATH DIV	7	8	7	5			9	12		23	25
TOXIN DIV	6	5	22	15			36	39		64	59
VIR DIV	5	5	16	11			33	36		54	52
MRVS										73	65
TOTAL	55	53	113	87	73	65	193	234	3	434	442

*1 WO

**Includes 62 Term Employees: HQ -11 Log -4 Vet Med -4 Bact -7 DSD -8 Med -2 Path -4 Tox -11 Vir -11