

REPORT DOCUMENTATION PAGE			<i>Form Approved OMB No. 0704-0188</i>	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.				
1. REPORT DATE (DD-MM-YYYY) 03-25-2021		2. REPORT TYPE Technical Report		3. DATES COVERED (From - To) 2007-01 - 2020-12-31
4. TITLE AND SUBTITLE COVID-19: A Selected Bibliography.			5a. CONTRACT NUMBER	
			5b. GRANT NUMBER	
			5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Fairchild, Christina L.			5d. PROJECT NUMBER	
			5e. TASK NUMBER	
			5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Defense Technical Information Center, 8725 John J. Kingman Road, Fort Belvoir, Virginia 22060-6218			8. PERFORMING ORGANIZATION REPORT DTIC-TR-2021-01	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Defense Technical Information Center, 8725 John J. Kingman Road, Fort Belvoir, Virginia 22060-6218			10. SPONSOR/MONITOR'S ACRONYM(S)	
			11. SPONSOR/MONITOR'S REPORT NUMBER(S) DTIC-TR-2021-01	
12. DISTRIBUTION / AVAILABILITY STATEMENT DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.				
SUPPLEMENTARY NOTES				
14. ABSTRACT This is a selected bibliography on the topic of COVID-19. This bibliography includes topics such as COVID-19 case studies, vaccines, studies on SARS-CoV-2, personal protective equipment, drugs to treat COVID-19, and more.				
15. SUBJECT TERMS: SARS-CoV-2, Coronavirus, COVID-19, Pandemic, Health Services, Medical Personnel, Antiviral Agents, Disease Outbreaks, Cardiovascular System, Hygiene, Viruses, Military Medicine, Quarantine, Airway Management, Interferon, Patient Care, Microbial Genome, Personal Protective Equipment, Vaccines, Contagion.				
16. SECURITY CLASSIFICATION OF: Unclassified			17. LIMITATION OF ABSTRACT SAR	18. NUMBER OF PAGES 80
a. REPORT U	b. ABSTRACT U	c. THIS PAGE U		
			19b. TELEPHONE NUMBER (include area code) 571-448-9799	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

COVID-19: A Selected Bibliography



DTIC-TR-2021-01

Distribution Statement A

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DoD Funded Research related to SARS-CoV-2

Since the beginning of the spread of SARS-CoV-2, which causes COVID-19, the U.S. Government began to research how to stop the spread, treat patients, and develop a vaccine. This bibliography includes Department of Defense funded reports related to COVID-19. Topics include decontamination, personal protective equipment, vaccines, pandemic response, treating patients, testing, and convalescent plasma, among others.

These reports are available on www.discover.dtic.mil.

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Care of Patients

Case Studies and Other Coronavirus Patient Care

Seizure Control, Stress, and Access to Care During the COVID-19 Pandemic in New York City: The Patient Perspective		
Accession Number:	Report Date:	Access Restrictions:
AD1116642	11/30/2020	Approved for Public Release.
Author:	Rosengard, Jillian L., Donato, Jad, Ferastraoar, Victor, Zhao, Dan, Molinero, Isaac, Boro, Alexis, Gursky, Jonathan, Correa, Daniel J, Galanopoulou, Aristeia S, Hung, Christine, Legatt, Alan D, Patel, Puja, Rubens, Elayna, Moshe, Solomon L, Haut, Sheryl	
Corporate Author:	Albert Einstein College Of Medicine Of (Yeshiva Univ) Bronx NY	
Descriptors:	Disease Outbreaks, Health Care, Infection, Neurologic Manifestations, Neurology, Quarantine, African Americans, Health, Diseases And Disorders, New York, Public Health, Therapy, Epilepsy, Physicians, Pain, Health Services, Medical Personnel	

Elevated Nosocomial Infection Rates in Patients with COVID-19 Requiring Extracorporeal Membrane Oxygenation		
Accession Number:	Report Date:	Access Restrictions:
AD1116335	11/30/2020	Approved for Public Release.
Author:	Marcus, Joseph E., Sams, Valerie G., Barsoumian, Alice E.	
Corporate Author:	JBSA-Ft. Sam Houston San Antonio, Texas	
Descriptors:	Patient Care, Infectious Diseases, Disease Outbreaks, Hospitalizations, Military Medicine, Influenza	
Identifiers:	Nosocomial Infections, Extracorporeal Membrane Oxygenation, In Hospital Outbreaks	
A retrospective cohort compared nosocomial infections for patients receiving extracorporeal membrane oxygenation (ECMO) for influenza or COVID-19. COVID-19 was associated with more infections per 1000 patient days (37.3 vs. 17.7, p=0.04) and infections earlier in patients ECMO course (median [IQR] 5 days (3-7) vs. 16 (10-21), p=0.03) compared to influenza.		

Gut Microbiota-targeted Interventions for Reducing the Incidence, Duration, and Severity of Respiratory Tract Infections in Healthy Non-elderly Adults		
Accession Number:	Report Date:	Access Restrictions:
AD1114650	11/2/2020	Approved for Public Release.
Author:	Karl, J. P.	
Corporate Author:	Army Research Institute Of Environmental Medicine Natick, MA	
Descriptors:	Respiratory Tract Diseases, Health Services, Dietary Supplements, Vaccines, Military Medicine	
Respiratory tract infections (RTI), such as those caused by influenza viruses and, more recently, the severe acute respiratory syndrome coronavirus-2, pose a significant burden to military health care		

systems and force readiness. The gut microbiota influences immune function, is malleable, and may provide a target for interventions aiming to reduce RTI burden. This narrative review summarizes existing evidence regarding the effectiveness of probiotics, prebiotics, and synbiotics, all of which are gut microbiota-targeted interventions, for reducing the burden of RTI in military-relevant populations (i.e., healthy non-elderly adults).

Point-of-Care Ultrasound for Intubation Confirmation of COVID-19 Patients		
Accession Number:	Report Date:	Access Restrictions:
AD1110351	2020-10-02	Approved for Public Release.
Author:	Gottlieb, Michael; Alerhand, Stephen; Long, Brit.	
Corporate Author:	Rush University Medical Center, Chicago, IL.	
Descriptors:	Intubation, Ultrasounds, Infection Control, Personal Protective Equipment (PPE), Emergency Medicine, Point of Care Diagnostic Testing, Patient Care, Airway Management, Morbidity	
<p>The novel coronavirus disease of 2019 (COVID-19) is associated with significant morbidity and mortality, as well as large numbers of patients requiring endotracheal intubation. While much of the literature has focused on the intubation technique, there is scant discussion of intubation confirmation. Herein, we discuss the limitations of traditional confirmatory approaches, summarize the literature supporting a role for point-of-care ultrasound in this application, and propose an algorithm for intubation confirmation among COVID-19 patients.</p>		

Nebulized in-Line Endotracheal Dornase Alfa and Albuterol Administered to Mechanically Ventilated COVID-19 Patients: A Case Series		
Accession Number:	Report Date:	Access Restrictions:
AD1110995	9/29/2020	Approved for Public Release.
Author:	Weber, Andrew G.; Chau, Alice S.; Egeblad, Mikala; Barnes, Betsy J.; Janowitz, Tobias	
Corporate Author:	North Shore Hospital Manhasset, NY	
Descriptors:	Health Services, Lung Diseases , Airway Management, Therapy, Hospitals, Patient Care	
<p>Mechanically ventilated patients with COVID-19 have a mortality of 2453%, in part due to distal mucopurulent secretions interfering with ventilation. DNA from neutrophil extracellular traps (NETs) contribute to the viscosity of mucopurulent secretions and NETs are found in the serum of COVID-19 patients. Dornase alfa is recombinant human DNase 1 and is used to digest DNA in mucoid sputum.</p>		

Here, we report a single-center case series where dornase alfa was co-administered with albuterol through an in-line nebulizer system.

Case Report: COVID-19 Patient With Chief Complaint of Anosmia and Ageusia; a Unique Perspective on Atypical Symptomatology and Management in the Military		
Accession Number:	Report Date:	Access Restrictions:
AD1106680	08-25-2020	Approved for Public Release.
Author:	Smith, Alicia C.; Hodges, James; Pratt, Molly; Porter, Ian M.	
Corporate Author:	Navy Medicine Readiness and Training Unit, Department of Aviation Medicine Jacksonville United States	
Descriptors:	Therapy, Respiratory Tract Diseases, Health Services, Public Health, Signs and Symptoms, Smell, Taste	
Identifiers:	Anosmia, Ageusia, Loss of Smell, Loss of Taste, High Risk Activities	
<p>A novel corona virus, severe acute respiratory syndrome coronavirus-2, found in Wuhan, China in December 2019 has since spread to multiple continents and has been implicated in thousands of deaths. This pandemic-causing virus has been initially described (corona virus disease 2019 [COVID-19]) with the presentation of fever, cough, and shortness of breath. The majority of studies published have been conducted on inpatient cases and a shortage of tests has encouraged screening only of patients with classic presentation. A positive COVID-19 case of a healthy military male, with the chief complaint of anosmia and ageusia, instigated local re-evaluation of the screening protocol for possible COVID-19 patients. Multiple studies in Europe have implicated anosmia and ageusia as symptoms associated with COVID-19, and subsequently, anosmia and ageusia have been added to Centers for Disease Control and Prevention screening guidelines as well. There should be a higher index of suspicion when evaluating a patient with high-risk activities, travel, and atypical symptoms. More studies need to be conducted with a healthy outpatient population to further understand this disease and decrease its impact.</p>		

Evaluation of the Biomeme Franklin Human Performance Factors: Final Report		
Accession Number:	Report Date:	Access Restrictions:
AD1105851	08-10-2020	Approved for Public Release.
Author:	Rivers, Bryan A.; Berk, Kimberly L.; Blum, Steven M.; Buckley, Patricia E.	
Corporate Author:	US Army CCDC CBC APG United States	
Descriptors:	Medical Screening, Bioassays, Job Training, Human Performance Tests	

Identifiers:	Biological Identification, PCR (Polymerase Chain Reaction), SARS-CoV-2 Test Kit
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Optimizing Peripandemic Care for Veteran Major Non-Traumatic Lower Extremity Amputees: A Proposal Informed by a National Retrospective Descriptive Analysis of COVID-19 Risk Factor Prevalence		
Accession Number:	Report Date:	Access Restrictions:
AD1104689	06-30-2020	Approved for Public Release.
Author:	Dittman, James M.; Tse, Wayne; Amendola, Michael F.	
Corporate Author:	Virginia Commonwealth University School of Medicine, Richmond, VA	
Descriptors:	Military Medicine, Hypertension, Cardiovascular Diseases, Diabetes Mellitus, Amputation, Cancer, Amputees, Veterans Health, Legs, Lower Limb Amputees, Patient Care, Health Services, Risk Analysis, Risk Factors, Prosthetics, Lower Limb Amputations, Therapy, Surgical Amputations, Department of Veterans Affairs	
Identifiers:	COPD (Chronic Obstructive Airway Disease), Comorbidity, Preoperative Care, Amputation Below Knee, Case Fatality Rate, Respiratory Tract Diseases, Peripandemic	
<p>In response to the Coronavirus 2019 (COVID-19) pandemic, vascular surgeons in the Veteran Affairs Health Care System have been undertaking only essential cases, such as advanced critical limb ischemia. Surgical risk assessment in these patients is often complex, considers all factors known to impact short- and long-term outcomes, and the additional risk that COVID-19 infection could convey in this patient population is unknown. The European Centre for Disease Prevention and Control (ECDC) published risk factors (ECDC-RF) implicated in increased COVID-19 hospitalization and case-fatality which have been further evidenced by initial reports from the United States Centers for Disease Control and Prevention. CDC reports additionally indicate that African American (AA) patients have incurred disparate infection outcomes in the United States. We set forth to survey the Veterans Affairs Surgical Quality Improvement Program (VASQIP) database over a nearly 20 year span to inform ongoing risk assessment with an estimation of the prevalence of ECDC-RF in our veteran critical limb ischemia population and investigate whether an increased COVID-19 comorbidity burden exists for AA veterans presenting for major non-traumatic amputation.</p>		

Sentinel Case of COVID-19 at Fort Stewart, GA in a National Guard Soldier Participating in Annual Training: A Case Report		
Accession Number:	Report Date:	Access Restrictions:
AD1105927	06-22-2020	Approved for Public Release.

Author:	Kline, Jonathan D; Donovan, Andrew E.
Corporate Author:	Winn Army Community Hospital, Fort Stewart, GA
Descriptors:	Public Health, Military Medicine, Infection Control, Therapy, Military Personnel, Respiratory Tract Diseases, Quarantine
<p>For healthcare providers, specifically military and federal public health personnel, prompt and accurate diagnosis and isolation of SARS-CoV-2 novel coronavirus patients provide a two-fold benefit: (1) directing appropriate treatment to the infected patient as early as possible in the progression of the disease to increase survival rates and minimize the devastating sequelae following recovery and remission of symptoms; (2) provide critical information requirements that enable commanders and public health officials to best synchronize policy, regulations, and troop movement restrictions while best allocating scarce resources in the delicate balance of risk mitigation versus mission readiness. Simple personal protective measures and robust testing and quarantine procedures, instituted and enforced aggressively by senior leaders, physicians, and healthcare professionals at all levels are an essential aspect of the battle against the COVID-19 pandemic that will determine the success or failure of the overall effort. As consideration, the authors respectfully submit this vignette of the first confirmed positive COVID-19 case presenting to the Emergency Department at Winn Army Community Hospital, Fort Stewart, Georgia.</p>	

Call to Duty: US Military Plastic Surgery Response to the Coronavirus Disease 2019 Pandemic		
Accession Number:	Report Date:	Access Restrictions:
AD1105958	2020-06-16	Approved for Public Release.
Author:	Farber, Scott; Wallace, Charles; Valerio, Ian.	
Corporate Author:	U.S. Navy Medical Support Team, Operation Gotham, Joint Task Force COVID-19 Pandemic Response, New York	
Descriptors:	Health Services, Medical Personnel, Public Health, Physicians, Patient Care, Hospitals, Medical Specialties, Health Care, General Surgery, Military Hospitals, Intensive Care Units	
<p>The coronavirus disease 2019 (COVID-19) pandemic has impacted healthcare throughout the globe. Elective surgery cases were paused; non-elective cases declined significantly; and redeployment of specialists became a reality. The rise in hot zones located throughout the United States contributed to our military's rapid mobilization of medical assets to these trouble spots. Our plastic surgeons serving in the Armed Forces have answered the call and have been repurposed into leadership, logistical, and clinical roles outside of their traditional scope of practice. We have been deployed to sea-based platforms (ie, USNS Mercy and Comfort), field hospitals (eg, the Javits Center, N.Y.), as well as embedded within medical centers in cities where the COVID-19 pandemic has had a severe impact.</p>		

COVID-19 Pandemic: A Collection of Relevant Publications from Military Medicine		
Accession Number:	Report Date:	Access Restrictions:
AD1104732	2020-06-02	Approved for Public Release.
Author:	Talbot, Laura A; Haffner, William H; Rice, Charles L; Rothwell, Stephen W.	
Corporate Author:	Association of Military Surgeons of the United States, Gaithersburg, MD	
Descriptors:	Disease Outbreaks, Military Medicine, Public Health, Biological Warfare, Medical Personnel, Health Services, Infectious Diseases, Aeromedical Evacuation	
<p>The most recent coronavirus, SARS-CoV-2 and its subsequent coronavirus disease 2019 (COVID-19),¹ has reached pandemic proportions requiring unprecedented actions. One established resource for national emergencies has been our nation's military. The Department of Defense mobilized National Guard, Reserve, and Active Duty service members to support the COVID-19 response and thereby accessed the nation's largest source for medical surge capacity. Our purpose for this commentary was to review over 80 years of publications in Military Medicine and identify a collection of relevant articles to the topic of COVID-19. These selected articles examine various aspects of infectious diseases, epidemics, and pandemics as analyzed through the lens of military medical experts. Our objective was to identify a selection of pertinent published military medical articles readily accessible with free access on the Military Medicine website.</p>		

Characteristic and quantifiable COVID-19 like abnormalities in CT- and PET/CT-1 imaged lungs of SARS-CoV-2 infected crab eating macaques (<i>Macaca fascicularis</i>)		
Accession Number:	Report Date:	Access Restrictions:
AD1105892	5/14/2020	Approved for Public Release.
Author:	Finch, Courtney L.; Crozier, Ian; Lee, Ji Hyun; Byrum, Russ; Cooper, Timothy K., Liang, Janie; Sharer, Kaleb; Solomon, Jeffrey; Syre, Philip J.; Kocher, Gregory; Bartos, Christopher; Aiosa, Nina M.; Castro, Marcelo; Larson, Peter A.; Adams, Ricky; Beitzel, Brett; Di Paola, Nicholas; Kugelman, Jeffrey R.; Kurtz, Jonathan R.; Burdette, Tracey	
Corporate Author:	National Institute of Allergy and Infectious Diseases, Fort Detrick, MD, Bethesda	
Descriptors:	Infectious Diseases, Respiratory Tract Diseases, Positron Emission Tomography, <i>Macaca Fascicularis</i> , Laboratory Animals, Computerized Tomography	
Identifiers:	Animal Models, Lung Abnormalities	
<p>Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is causing an exponentially increasing number of coronavirus disease 19 (COVID-19) cases globally. Prioritization of medical</p>		

countermeasures for evaluation in randomized clinical trials is critically hindered by the lack of COVID-19 animal models that enable accurate, quantifiable, and reproducible measurement of COVID-19 pulmonary disease free from observer bias. We first used serial computed tomography (CT) to demonstrate that bilateral intrabronchial instillation of SARS CoV-2 into crab-eating macaques (*Macaca fascicularis*) results in mild-to-moderate lung abnormalities qualitatively characteristic of subclinical or mild-to-moderate COVID-19 (e.g., ground-glass opacities with or without reticulation, paving, or alveolar consolidation, peri-bronchial thickening, linear opacities) at typical locations (peripheral>central, posterior and dependent, bilateral, multi-lobar). We then used positron emission tomography (PET) analysis to demonstrate increased FDG uptake in the CT-defined lung abnormalities and regional lymph nodes. PET/CT imaging findings appeared in all macaques as early as 2 days post exposure, variably progressed, and subsequently resolved by 6-12 days post exposure. Finally, we applied operator-independent, semi-automatic quantification of the volume and radiodensity of CT abnormalities as a possible primary endpoint for immediate and objective efficacy testing of candidate medical countermeasures.

Recommendations From the CSO-HNS Taskforce on Performance of Tracheotomy During the COVID-19 Pandemic

Accession Number:	Report Date:	Access Restrictions:
AD1105862	2020-04-27	Approved for Public Release.
Author:	Sommer, D. D.; Engels, P. T., Weitzel, E. K.; Khalili, S.; Corsten, M.; Tewfik, M. A.; Fung, K., Cote, D.; Gupta, M.; Sne, N.; Brown, T. F.; Paul, J.; Kost, K. M.; Witterick, I. J.	
Corporate Author:	Brooke Army Medical Center, Fort Sam Houston, Texas	
Descriptors:	Aerosols, Personal Protective Equipment, Intensive Care Units, Tracheotomy, Airway Management, Patient Care, Ventilators, General Surgery, Endoscopes, Safety, Anesthesia, Standards	
Identifiers:	Tracheostomy, AGMP (Aerosol Generating Mucosal Procedure), Global Pandemic, Recommendations	

Introduction: The performance of tracheotomy is a common procedural request by critical care departments to the surgical services of general surgery, thoracic surgery and otolaryngology - head and neck surgery. A Canadian Society of Otolaryngology Head and Neck Surgery (CSO-HNS) task force was convened with multi-specialty involvement from otolaryngology-head and neck surgery, general surgery, critical care and anesthesiology to develop a set of recommendations for the performance of tracheotomies during the COVID-19 pandemic. Main body: The tracheotomy procedure is highly aerosol generating and directly exposes the entire surgical team to the viral aerosol plume and secretions, thereby increasing the risk of transmission to healthcare providers. As such, we believe extended endotracheal intubation should be the standard of care for the entire duration of ventilation in the vast majority of patients. Pre-operative COVID-19 testing is highly recommended for any nonemergent procedure. Conclusion: The set of recommendations in this document highlight the

importance of avoiding tracheotomy procedures in patients who are COVID-19 positive if at all possible. Recommendations for appropriate PPE and environment are made for COVID-19 positive, negative and unknown patients requiring consideration of tracheotomy. The safety of healthcare professionals who care for ill patients and who keep critical infrastructure operating is paramount.

Caring for Patients with Pain During the COVID-19 Pandemic: Consensus Recommendations from an International Expert Panel

Accession Number:	Report Date:	Access Restrictions:
AD1105985	2020-04-07	Approved for Public Release.
Author:	Shanthanna, H.; Strand, N. H.; Provenzano, D. A.; Lobo, C. A.; Eldabe, S.; Bhatia, A.	
Corporate Author:	Uniformed Services University of the Health Sciences, Bethesda, MD.	
Descriptors:	Health Services, Medical Personnel, Pain, Drug Abuse, Therapy, Pain Management, Opioids, Lung Diseases; Immune System; Pharmacology; Patient Care; Nervous System; Hospitals; Drug Therapy	
Identifiers:	NSAID (Nonsteroidal Anti-Inflammatory Drugs), ACE (Angiotensin Converting Enzyme), PPE (Personal Protective Equipment)	

Chronic pain causes significant suffering, limitation of daily activities and reduced quality of life. Infection from COVID-19 is responsible for an ongoing pandemic that causes severe acute respiratory syndrome, leading to systemic complications and death. Led by the World Health Organization, healthcare systems across the world are engaged in limiting the spread of infection. As a result, all elective surgical procedures, outpatient procedures and patient visits, including pain management services, have been postponed or cancelled. This has affected the care of chronic pain patients. Most are elderly with multiple comorbidities, which puts them at risk of COVID-19 infection. Important considerations that need to be recognized during this pandemic for chronic pain patients include: ensuring continuity of care and pain medications, especially opioids; use of telemedicine; maintaining biopsychosocial management; use of anti-inflammatory drugs; use of steroids; and prioritizing necessary procedural visits. There are no guidelines to inform physicians and healthcare providers engaged in caring for patients with pain during this period of crisis. We assembled an expert panel of pain physicians, psychologists and researchers from North America and Europe to formulate recommendations to guide practice. As the COVID-19 situation continues to evolve rapidly, these recommendations are based on the best available evidence and expert opinion at this present time and may need adapting to local workplace policies.

Pain Management Best Practices from Multispecialty Organizations During the COVID-19 Pandemic and Public Health Crises

Accession Number:	Report Date:	Access Restrictions:
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AD1105874	2020-04-07	Approved for Public Release.
Author:	Cohen, Steven P.; Baber, Zafeer B.; Buvanendran, Asokumar; McLean, Brian C.; Chen, Yian; Hooten, W. M.; Laker, Scott R.; Wasan, Ajay D.; Kennedy, David J.; Sandbrink, Friedhelm; King, Scott A.; Fowler, Ian M.; Stojanovic, Milan P.; Hayek, Salim M.; Phillips, Christopher R.	
Corporate Author:	Walter Reed National Military Medical Center Bethesda, MD	
Descriptors:	Public Health, Quarantine, Therapy, Pain Management, Patient Care, Health Services, Medical Personnel, Hospitals, Physical Disabilities, Risk, Safety, Infection Control, Telemedicine, Opioids, Mental Health	
Identifiers:	Chronic Pain, Undertreatment, High Risk Patients	
<p>Background: It is nearly impossible to overestimate the burden of chronic pain, which is associated with enormous personal and socioeconomic costs. Chronic pain is the leading cause of disability in the world, is associated with multiple psychiatric comorbidities, and has been causally linked to the opioid crisis. Access to pain treatment has been called a fundamental human right by numerous organizations. The current COVID-19 pandemic has strained medical resources, creating a dilemma for physicians charged with the responsibility to limit spread of the contagion and to treat the patients they are entrusted to care for. Methods: To address these issues, an expert panel was convened that included pain management experts from the military, Veterans Health Administration, and academia. Endorsement from stakeholder societies was sought upon completion of the document within a one-week period. Results: In these guidelines, we provide a framework for pain practitioners and institutions to balance the often conflicting goals of risk mitigation for health care providers, risk mitigation for patients, conservation of resources, and access to pain management services. Specific issues discussed include general and intervention-specific risk mitigation, patient flow issues and staffing plans, telemedicine options, triaging recommendations, strategies to reduce psychological sequelae in health care providers, and resource utilization. Conclusions: The COVID-19 public health crisis has strained health care systems, creating a conundrum for patients, pain medicine practitioners, hospital leaders, and regulatory officials. Although this document provides a framework for pain management services, systems-wide and individual decisions must take into account clinical considerations, regional health conditions, government and hospital directives, resource availability, and the welfare of health care providers.</p>		

Special Report on Protecting Patient Health Information During the COVID-19 Pandemic		
Accession Number:	Report Date:	Access Restrictions:
AD1104727	2020-04-23	Approved for Public Release.
Author:	Gorman, Carol N.	
Corporate Author:	Office of the Inspector General (Department of Defense), Alexandria, VA	

Descriptors:	Health Services, Information Security, Patient Care, Medical Technicians, Military Hospitals, Department of Defense, Cybersecurity, Military Medicine, Medical Personnel, Privacy, Lessons Learned
Identifiers:	PHI (Patient Health Information), PII (Personally Identifiable Information)
<p>On April 10, 2020, the Assistant Secretary of Defense for Health Affairs stated that military medicine is at the front lines of the national Novel Coronavirus (COVID19) response, bringing unique and agile expertise and rapidly deployable resources to the fight. The Assistant Secretary also stated that the DoD and its Military Health System have mobilized doctors, nurses, and medical technicians from active duty and the Reserve Components to two ships and numerous expeditionary field hospitals around the country to support local health care systems. The Assistant Secretary emphasized that the DoD is diligently working to ensure that its beneficiaries have continued access to the care they need by ramping up virtual health capabilities, establishing driveup testing sites, and putting the right protection measures in place to minimize exposure risk to patients and health care workers. As the DoD continues to support the Nation in treating COVID-19 cases around the world, it is imperative that personnel working in military medical treatment facilities (MTFs) renew their efforts to protect controlled unclassified information, including patient health information (PHI) and personally identifiable information (PII). PHI is a subset of PII, and if obtained, can be used to steal identities and reveal the health conditions and medical diagnosis of a patient. As the Nations COVID-19 cases continue to increase and the DoD works diligently to care for the sick, the DoD must ensure that controls are in place to not only protect patients, physicians, and nurses from further spreading the virus, but also protect the sensitive and personal data collected from those individuals from unauthorized access and inadvertent disclosure.</p>	

<p>Cytokine Release Syndrome in Severe COVID 19: Lessons From Arthritis and Cell Therapy in Cancer Patients Point to Therapy for Severe Disease</p>		
Accession Number:	Report Date:	Access Restrictions:
AD1099334	2020-04-17	Approved for Public Release.
Author:	Moore, John B.; June, Carl H.	
Corporate Author:	Walter Reed National Military Medical Center Bethesda, MD	
Descriptors:	Therapy, Respiration Disorders, Respiratory Tract Diseases, Cytokines, Biological Markers, Immune System, Mononuclear Phagocyte System, Disease Outbreaks, Epithelial Cells, Drug Therapy, Clinical Trials, Hypotension	
Identifiers:	CRS (Cytokine Release Syndrome), ARDS (Acute Respiratory Distress Syndrome), IL 6 (Interleukin 6), SHLH (Secondary Hemophagocytic Lymphohistiocytosis), Ferritin, Tocilizumab, IL 6 Antagonists, Cytokine Elevations, Cytokine Storm, Cytokine Driven Hyperinflammatory Syndromes, IL 6R Antagonists	

(U) In December 2019, a new strain of coronavirus, severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2), was recognized to have emerged in Wuhan, China. Along with SARS-CoV and Middle East respiratory syndrome-coronavirus (MERS-CoV), SARS-CoV-2 is the third coronavirus to cause severe respiratory illness in humans, called coronavirus disease 2019(COVID-19). This was recognized as a pandemic by the World Health Organization(WHO) in March 2020 and has had considerable global economic and health impacts. Although the situation is rapidly evolving, severe disease manifested by fever and pneumonia, leading to acute respiratory distress syndrome (ARDS), has been described in up to 20% of COVID-19 cases. This is reminiscent of cytokine release syndrome (CRS)induced ARDS and secondary hemophagocytic lymphohistiocytosis (sHLH) observed in patients with SARS-CoV and MERS-CoV as well as in leukemia patients receiving engineered T cell therapy. Given this experience, urgently needed therapeutics based on suppressing CRS, such as tocilizumab, have entered clinical trials to treat COVID-19.

Domestic Public Health Response to COVID-19: Current Status and Resources Guide		
Accession Number:	Report Date:	Access Restrictions:
AD1099626	2020-03-25	Approved for Public Release.
Author:	Sekar, Kavya; Cornell, Ada S.	
Corporate Author:	Library of Congress, Washington DC	
Descriptors:	Diseases and Disorders, Infectious Diseases, Public Health, Emergency Response, United States Government	
<p>This CRS Insight presents selected information and resources relevant to the domestic public health response to COVID-19 in containing and mitigating the spread and impact of the disease. As the situation evolves, CRS will continue to publish and update products relevant to the current needs of Congress. This Insight will be updated accordingly. This Insight does not provide information on the international response to COVID-19, or on economic or other non-health policy issues related to COVID-19. This Insight also does not address issues related to health insurance and financing, or human services. For further information on those issues, see the CRS Coronavirus Disease 2019 homepage.</p>		

Caring for Patients' Mental Well Being During Coronavirus and Other Emerging Infectious Diseases: A Guide for Clinicians		
Accession Number:	Report Date:	Access Restrictions:
AD1096753	2020-03-11	Approved for Public Release.
Corporate Author:	Uniformed Services University of the Health Sciences, Bethesda, MD	
Descriptors:	Public Health, Disease Outbreaks, Infectious Diseases, Psychiatry, Uncertainty, Viruses, Digestive System	

	Processes, Therapy, Virus Diseases, Mental Health, Hygiene, Diseases and Disorders, Health, Social Media
<p>As our world becomes increasingly interconnected, the potential for rapid and far-reaching spread of new infectious diseases is a growing threat. Especially in the early stages of an emerging infectious disease outbreak such as Coronavirus (COVID-19), there is frequently a great deal of uncertainty about the nature of the disease, its spread, and its scope and impact. This may lead to significant and understandable emotional distress, even among those who have not been, and don't know if they will be, directly exposed to the disease. During emerging infectious disease outbreaks, both medical and mental health clinicians are likely to encounter patients who are experiencing various levels of emotional distress about the outbreak and its impact on them, their families, and their communities. Providers should acknowledge uncertainty about emerging diseases and help patients understand that there is often an emotional component to potential health concerns. In addition, providers should consider the following recommendations for promoting patients mental well-being during emerging infectious disease outbreaks:</p>	

Estimated Effectiveness of Symptom and Risk Screening to Prevent the Spread of COVID-19		
Accession Number:	Report Date:	Access Restrictions:
AD1115100	2/24/2020	Approved for Public Release.
Author:	Gostic, Katelyn; Gomez, Ana C; Mummah, Riley O; Kucharski, Adam J Lloyd-Smith, James O.	
Corporate Author:	National Institutes Of Health, Bethesda, MD	
Descriptors:	Signs And Symptoms, Medical Screening, Exposure (Physiology), Disease Outbreaks, Quarantine, Public Health, Risk Factors, Emergency Response, Hygiene, Mathematical Models, Epidemiology, Pathogens	
Identifiers:	Risk Screening, Travel Screening, Global Health, Epidemic Containment, Epidemic Control	
<p>Traveller screening is being used to limit further spread of COVID-19 following its recent emergence, and symptom screening has become a ubiquitous tool in the global response. Previously, we developed a mathematical model to understand factors governing the effectiveness of traveller screening to prevent spread of emerging pathogens (Gostic et al., 2015). Here, we estimate the impact of different screening programs given current knowledge of key COVID-19 life history and epidemiological parameters. Even under best-case assumptions, we estimate that screening will miss more than half of infected people. Breaking down the factors leading to screening successes and failures, we find that most cases missed by screening are fundamentally undetectable, because they have not yet developed symptoms and are unaware they were exposed. Our work underscores the need for measures to limit transmission by individuals who become ill after being missed by a screening program. These findings can support evidence-based policy to combat the spread of COVID-19, and prospective planning to mitigate future emerging pathogens.</p>		

Convalescent Plasma

Relationship between Anti-Spike Protein Antibody Titers and SARS-CoV-2 In Vitro Virus Neutralization in Convalescent Plasma		
Accession Number:	Report Date:	Access Restrictions:
AD1105910	6/9/2020	Approved for Public Release
Author	Salazar, Eric; Kuchipudi, Suresh V.; Paulsen, Paul A.; Eagar, Todd N.; Yi, Xin; Zhao, Picheng; Jin, Zhicheng; Long, S. W.; Olsen, Randall J.; Chen, Jian; Castillo, Brian; Leveque, Christopher; Towers, Dalton M.; Lavinder, Jason; Gollihar, Jimmie D.; Cardona, Jose; Ippolito, Gregory C.; Nissly, Ruth H.; Bird, Ian M.; Greenawalt, Denver; Rossi, Randall M.; Gontu, Abinhay; Srinivasan, Sreenidhi; Poojary, Indira B.; Cattadori, Isabella M.; Hudson, Peter J.; Joselyn, Nicole; Prugar, Laura; Hule, Kathleen; Herbert, Andrew; Bernard, David W.; Dye, John; Kapur, Vivek; Musser, James M.	
Corporate Author:	Army Medical Research Institute Of Infectious Diseases, Fort Detrick, MD	
Descriptors:	Respiratory Tract Diseases ,Infectious Diseases, Proteins, Blood Transfusions, Therapy, Antibodies ,Blood Plasma, Clinical Trials, Assays, Pathogens	
Identifiers:	Virus Neutralization , VN Titers, Plasma Donation, Plasma Donors, Antibody Titers, Anti Receptor Binding Domain Igg Titers, Anti Spike Ectodomain Igg Titers	
<p>Newly emerged pathogens such as SARS-CoV-2 highlight the urgent need for assays that detect levels of neutralizing antibodies that may be protective. We studied the relationship between anti-spike ectodomain (ECD) and anti-receptor binding domain (RBD) IgG titers, and SARS-CoV-2 virus neutralization (VN) titers generated by two different in vitro assays using convalescent plasma samples obtained from 68 COVID-19 patients, including 13 who donated plasma multiple times. Only 23% (16/68) of donors had been hospitalized. We also studied 16 samples from subjects found to have anti-spike protein IgG during surveillance screening of asymptomatic individuals. We report a strong positive correlation between both plasma anti-RBD and anti-ECD IgG titers, and in vitro VN titer. Anti-RBD plasma IgG correlated slightly better than anti-ECD IgG titer with VN titer. The probability of a VN titer 160 was 80% or greater with anti-RBD or anti-ECD titers of 1:1350. Thirty-seven percent (25/68) of convalescent plasma donors lacked VN titers 160, the FDA-recommended level for convalescent plasma used for COVID-19 treatment. Dyspnea, hospitalization, and disease severity were significantly associated with higher VN titer. Frequent donation of convalescent plasma did not significantly decrease either VN or IgG titers. Analysis of 2,814 asymptomatic adults found 27 individuals with anti-RBD or anti-ECD IgG titers of 1:1350, and evidence of VN1:160. Taken together, we conclude that anti-RBD or anti-ECD IgG titers can serve as a surrogate for VN titers to identify suitable plasma donors. Plasma anti-RBD or anti-ECD titer of 1:1350 may provide critical information about protection against COVID-19 disease.</p>		

Cytokine Storms with COVID-19 and Other Viral Outbreaks

Cytokine Release Syndrome in Severe COVID 19: Lessons From Arthritis and Cell Therapy in Cancer Patients Point to Therapy for Severe Disease		
Accession Number:	Report Date:	Access Restrictions:
AD1099334	4/17/2020	Approved for Public Release.
Author:	Moore, John B.; June, Carl H.	
Corporate Author:	Walter Reed National Military Medical Center, Bethesda, MD	
Descriptors:	Therapy, Respiration Disorders, Respiratory Tract Diseases, Cytokines, Biological Markers, Infectious Diseases, Immune System, Mononuclear Phagocyte System, Disease Outbreaks, Epithelial Cells, Drug Therapy, Clinical Trials, Hypotension	
Identifiers:	CRS (Cytokine Release Syndrome), ARDS (Acute Respiratory Distress Syndrome), Il 6 (Interleukin 6), SHL (Secondary Hemophagocytic Lymphohistiocytosis), Ferritin, Tocilizumab, Il 6 Antagonists, Cytokine Elevations, Cytokine Storm, Cytokine Driven Hyperinflammatory Syndromes, Il 6R Antagonists]	
<p>In December 2019, a new strain of coronavirus, severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2), was recognized to have emerged in Wuhan, China. Along with SARS-CoV and Middle East respiratory syndrome-coronavirus (MERS-CoV), SARS-CoV-2 is the third coronavirus to cause severe respiratory illness in humans, called coronavirus disease 2019(COVID-19). This was recognized as a pandemic by the World Health Organization (WHO) in March 2020 and has had considerable global economic and health impacts. Although the situation is rapidly evolving, severe disease manifested by fever and pneumonia, leading to acute respiratory distress syndrome (ARDS), has been described in up to 20% of COVID-19 cases. This is reminiscent of cytokine release syndrome (CRS) induced ARDS and secondary hemophagocytic lymphohistiocytosis (SHLH) observed in patients with SARS-CoV and MERS-CoV as well as in leukemia patients receiving engineered T cell therapy. Given this experience, urgently needed therapeutics based on suppressing CRS, such as tocilizumab, have entered clinical trials to treat COVID-19.</p>		

Surviving the Storm : Expanding Public Health's Capabilities in Response to the Increasing Threats Posed by Novel Viruses		
Accession Number:	Report Date:	Access Restrictions:
ADA621630	12/1/2013	Approved for Public Release.
Author:	Mackie, Daniel P.	
Corporate Author:	Naval Postgraduate School, Monterey, CA	

Descriptors:	Antiviral Agents, Influenza Virus, Medicine, Public Health, Antibiotics, Chemotherapy, Cytokines, Drugs, Epidemiology, Filters, Global, Pipelines, Population, Preventive Medicine, Response, Stockpiles, Therapy, Theses, Threats, Viruses
Identifiers:	Pandemic Influenza, H1N1, H5N1, H7N9, MERS (Middle Eastern Respiratory Syndrome, HCoV (Human Coronavirus), Prophylaxis, ARDS (Acute Respiratory Distress Syndrome), Medications, Therapies, Antibiotics, Corticosteroids, Interferons, Herbal Medications, Lipitor, Zocor, Gemfibrozil
<p>As the planet s population continues to grow at rate that will see a global population of nine billion people by the year 2050, is an era being entered into which pandemics involving novel viruses are the new norm? If that idea is possible, then are drug therapies (approved by the FDA or in the pipeline for its approval) available that either limit virus replication within a host cell, or reduce the body s hyper-immune response (also known as cytokine storm) to novel or pandemic strain viruses with which states could supplement their existing stockpiles? This research explores six classes of medications that could potentially assist state-level governments in expanding their state-level stockpiles, to include more treatment and prophylaxis options, in the face of pandemics involving novel viruses. The results of this research were filtered through three criteria (medical efficacy, cost, logistical considerations) that narrow the field of candidate therapies down to four specific findings: one generic version of the antiviral called Ribavirin, and generic versions of the statins called Lipitor, Zocor and Gemfibrozil. This research may be applied to state and local-level public health agencies interested in bolstering their existing stockpiles for pandemic preparedness.</p>	

<p>Avian Influenza: Potential Impact on Sub-Saharan Military Populations with High Rates of Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome</p>		
Accession Number:	Report Date:	Access Restrictions:
ADA470975	7/1/2007	Approved for Public Release
Author:	Feldman, Robert L., Nickell, Kent	
Corporate Author:	TRADOC Analysis Center, Fort Leavenworth, KS, Foreign Military Studies Office	
Descriptors:	Military Personnel, Subsaharan Africa, Acquired Immune Deficiency Syndrome, Influenza Virus, Reprints, Military Forces (Foreign), Human Immunodeficiency Viruses	
Identifiers:	Avian Influenza, Coinfection, H5N1 Virus, HIV Aids, Bird Flu, Cytokine Storm	
<p>Several sub-Saharan militaries have large percentages of troops with human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome. With the arrival of avian influenza in Africa, the potential exists that some of those soldiers might also become infected with H5N1, the virus responsible for the disease. Two possible scenarios have been postulated regarding how such a coinfection of HIV and H5N1 might present. (1) Soldiers already weakened by HIV/acquired</p>		

immunodeficiency syndrome rapidly succumb to H5N1. The cause of death is a "cytokine storm, "essentially a runaway inflammatory response. (2) The weakened immune system prevents the cytokine storm from occurring; however, H5N1 is still present, replicating, and being shed, leading to the infection of others. A cytokine storm is particularly dangerous for individuals of military age, as evidenced by the large number of soldiers who died during the 1918 influenza epidemic. If large numbers of sub-Saharan soldiers suffer a similar fate from avian influenza, then military and political instability could develop.

COVID-19 Studies

High Affinity Nanobodies Block Sars-CoV-2 Spike Receptor Binding Domain Interaction with Human Angiotensin Converting Enzyme		
Accession Number:	Report Date:	Access Restrictions:
AD1118474	12/22/2020	Approved for Public Release.
Author:	Esparza, Thomas J., Martin, Negin P., Anderson, George P., Goldman, Ellen R., Brody, David L.	
Corporate Author:	National Institute Of Environmental Health Sciences Research, Triangle Park, NC	
Descriptors:	Albumins, Biomedical And Dental Materials, Coronaviruses, Detection, Materials, Microbial Genome, Therapy, Disease Outbreaks, Fungi, Zoonoses, Mers-Cov, Environmental Health, Hematologic Diseases, Surface Plasmon Resonance, Viruses, Chemical Synthesis, Chemistry	

Whole-genome Sequencing of SARS CoV 2: Using Phylogeny and Structural Modeling to Contextualize Local Viral Evolution		
Accession Number:	Report Date:	Access Restrictions:
AD1116308	11/30/2020	Approved for Public Release.
Author:	Nazzario-Toole, Ashley E., Xia, Hui, Gibbons, Thomas F.	
Corporate Author:	59th MDW San Antonio, TX	
Descriptors:	Virus Diseases, Viruses, Covid-19, Disease Outbreaks, Infectious Diseases, Vaccines, Genomes, Military Medicine, Military Personnel, Public Health, Biomedical Research	
<p>The outbreak of SARS-CoV-2 has created a global pandemic resulting in over 1 million deaths worldwide. Rapid estimations of transmission and mutational patterns of virus outbreaks can be accomplished using whole genome viral sequencing. Here we report the development of a local pipeline for molecular epidemiological surveillance enabling DoD public health officials to track viral evolution and outbreaks. Sequencing of clinical specimens revealed that by June 2020, SAR-CoV-2</p>		

strains carrying the 614G mutation were the predominant cause of COVID-19 infections at JBSA/Lackland. Furthermore, we identified and mapped six additional spike protein amino acid changes, information which could potentially aid vaccine design. The sequencing and phylogenetic workflow described in this paper will enable local officials to track and better understand virus transmission events. Overall, this work could improve long-term readiness efforts by providing a mechanism for analyzing the current SARS-CoV-2 pandemic as well as future disease outbreaks.

[Modeling the Stability of Severe Acute Respiratory Syndrome Coronavirus 2 \(SARS-CoV-2\) on Skin, Currency, and Clothing](#)

Accession Number:	Report Date:	Access Restrictions:
AD1115350	11/9/2020	Approved for Public Release.
Author:	Harbourt, David E., Haddow, Andrew D., Piper, Ashley E., Bloomfield, Holly, Kearney, Brian J., Fetterer, David, Gibson, Kathleen, Minogue, Timothy	
Corporate Author:	Army Medical Research Institute Of Infectious Diseases, Fort Detrick, MD	
Descriptors:	Viruses, Respiratory System, Sampling, Clothing, Skin, Laboratory Tests, Money, Disease Outbreaks, Infectious Diseases	

A new coronavirus (SARS-CoV-2) emerged in the winter of 2019 in Wuhan, China, and rapidly spread around the world. The extent and efficiency of SARS-CoV-2 pandemic is far greater than previous coronaviruses that emerged in the 21st Century. Here, we modeled stability of SARS-CoV-2 on skin, paper currency, and clothing to determine if these surfaces may factor in the fomite transmission dynamics of SARS-CoV-2. Skin, currency, and clothing samples were exposed to SARS-CoV-2 under laboratory conditions and incubated at three different temperatures (4 deg C + or - 2 degC, 22 deg C + or - 2 deg C, and 37 deg C + or - 2 deg C). We evaluated stability at 0 hours (h), 4 h, 8 h, 24 h, 72 h, 96 h, 7 days, and 14 days post-exposure. SARS-CoV-2 was stable on skin through the duration of the experiment at 4 deg C (14 days). Virus remained stable on skin for at least 96 h at 22 deg C and for at least 8h at 37 deg C. There were minimal differences between the tested currency samples. The virus remained stable on the \$1 U.S.A. Bank Note for at least 96 h at 4 deg C while we did not detect viable virus on the \$20 U.S.A. Bank Note samples beyond 72 h. The virus remained stable on both Bank Notes for at least 8 h at 22 deg C and 4 h at 37 deg C. Clothing samples were similar in stability to the currency. Viable virus remained for at least 96 h at 4 deg C and at least 4 h at 22 deg C. We did not detect viable virus on clothing samples at 37 deg C after initial exposure. This study confirms the inverse relationship between virus stability and temperature. Furthermore, virus stability on skin demonstrates the need for continued hand hygiene practices to minimize fomite transmission both in the general population as well as in workplaces where close contact is common.

[Questioning COVID-19 Surface Stability and Fomite Spreading in Three Aeromedical Cases: A Case Series](#)

Accession Number:	Report Date:	Access Restrictions:

AD1118384	11/1/2020	Approved for Public Release.
Author:	Horoho, Sean, Musik, Stephen, Bryant, David, Brooks, William, Porter, Ian M	
Corporate Author:	Navy Medicine Support Command, Jacksonville, FL	
Descriptors:	Chain Reactions, Active Duty, Diseases And Disorders, Health, Ships, Survival Equipment, Viral Pneumonia, Governments, Navy, Stainless Steel, Air Force, Disease Outbreaks, Mers Cov, Quarantine, Virus Diseases, Military Medicine, Viruses, Medical Personnel	

Symptom Characterization and Outcomes of Sailors in Isolation After a COVID-19 Outbreak on a US Aircraft Carrier		
Accession Number:	Report Date:	Access Restrictions:
AD1111000	10/1/2020	Approved for Public Release.
Author:	Alvarado, Gadiel R.; Pierson, Benjamin C.; Teemer, Eric S.; Gama, Hector J.; Cole, Ronald D.; Jang, Samuel S.	
Corporate Author:	Brooke Army Medical Center, Fort Sam Houston, TX	
Descriptors:	Pain, Infectious Diseases, Public Health, Disease Outbreaks, Viruses, , Diseases And Disorders, USS Theodore Roosevelt, Virus Diseases, Quarantine	
<p>Reports of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) outbreaks affecting nursing homes, homeless shelters, and cruise ships describe both asymptomatic and symptomatic cases among patients whose primary risk factor for acquisition was residence in a confined congregate environment. However, the age distribution of patients with coronavirus disease 2019(COVID-19) described is weighted heavily toward elderly individuals and those with preexisting conditions. The USS Theodore Roosevelt (TR) outbreak investigation by the US Navy and Centers for Disease Control and Prevention illuminated how the virus affects a young military population. In this study, the US Army Public Health COVID-19 Task Force describes the results of an independent investigation of the shore-based USS TR outbreak response and 736 USS TR sailors in isolation status.</p>		

Stability of SAR-CoV-2 on Produce following a Low-Dose Aerosol Exposure		
Accession Number:	Report Date:	Access Restrictions:
AD1109735	9/14/2020	Approved for Public Release.
Author:	Haddow, Andre D., Watt, Taylor R., Bloomfield, Holly A., Shamblin, Joshua D., Dyer, David N., Harbourt, David E.	
Corporate Author:	Army Medical Research Institute Of Infectious Diseases, Fort Detrick, MD	

Descriptors:	Infectious Disease Transmission, Aerosols, Fruit, Vegetables, Contamination, Temperature
Identifiers:	Stability, Airborne Transmission, Droplets, Fomites, Organic Produce
<p>Transmission of SARS-CoV-2, the causative agent of COVID-19, primarily occurs through respiratory droplets, although increasing evidence suggests the potential for airborne transmission. However, fomites may act as a secondary transmission mode. Before purchase, produce is commonly handled by and exposed to multiple persons, including staff and shoppers, therefore increasing the likelihood of contamination via infectious respiratory droplets (> 5 micrometers) and/or droplet nuclei (less than or equal to 5 micrometers). Herein, we carried out a pilot study to model the stability of SARS-CoV-2 on apples, tomatoes, and jalapeno peppers at two temperatures following an aerosol exposure designed to simulate a low-dose SARS-CoV-2 airborne transmission event involving droplet nuclei.</p>	

Disruption of Adaptive Immunity Enhances Disease in SARS-CoV-2 Infected Syrian Hamsters		
Accession Number:	Report Date:	Access Restrictions:
AD1108652	9/8/2020	Approved for Public Release.
Author:	Brocato, Rebecca L., Principe, Lucia M., Kim, Robert K., Zeng, Xiankun, Williams, Janice A., Liu, Yanan, Li, Rong, Smith, Jeffrey M., Golden, Joseph W., Gangem, Dave, Youssef, Sawsan, Wang, Zhongde, Glanville, Jacob, Hooper, Jay W.	
Corporate Author:	Utah State University, Logan	
Descriptors:	Body Weight, Virion, Adaptive Immunity, Proteins, Pneumocytes, Disease Attributes, Blood, Cells, Antibodies, Cytoplasmic Vesicles, Covid 19, CYP (Cyclophosphamide), ISH (In Situ Hybridization)]	
<p>Animal models recapitulating human COVID-19 disease, especially with severe disease, are urgently needed to understand pathogenesis and evaluate candidate vaccines and therapeutics. Here, we develop novel severe disease animal models for COVID-19 involving disruption of adaptive immunity in Syrian hamsters. Cyclophosphamide (CyP) immunosuppressed or RAG2 knockout (KO) hamsters were exposed to SARS-CoV-2 by the respiratory route. Both the CyP-treated and RAG2 KO hamsters developed clinical signs of disease that were more severe than in immunocompetent hamsters, notably weight loss, viral loads, and fatality (RAG2 KO only). Disease was prolonged in transiently immunosuppressed hamsters and uniformly lethal in RAG2 KO hamsters. We evaluated the protective efficacy of a neutralizing monoclonal antibody and found that pretreatment, even in immunosuppressed animals, limited infection. Our results suggest that functional B and/or T cells are not only important for the clearance of SARS-CoV-2, but also play an early role in protection from acute disease.</p>		

Development of Highly Sensitive Goggle for Fluorescence-Based Detection of Middle East Respiratory Syndrome Coronavirus (MERS CoV) and Other Pathogens		
Accession Number:	Report Date:	Access Restrictions:
AD1116293	8/1/2020	Approved for Public Release.
Author:	Caballero, Manuel Y., Liu, Yang, Hua, Tho	
Corporate Author:	59th MDW San Antonio, TX	
Descriptors:	Detection, Wearable Technology, Engineering, Liquid Crystal Displays, Virus Diseases, Graphical User Interface, Infectious Diseases, Light Sources, Viruses, MERS, Fluorescence	
Identifiers:	Multipurpose Imaging Goggle, Middle East Respiratory Syndrome Coronavirus, Fluorescence Linked Immunosorbent Assay, Enzyme Linked Immunosorbent Assay	
<p>In this project, a fluorescence-sensitive goggle prototype was developed at the University of Akron with potential field applicability in detection and identification of viral and bacterial pathogens. The goggle prototype is a wearable device that has two lenses for capturing 3D stereoscopic images. It also has video-recording capability. Further, an especially important feature of the goggle is that it can transmit the information back to a computer for detailed analysis. At the Center for Molecular Detection (CAMD), our work focused on testing and evaluation of the goggles fluorescence detection capability. To do that, we devised an in vitro fluorescence-linked immunosorbent assay (FLISA). For this assay, we used purified spike protein of Middle East Respiratory Syndrome Coronavirus (MERS-CoV) and several anti-spike protein polyclonal and monoclonal antibodies. The fluorescent dye Alexa Fluor (registered trademark) 647 conjugated to secondary antibodies was used as the fluorophore. For comparison, the fluorescence signals were also read with a BioTek plate reader. The goggle prototype was able to detect fluorescence signals with detection limit of 625 ng/mL of the Alexa Fluor (registered trademark) 647 goat anti-rabbit IgG in a 96-well plate format. For the detection of purified MERS-CoV spike protein, samples with the spike protein can be distinguished from samples without the spike protein. However, the fluorescence detection limit was significantly lower in comparison to the fluorescence detection limit of the BioTek plate reader in 96-well plate format. The software for the goggle prototype was easy to use and offered several options to improve the quality of the capture images and the detection limit of the fluorescence signal.</p>		

Risk Stratification of Hospitalized COVID-19 Patients Through Comparative Studies of Laboratory Results with Influenza		
Accession Number:	Report Date:	Access Restrictions:
AD1113002	7/31/2020	Approved for Public Release.
Author:	Mei, Yang; Weinberg, Samuel E; Zhao, Lihui; Frink, Adam; Qi, Chao; Behdad, Amir; Ji, Peng	

Corporate Author:	Northwestern University, Chicago, IL
Descriptors:	Viruses, Hospitalizations, Influenza, Risk Analysis, Virus Diseases, Clinical Laboratory Techniques (Medicine), Biomedical Research, Patients
<p>Background: The outbreak of coronavirus disease 2019 (COVID-19) in December 2019 overlaps with the flu season. Methods: We compared clinical and laboratory results from 719 influenza and 973 COVID-19 patients from January to April 2020. We compiled laboratory results from the first 14 days of the hospitalized patients using parameters that are most significantly different between COVID-19 and influenza and hierarchically clustered COVID-19 patients. Findings: Compared to influenza, patients with COVID-19 exhibited a continued increase in white blood cell count, rapid decline of hemoglobin, more rapid increase in blood urea nitrogen (BUN) and D-dimer, and higher level of alanine transaminase, C-reactive protein, ferritin, and fibrinogen. COVID-19 patients were sub-classified into 5 clusters through a hierarchical clustering analysis. Medical records were reviewed and patients were risk stratified based on the clinical outcomes. The cluster with the highest risk showed 27-8% fatality, 94% ICU admission, 94% intubation, and 28% discharge rates compared to 0%, 38%, 22%, and 88% in the lowest risk cluster, respectively. Patients in the highest risk cluster had leukocytosis including neutrophilia and monocytosis, severe anemia, increased red blood cell distribution width, higher BUN, creatinine, D-dimer, alkaline phosphatase, bilirubin, and troponin. Interpretation: There are significant differences in the clinical and laboratory courses between COVID-19 and influenza. Risk stratification in hospitalized COVID-19 patients using laboratory data could be useful to predict clinical outcomes and pathophysiology of these patients.</p>	

<p>COVID-19 Monitoring and Response for U.S. Air Force Military Basic Trainees -Texas, March-April 2020</p>		
Accession Number:	Report Date:	Access Restrictions:
AD1104769	7/28/2020	Approved for Public Release.
Author:	Marcus, Joseph E., Frankel, Dianne N., Pawlak, Mary T., Casey, Theresa M., Blackwell, Rebecca S., Tran, Francis V., Dolan, Mathew J., Yun, Heather C.	
Corporate Author:	59Th Medical Wing, San Antonio, Texas	
Descriptors:	Public Health Practice, Military Training, Trainees, Infectious Disease Transmission	
Identifiers:	BMT (Basic Military Training), Congregate Living, NPI (Non Pharmaceutical Interventions), Social Distancing	
<p>COVID-19 has had significant risk of spread in settings involving congregate living and training, yet certain essential functions need to continue despite these risks. This report shows the nonpharmaceutical interventions (NPI) used to limit transmission amongst the 10,579 basic trainees at Joint Base San Antonio-Lackland during the COVID-19 pandemic to 5 positive cases (47 per 100,000).</p>		

COVID-19 Case and Contact Investigation in an Office Workspace		
Accession Number:	Report Date:	Access Restrictions:
AD1104672	7/17/2020	Approved for Public Release.
Author:	Hall, Matthew T., Bui, Han Q., Rowe, John, Do, Tai A.	
Corporate Author:	Bureau Of Medicine And Surgery, Falls Church, VA	
Descriptors:	Infection Control, Quarantine, Public Health, Disinfection, Pandemics, Office Buildings, Exposure (Physiology), Signs And Symptoms, Cleaning, Risk, Infectious Disease Transmission	
Identifiers:	Office Workspace, Contact Investigation	
<p>This investigation report describes a case of COVID-19 in a combined military and civilian office workspace and the contact investigation and mitigation efforts that followed. This office space included an embedded public health officer who was able to conduct the contact investigation and advise on the outbreak response. Over a 3-day period, the index case unintentionally exposed 150 coworkers to SARS-CoV-2 through participation in carpools, conferences, and small meetings. Of these exposures 37 were considered medium risk at the time and 113 were considered low risk. A total of 5 contacts reported COVID-like-symptoms at the time of the investigation and another 5 developed symptoms during the 14-day quarantine period and all were directed to self-isolate. None of the contacts required hospitalization and all the symptomatic contacts tested negative for SARS-CoV-2. With the advice and aid of the embedded public health officer, the office authorized telework, conducted thorough cleaning of spaces, distributed informative messaging, conducted virtual question-and-answer forums, and evaluated outbreak policies. This report demonstrates that the close integration of public health and office management can lead to rapid identification of those at risk of infection and implementation of mitigation and control efforts to stop the spread of disease.</p>		

Sentinel Case of COVID-19 at Fort Stewart, GA in a National Guard Soldier Participating in Annual Training: A Case Report		
Accession Number:	Report Date:	Access Restrictions:
AD1104730	6/22/2020	Approved for Public Release.
Author:	Kline, Jonathan D; Donovan, Andrew E.	
Corporate Author:	Winn Army Community Hospital, Hinesville, United States	
Descriptors:	Military Medicine, Infectious Diseases, Military Personnel, Therapy, Case Studies, Emergency Medicine, Military Hospitals, Quarantine, Diagnosis (Medicine), Public Health, Army Personnel, Virus Diseases, Epidemiology	

Identifiers:	Sentinel Health Event, Survival Rate, Soldiers, Remission, Acute Respiratory Disease
<p>For healthcare providers, specifically military and federal public health personnel, prompt and accurate diagnosis and isolation of SARS-CoV-2 novel coronavirus patients provide a two-fold benefit: (1) directing appropriate treatment to the infected patient as early as possible in the progression of the disease to increase survival rates and minimize the devastating sequelae following recovery and remission of symptoms; (2) provide critical information requirements that enable commanders and public health officials to best synchronize policy, regulations, and troop movement restrictions while best allocating scarce resources in the delicate balance of risk mitigation versus mission readiness. Simple personal protective measures and robust testing and quarantine procedures, instituted and enforced aggressively by senior leaders, physicians, and healthcare professionals at all levels are an essential aspect of the battle against the COVID-19 pandemic that will determine the success or failure of the overall effort. As consideration, the authors respectfully submit this vignette of the first confirmed positive COVID-19 case presenting to the Emergency Department at Winn Army Community Hospital, Fort Stewart, Georgia.</p>	

<p>Universal and Serial Laboratory Testing for SARS-CoV-2 at a Long-Term Care Skilled Nursing Facility for Veterans-Los Angeles, California, 2020</p>		
Accession Number:	Report Date:	Access Restrictions:
AD1103339	5/29/2020	Approved for Public Release.
Author:	Dora, Amy V; Winnett, Alexander; Jatt, Lauren P; Davar, Kusha; Watanabe, Mika; Sohn, Linda; Kern, Hannah S.; Graber, Christopher J; Goetz, Matthew B.	
Corporate Author:	Veterans Affairs Greater Los Angeles Healthcare System, Los Angeles, CA	
Descriptors:	Public Health, Public Health Practice, California, Health Care, Delivery Of Health Care, Infection Control, Therapy, Veterans Health, Veterans (Military Personnel)	
Identifiers:	Skilled Nursing Facilities, Laboratory Testing	
<p>On March 28, 2020, two residents of a long-term care skilled nursing facility (SNF) at the Veterans Affairs Greater Los Angeles Healthcare System (VAGLAHS) had positive test results for SARS-CoV-2, the cause of coronavirus disease 2019 (COVID-19), by reverse transcription-polymerase chain reaction (RT-PCR) testing of nasopharyngeal specimens collected on March 26 and March 27. During March 29-April 23, all SNF residents, regardless of symptoms, underwent serial (approximately weekly) nasopharyngeal SARS-CoV-2 RT-PCR testing, and positive results were communicated to the county health department. All SNF clinical and nonclinical staff members were also screened for SARS-CoV-2 by RT-PCR during March 29-April 10. Nineteen of 99 (19%) residents and eight of 136 (6%) staff members had positive test results for SARS-CoV-2 during March 28-April 10; no further resident cases were identified on subsequent testing on April 13, April 22, and April 23. Fourteen of the 19 residents with COVID-19 were asymptomatic at the time of testing. Among these residents, eight developed symptoms 1-5 days after specimen collection and were later classified as presymptomatic; one of</p>		

these patients died. This report describes an outbreak of COVID-19 in an SNF, with case identification accomplished by implementing several rounds of RT-PCR testing, permitting rapid isolation of both symptomatic and asymptomatic residents with COVID-19. The outbreak was successfully contained following implementation of this strategy.

Temperature and Humidity Effects on SARS-CoV-2 and Related Coronaviruses

Accession Number:	Report Date:	Access Restrictions:
AD1108916	5/11/2020	Approved for Public Release.
Author:	Butkus, Claire; Veigl, Alena	
Corporate Author:	UES Inc., Dayton, OH	
Descriptors:	Culture Techniques, Statistical Analysis, Equine Encephalitis, Respiratory Tract Diseases, Low Temperature, Low Humidity, Half Life	
<p>In all studies investigating temperature and humidity effects on COVID-19 and related coronaviruses, low air temperature (AT) and low relative humidity (RH) favored the survival of both SARS-CoV-2 and related coronaviruses; however, inactivation was more rapid at increasing RH levels and at high AT [1-8]. In each case, high temperature at high RH were found to have a synergistic effect on the inactivation of coronavirus viability while lower temperatures and low relative humidity support prolonged survival of viruses on contaminated surfaces [3]. The results of these studies suggest that RH has a greater effect on viral stability/inactivation than AT [2].</p>		

COVID-19 Virus Shedding

Accession Number:	Report Date:	Access Restrictions:
AD1106242	4/23/2020	Approved for Public Release.
Author:	Trice, Joshua	
Corporate Author:	ABSS Solutions, Inc., Upper Marlboro, United States	
Descriptors:	Literature Surveys, Ribonucleic Acids, Personal Protective Equipment, Infectious Disease Transmission, Decision Making, Children	
Identifiers:	Virus Shedding, RNA (Ribonucleic Acids), Viral Load, Time Course	
<p>As of December 2019, the SARS-CoV-2 virus (responsible for the COVID-19 disease) has been rapidly spreading throughout the world. In order to understand the spread, viral shedding characteristics, which refers to the release of the virus from an infected individual into the environment, must be determined. As we are currently in the middle of the COVID-19 pandemic, additional research is required to fully understand the characteristics of SARS-CoV-2 shedding.</p>		

Alternatives to Viral Transport Medium for Use in SARS-CoV-2 Sample Preparation		
Accession Number:	Report Date:	Access Restrictions:
AD1110662	4/17/2020	Approved for Public Release.
Author:	Starr, Clarise; Chapleau, Richard; Rhode, Michael; Lisanby Mark; Salisbury, Richard	
Corporate Author:	School Of Aerospace Medicine, Air Force, Wright-Patterson AFB, OH	
Descriptors:	Virus Diseases, Health Services, Public Health, Viruses, Supply Chain Management, Aerospace Medicine	
Identifiers:	VTM (Viral Transport Media), GEIS (Global Emerging Infection Surveillance), PBS (Phosphate Buffered Saline), PCR (Real Time Reverse Transcriptase Polymerase Chain Reaction)	
<p>The COVID19 outbreak has severely impacted laboratory supply chains for all materials required for testing. This supply chain concern has begun to impact the reagents needed for sample collection and transport. In a news article released by National Public Radio, the apparent decrease in new tests seen by contract laboratories like Labcorp and Quest can partially be attributed to a limited supply of VTM. To address this gap in sample transport supplies before it becomes a critical point within the MHS, GEIS requested USAFSAM/PHT perform a bridge study to evaluate the performance of saline and RNAlater as alternative transport media. We performed a six-point dilution series over three days and a freeze-thaw cycle to determine the performance the CDC SARS-CoV-2 assay in samples near the limit of detection prepared in RNAlater or buffered saline. Our results indicate that samples prepared in buffered saline and frozen encounter no reduction in assay sensitivity or increase in variability, but even after only 24 hours of refrigeration the saline samples begin to degrade. In contrast, RNAlater successfully stabilized refrigerated samples with no change in performance over 72 hours of refrigeration, but freezing RNAlater-stabilized samples resulted in decreased assay performance for concentrations near the lower limit of detection. We recommend advising GEIS partner network and MHS clinical labs to collect NP/OP swabs in RNAlater or buffered saline and for sample transport on dry ice to USAFSAM and updating EUA submissions with reference to this bridge study demonstrating suitability of RNAlater and saline as alternative sample collection and transport materials.</p>		

A Cryptic Site of Vulnerability on the Receptor Binding Domain of the SARS-CoV 2 Spike Glycoprotein		
Accession Number:	Report Date:	Access Restrictions:
AD1105900	3/17/2020	Approved for Public Release.
Author:	Joyce, M. G; Sankhala, Rajeshwer S; Chen, Wei-Hung; Choe, Misook; Bai, Hongjun; Hajduczki, Agnes; Yan, Lianying; Sterling, Spencer L.; Peterson, Caroline E.; Green, Ethan C.; Smith, Clayton; De Val, Natalia; Amare, Mihret; Scott, Paul;	

	Liang, Eric D; Broder, Christopher C.; Rolland, Morgane; Michael, Nelson L; Modjarrad, Kayvon
Corporate Author:	Walter Reed Army Institute Of Research, Silver Spring, MD
Descriptors:	Zoonotic Diseases, Biomedical Research, Vaccines, Immunotherapy, Glycoproteins, Respiratory Tract Diseases, Virus Diseases, Crystal Structure, Antibodies, Infectious Diseases, Communicable Disease Control
Identifiers:	Structural Biology, RBD (Receptor Binding Domain)
<p>SARS-CoV-2 is a zoonotic virus that has caused a pandemic of severe respiratory disease-COVID-19- within several months of its initial identification. Comparable to the first SARS-CoV, this novel coronavirus surface Spike (S) glycoprotein mediates cell entry via the human ACE-2 receptor, and, thus, is the principal target for the development of vaccines and immunotherapeutics. Molecular information on the SARS-CoV-2 S glycoprotein remains limited. Here we report the crystal structure of the SARS-CoV-2 S receptor-binding-domain (RBD) at a the highest resolution to date, of 1.95. We identified a set of SARS-reactive monoclonal antibodies with cross-reactivity to SARS-CoV-2 RBD and other betacoronavirus S glycoproteins. One of these antibodies, CR3022, was previously shown to synergize with antibodies that target the ACE-2 binding site on the SARS-CoV RBD and reduce viral escape capacity. We determined the structure of CR3022, in complex with the SARS-CoV-2 RBD, and defined a broadly reactive epitope that is highly conserved across betacoronaviruses. This epitope is inaccessible in the closed prefusion S structure, but is accessible in open conformations. This first-ever resolution of a human antibody in complex with SARS-CoV-2 and the broad reactivity of this set of antibodies to a conserved betacoronavirus epitope will allow antigenic assessment of vaccine candidates, and provide a framework for accelerated vaccine, immunotherapeutic and diagnostic strategies against SARS-CoV-2 and related betacoronaviruses.</p>	

National Biodefense Strategy: Opportunities and Challenges with Early Implementation		
Accession Number:	Report Date:	Access Restrictions:
AD1098879	3/11/2020	Approved for Public Release.
Author:	Currie, Chris P.; Denigan-Macauley, Mary	
Corporate Author:	Government Accountability Office, Washington DC	
Descriptors:	Disease Outbreaks, Health, Risk Management, Virus Diseases, Diseases And Disorders, Public Health, Viruses, Governments, SARS, Infectious Diseases, Government	
<p>We are pleased to be here today to discuss our recently issued work on the National Biodefense Strategy. Catastrophic biological threats highlight the inextricable link between security and public health concerns. These threats whether naturally-occurring, intentional, or accidental have the potential to cause loss of life and sustained damage to the economy, societal stability, and global security. The vast and evolving biological threat landscape includes threats of naturally-occurring</p>		

infectious diseases, bioterrorism, and safety and security lapses at facilities that house biological threat agents. For example, the unpredictable nature of naturally-occurring disease, such as the novel coronavirus (COVID-19), poses a threat to humans. As of March 5, 2020, COVID-19 has spread from China to nearly 80 countries, including the United States, which has over 150 cases and nearly a dozen deaths associated with the virus. This novel virus poses a public health and economic threat, and may eventually be declared a pandemic, as seen with severe acute respiratory syndrome (SARS) in 2003. Infectious diseases, such as coronaviruses, can be transmissible from animals to humans, demonstrating how our relationships with animals may increase the risk of disease transmission among people, pets, livestock, and wildlife.

Continuing Operations, Safety and Government Response

Continuing Operations

TRANSCOM/AMC Commercial Aircraft Cabin Aerosol Dispersion Tests		
Accession Number:	Report Date:	Access Restrictions:
AD1117734	12/14/2020	Approved for Public Release.
Author:	Silcott, David; Kinahan, Sean; Santarpia, Joshua; Silcott, Blake; Silcott, Peter; Silcott, Braden; Distelhorst, Steven; Herrera, Vicki; Rivera, Danielle; Crown, Kevin; Lucero, Gabriel; Bryden, Wayne; McLoughlin, Mike; Cetta, Maximilian; Accardi, Russell	
Corporate Author:	National Strategic Research Institute, Lincoln	
Identifiers:	Commercial Aircraft Cabins, Aerosol Dispersion Tests, Viral Shedding, Infectious Dose, Fluorescent Tracer Aerosol Detection, DNA-Tagged Microspheres, Nebulization, Airframe Testing, In-Flight Testing, ground testing, IBAC sensors, IBAC (Instantaneous Biological Analyzer and Collector), Breathing zones, Transmission model calculations	
Abstract:	The COVID-19 pandemic, has led to questions regarding the potential risk of SARS-CoV-2 exposure, which may lead to transmission, amongst passengers on an aircraft, and the safety of travelers. It is difficult to determine the potential exposure risk using available computational fluid dynamics models or contact tracing methods, due to the lack of experimental validation of aerosol transport in the aircraft environment and the lack of detailed tracking of human interactions in aircraft. Using fluorescent aerosol tracers between 1-3 micro m and real time optical sensors, coupled with DNA-tagged tracers to measure aerosol deposition, we completed the largest aircraft aerosol experimental validation testing to date, with 8 days of testing involving both inflight and ground tests on Boeing 777-200 and 767-300 airframes. Tracer aerosols were released from a simulated infected passenger, in multiple rows and seats, to determine their risk of exposure and penetration into breathing zones of nearby seats. In particular, penetration into the breathing zones of passengers seated in the same row and in numerous rows in front and back of the source were measured. Over 300 aerosol release tests were performed repeatedly releasing 180,000,000 fluorescent tracer particles from the aerosol source (simulated virus aerosol), with 40+ Instantaneous Biological	

	Analyzer and Collector (IBAC) sensors placed in passenger breathing zones for real-time measurement of simulated virus particle penetration. In total, more than 11,500 breathing zone seat measurements were taken with releases in 46 seats of the airframes. Results from the Boeing 777-200 and 767-300 airframes showed a minimum reduction of 99.7% of 1 micro m simulated virus aerosol from the index source to passengers seated directly next to the source. An average 99.99% reduction was measured for the 40+ breathing zones tested in each section of both airframes.
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An Outbreak of Covid-19 on an Aircraft Carrier		
Accession Number:	Report Date:	Access Restrictions:
AD1115097	11/11/2020	Approved for Public Release.
Author:	Kasper, Matthew R; Geibe, Jesse R; Sears, Christine L; Riegodedios, Asha J; Luse, Tina; Von Thun, Annette M; McGinnis, Michael B; Olson, Niels; Houskamp, Daniel; Fenequito, Robert; Burgess, Timothy H; Armstrong, Adam W; DeLong, Gerald; Hawkins, Robert J; Gillingham, Bruce L	
Corporate Author:	Bureau Of Medicine And Surgery (Navy) Falls Church, VA	
Descriptors:	Ethnic Groups, Health, Health Care, Hospitalizations, Disease Outbreaks, Military Medicine, Aircraft Carriers, Hospitals, United States, Navy, Hygiene, Public Health, Quarantine, USS Theodore Roosevelt, Viruses, Pain, SARS, Health Services, Medical Personnel	

TATRC Times. October 2020, Volume 6, Qtr. 3		
Accession Number:	Report Date:	Access Restrictions:
AD1115684	10/1/2020	Approved for Public Release.
Corporate Author:	Telemedicine And Advanced Technology Research Center (Tatrc) Fort Detrick, MD	
Descriptors:	Mobile, Telemedicine, Health Services, Medical Personnel, Military Medicine, Patient Care, Delivery Of Health Care, Warfare, Combat Casualty Care	
Identifiers:	Telemedicine and Advanced Technology Research Center	
A quarterly newsletter of the Telemedicine and Advanced Technology Research Center.		

The Effect of Arrival Quarantine on Subsequent COVID-19 Testing in a Cohort of Military Basic Trainees		
Accession Number:	Report Date:	Access Restrictions:
AD1111321	10/1/2020	Approved for Public Release.
Author:	Marcus, Joseph E; Frankel, Dianne; Pawlak, Mary; Casey, Theresa; Enriquez, Erin; Yun, Heather	
Corporate Author:	59th MDW San Antonio, Texas	

Descriptors:	Quarantine, Trainees, Basic Training, Air Force Personnel, Signs And Symptoms, Diseases And Disorders, Intervention, Diarrhea, Medical Specialties, Respiratory System
Identifiers:	Non Pharmaceutical Interventions
<p>The COVID-19 pandemic has been associated with significant spread in congregate settings and various forms of non-pharmaceutical interventions (NPI) have been implemented to prevent spread. Basic Military Training at Joint Base-San Antonio is the entrance to the US Air Force and has been associated with respiratory outbreaks in the past. A two-week arrival quarantine was implemented in March 2020. Effects on subsequent testing for COVID-19 after an arrival quarantine is unknown. The first four weekly cohorts of trainees who underwent an arrival quarantine between March 16-April 13 were monitored during their 7 week training for COVID-19 symptoms. Symptoms, medical testing, and days removed from training were collected on every patient with possible COVID-19 symptoms including cough, shortness of breath, or fever. Testing during the two-week arrival quarantine were compared to the subsequent five weeks of training. Nominal variables were compared by chi squared or Fishers exact test as appropriate. Continuous variables were compared by Mann-Whitney U Test. A total of 2,573 started training during study period, 89(3.4 percent) had symptoms concerning for COVID-19 and were tested. 5(6 percent) patients tested positive, all of whom in the arrival quarantine. Compared to patients who completed quarantine(n=29), patients in the arrival quarantine who tested negative for COVID-19(n=54)were tested more often (26 trainees a week vs. 5.8 later in training, p=less than 0.01), and received more rapid flu tests (74 percent vs. 38 percent, p= less than 0.01)and multiplex respiratory PCR (15 percent vs. 0 percent, p=0.05).Trainees in quarantine were isolated longer for symptoms than patients who completed quarantine(median 3 vs. 2, p=0.01). There was no difference in presenting symptoms for trainees in quarantine or after quarantine.</p>	

<p>Non-Pharmaceutical Interventions and Military Hygiene at the United States Military Academy between 1890 and 1910</p>		
Accession Number:	Report Date:	Access Restrictions:
AD1108647	9/1/2020	Approved for Public Release.
Corporate Author:	Military Academy West Point, NY	
Descriptors:	Military Hygiene, Military Medicine, United States Military Academy, Preventive Medicine, Infectious Diseases, Bacteria	
<p>Introduction. Military installations are at increased risk for the transmission of infectious disease. Personnel who live and train on military installations live and train near one another facilitating disease transmission. An understanding of historical sanitation and hygiene can inform modern practices. This is especially pertinent considering the continuing rise of variants of infectious diseases, such as the recent pandemic of the 2019 severe acute respiratory syndrome coronavirus 2. In this article, we review the rise and decline of infectious disease at the United States Military Academy (USMA) during the period spanning 1890 through 1910, and the public health interventions used to combat disease spread. Materials and Methods. Primary data regarding cadet illness were acquired</p>		

from the historical archives of the USMA. These included annual reports, clinical admission records, casualty ledgers, and sanitation reports. Unpublished documents from the medical history of USMA provide periodic trends of health among cadets because of infectious disease. Results. Between 1890 and 1910, the USMA at West Point was confronted with cases of influenza, measles, mumps, scarlet fever, smallpox, typhus, and malaria. In response, a series of non-pharmaceutical interventions (NPIs) were instituted to curb the spread of infectious disease. These interventions most likely proved effective in suppressing the transmission of communicable diseases. The most common and arguably the most effective NPI was the physical separation of the sick from the well. Conclusions. The USMA experience mirrored what was occurring in the larger U.S. Army in the early 20th century and may serve as a model for the application of NPIs in response to modern infectious diseases resulting from novel or unknown etiologies.

Outcomes of Coronavirus Disease 2019 Drive Through Screening at an Academic Military Medical Center		
Accession Number:	Report Date:	Access Restrictions:
AD1106683	7/17/2020	Approved for Public Release.
Author:	Lindholm, David A; Kiley, John L.; Jansen, Nathan K.; Hoard, Robert T.; Bondaryk, Matthew R; Stanley, Elizabeth M.; Alvarado, Gadiel R.; Markelz, Ana E; Cybulski, Robert J; Okulicz, Jason F.	
Corporate Author:	Brooke Army Medical Center, Fort Sam Houston, TX	
Descriptors:	Medical Screening, Infection Control, Military Hospitals, Patient Care, Public Health, Delivery Of Health Care, Personal Protective Equipment	
Identifiers:	Drive Through, BAMC (Brooke Army Medical Center)	
Drive-through coronavirus disease 2019 screening can evaluate large numbers of patients while reducing healthcare exposures and personal protective equipment use. We describe the characteristics of screened individuals as well as drive-through process and outcome measures. Optimal drive-through screening involves rapid turnaround of test results and linkage to follow-up care.		

A Leader's Guide to Crisis Communication: Lessons from Ebola for COVID-19		
Accession Number:	Report Date:	Access Restrictions:
AD1104686	6/30/2020	Approved for Public Release.
Author:	Tetteh, Hassan A	
Corporate Author:	Association of Military Surgeons of the United States, Gaithersburg, United States	

Descriptors:	Disease Outbreaks, Ebola Virus, Leadership, Lessons Learned, Public Health, United States Africa Command, West Africa, Hospitals, Pandemics, Governments, Medical Personnel, Health Services
Identifiers:	Crisis Communication
<p>A crisis is defined as a critical turning point, a time of intense difficulty, or danger when an associated important decision is made to protect individuals from harm and save lives. Indeed, in their book <i>Theorizing Crisis Communication</i>, professors Timothy Sellnow and Matthew Seeger outline over 2 dozen typologies of crisis. They assert that a crisis poses a significant threat to high priority goals such as life, property, security, health, and psychological stability.² Collectively, the threats to high priority goals create anxiety and stress, and often require some immediate action by leaders in response to the crisis to limit and contain harm. Clear communication by leaders during a crisis is essential to limit harm and ultimately resolve the crisis. General axioms of crisis communication include preparation, communication plan development, and coordination of message through designated personnel.³ However, even in the best cases, critical information can be lost in communication and consequently place lives at risk. The consideration of what to communicate and how to communicate during a crisis using lessons learned from the Ebola outbreak as well as lessons now emerging from the Coronavirus Disease 2019 (COVID-19) pandemic is the focus of this perspective. This perspective offers practical guidelines for leaders identified here as the 3 Ws and 4Cs of crisis communication. These factors offer a checklist to be readily applied in a crisis, as well as in training for crisis response.</p>	

Memorandum for SECDEF: Restore "Shock" in Strategic Planning		
Accession Number:	Report Date:	Access Restrictions:
AD1104694	5/5/2020	Approved for Public Release.
Author:	Freier, Nathan; Hume, Robert; Schaus, John	
Corporate Author:	Army War College, Carlisle Barracks, PA	
Descriptors:	Department Of Defense, National Security, Public Health, Lessons Learned, Defense Planning, Leadership, Risk Analysis, United States, Federal Budgets, Influenza	
Identifiers:	Strategic Planning, Strategic Warning, DoD Implementation Plan For Pandemic Influenza, 2006 National Strategy For Pandemic Influenza, 2008 National Defense Strategy	
<p>The Department of Defense (DOD) needs to re-institutionalize horizon scanning for strategic shock and integrate this perspective into its strategy, plans, and risk assessment. Defense-relevant strategic shocks are disruptive, transformational events for DOD. Though their precise origin and nature are uncertain, strategic shocks often emerge from clear trends. Shocks are often recognized in advance on some level but are nonetheless shocking because they are largely ignored.</p>		

COVID-19 and the Ethics of Military Readiness		
Accession Number:	Report Date:	Access Restrictions:
AD1104702	4/30/2020	Approved for Public Release.
Author:	Pfaff, C. A.	
Corporate Author:	Army War College, Carlisle Barracks, PA	
Descriptors:	USS Theodore Roosevelt, Operational Readiness, Ethics, Navy, Risk Analysis, Peacetime, Military Personnel	
Identifiers:	Obligated Risks, Wartime	
<p>As is well known, then acting Secretary of the Navy Thomas Modly fired Captain Brett Crozier, captain of the aircraft carrier USS Theodore Roosevelt, after he wrote a letter arguing that all but ten percent of the crew should disembark the ship to prevent the spread of the COVID-19 virus. Doing so, he acknowledged, would diminish the carrier's readiness and slow its response time in a crisis. Justifying that decision, however, he argued, "we are not at war. Sailors do not need to die. If we do not act now, we are failing to properly take care of our most trusted asset our Sailors." The problem for the captain, of course, was not the content of the letter as much as it was the subsequent leak to the San Francisco Chronicle. Setting aside the fiasco that resulted in his firing, and led to Modly's sudden resignation, the captain raises some important concerns regarding what the risks sailors, soldiers, airmen, and marines should be required to take in peacetime. Because it is peacetime, he argues, [W]e cannot allow a single Sailor to perish as a result of this pandemic unnecessarily. Of course, even in war no one should die unnecessarily; however, the captain raises a good question: what risks are necessary in peacetime? To answer that question it is first important to understand what risks are necessary in wartime.</p>		

COVID-19 Monitoring and Response Among US Air Force Basic Military Trainees		
Accession Number:	Report Date:	Access Restrictions:
AD1111292	4/1/2020	Approved for Public Release.
Author:	Marcus, Joseph; Frankel, J. E.; Pawlek, D. N.	
Corporate Author:	59Th MDW San Antonio United States	
Descriptors:	Air Force Personnel, Basic Training, Trainees, Air Force Training, Monitoring, Anti Infective Agents, Disease Outbreaks, Virus Diseases, Viruses, Public Health, Quarantine, Infectious Diseases	
<p>Epidemiology of COVID-19 response at JBSA-Lackland during COVID. Effect of Arrival Quarantine on Subsequent COVID-19 Testing. Perspectives as a trainee doing COVID-19 research. Background on USAF Basic Military Training. ~40,000 trainees/year at Joint Base San Antonio-Lackland (JBSA). ~800 trainees arrive each week. 75 percent male with most in late teens or early 20s. Pre-health screening for underlying medical conditions. Training involves classrooms, small group activities, and field</p>		

exercises. USAF BMT Communal Living. Cohort of 50 trainees. Sleeping quarters. Activities. History of communicable diseases. Head-to-toe bunks. Regular cleaning of shared equipment. Active health surveillance. Diagnostic Testing and Isolation. All trainees were screened by training instructors and positive responses were evaluated by medical staff. SARS-CoV-2 tests Nasal swab, RT-PCR PCR. Initial testing for self-reported ill patients with symptoms and recent close contact or travel from high-transmission area. March 1-15: 2 patients tested. March 16: Symptoms only requirement. Symptomatic persons were isolated in single rooms and monitored; allowed to return 7 days after symptom onset and greater than 3 days post-fever.

[Model Projections: Expected Timelines and Infection Impact for an Outbreak of COVID-19 on a USN Capital Ship](#)

Accession Number:	Report Date:	Access Restrictions:
AD1095576	3/19/2020	Approved for Public Release.
Author:	Dickey, Bradley F.	
Corporate Author:	CNA Analysis And Solutions, Arlington, VA	
Descriptors:	Health Services, Medical Personnel, Infectious Diseases, Quarantine, Disease Outbreaks, Diseases And Disorders, Patient Care, Agent Based Simulations, Virus Diseases, Simulations, Public Health, Infection, Hospitalizations	
Insidious is an agent-based simulation model of infectious disease spread on US Navy ships, developed at PACFLT in March 2020 as a collaboration with CNA, NEPMU-6 and NMCPHC, described at the end of this document.		

[Controlling the Spread of Contagious Disease in an Operational Environment](#)

Accession Number:	Report Date:	Access Restrictions:
AD1099456	2/1/2020	Approved for Public Release
Author:	Burr, Julia K; Cubeta, Robert L; LaViolet, Lucas A; Oxford, Sean M	
Corporate Author:	Institute For Defense Analyses, Alexandria, Virginia	
Descriptors:	Infectious Diseases, Disease Outbreaks, Military Operations, Cost Benefit Analysis, Medical Countermeasures, Quarantine, Public Health, Health Services, Personal Protective Equipment, Situational Awareness	
Identifiers:	Operational Environments, Outbreak Control Measures, Rom (Restriction Of Movement), Contagious, Isolation Quarantine, Biological Outbreak, Outbreak Response, MEDCM (Medical Countermeasures), MTF (Medical Treatment Facilities), PPE (Personal Protective Equipment)	

Should an operationally significant outbreak of infectious disease occur during an ongoing military operation, US and Joint Force Commanders may consider a variety of measures to limit the spread of the outbreak and minimize its impact on operations and on the health of the force. The selection of any measure or set of measures will depend on a variety of factors, including the type of operation, the availability and effectiveness of outbreak control measures, and the potential operational degradation due to outbreak controls. This paper assesses the potential costs and benefits of a variety of outbreak control measures, including medical countermeasures and restrictions of movement, and considers the influence of several operational challenges and disease characteristics on the outcome. From this assessment, the paper derives a set of generalized rules of thumb to support commanders in selecting outbreak controls.

Government Response to COVID-19

SARS-CoV-2 in the U.S. Military - Lessons for Civil Society		
Accession Number:	Report Date:	Access Restrictions:
AD1115092	11/11/2020	Approved for Public Release.
Author:	Michael, Nelson L.	
Corporate Author:	Walter Reed Army Institute Of Research, Silver Spring, MD	
Descriptors:	Pandemics, Infectious Diseases, Virus Diseases, Disease Outbreaks, Military Operations, Quarantine, Health Services, Military Medicine, Military Personnel	
<p>Barr and Podolsky recently commented in the Journal on the long-term influence that military medicine has historically had on medical practice in civil society. They specifically note how the accelerated medical advances made by the military were adopted in civilian sectors during and after World War II, which they discuss in the context of the coronavirus disease 2019 (Covid-19) pandemic. The Department of Health and Human Services and the Department of Defense are using a framework to efficiently develop, test, and implement medical solutions to prevent, detect, and treat severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. Two articles now published in the Journal (online November 11) speak to this historical dialogue they show how medical practices used in the military could inform civilian public health practices with respect to shared living situations during the Covid-19 pandemic.</p>		

A Commons for a Supply Chain in the Post-COVID-19 Era: The Case for a Reformed Strategic National Stockpile		
Accession Number:	Report Date:	Access Restrictions:
AD1114655	11/2/2020	Approved for Public Release.

Author:	Handfield, Robert; Finkenstatdt, Daniel J.; Schneller, Eugene S.; Godfrey, A. B.; Guinto, Peter
Corporate Author:	Naval Postgraduate School Foundation, Monterey, CA
Descriptors:	Supply Chain Management, Contingency Operations (Military), Supply Chain, Personal Protective Equipment
Identifiers:	Strategic National Stockpile, Supply Chain Disruptions
<p>Much of the discussion about the failure of the COVID-19 supply chain has centered on personal protective equipment (PPE) and the degree of vulnerability of care. Prior research on supply chain risks have focused on mitigating the risk of disruptions of specific purchased materials within abounded region or on the shifting status of cross-border export restrictions. But COVID-19 has impacted every purchase category, region, and border. This paper is responsive to the National Academies of Sciences, Engineering and Medicine recommendation to study and monitor disasters and to provide governments with course of action to satisfy legislative mandates. Our analysis draws on our observations of the responses to COVID-19 in regard to acquisition and contracting problem-solving, our review of field discussions and interactions with experts, a critique of existing proposals for managing the strategic national stockpile in the United States a mapping of the responses to national contingency planning phases, and the identification of gaps in current national healthcare response policy frameworks and proposals.</p>	

COVID-19: Missing Puzzle Pieces, Time, and Black Swans		
Accession Number:	Report Date:	Access Restrictions:
AD1102914	7/14/2020	Approved for Public Release.
Author:	Przygodzki, Ronald M.	
Corporate Author:	Department Of Veterans Affairs, Washington DC	
Descriptors:	Department Of Veterans Affairs, Health Services, Health Care, Infectious Diseases, Therapy, Synthetic Biology, Genetics, Pilot Studies, Clinical Trials, Investigative Techniques, Genome, Genetic Structures, Genetic Processes	
<p>The Veterans Affairs (VA) Health Care System cares for over 9.2 million Veterans. Between 8 February and 26 May, over 172,000 have been tested for SARS-CoV-2, with 11,300 testing positive, 8,700 reaching convalescence, and 3,600 hospitalized. The VA Office of Research and Development is embedded in the covered health care entity and is developing several intramural efforts alongside other Federal agencies to overcome this pandemic.</p>		

COVID-19: Lessons to be Learned for National Biosecurity and Future Operational Environments		
Accession Number:	Report Date:	Access Restrictions:
AD1102910	7/14/2020	Approved for Public Release.
Author:	Dieuliis, Diane; Giordano, James	
Corporate Author:	National Defense University, Fort Mcnair, Washington DC	
Descriptors:	Infectious Diseases, Threats, National Security, Biological Factors, Biotechnology, Crisis Management, Risk Management, Lessons Learned, Operational Readiness, Synthetic Biology	
Identifiers:	Biosecurity, Biological Agents, Emergency Preparedness	
<p>The COVID-19 pandemic caused by the SARS-CoV-2 virus brings into stark relief extant inadequacies in both national and global biosecurity preparedness for, and coordinated response to, novel biological risks, threats, and harms. Although there has been much deliberation on bioevents, such discourse has most often been agent-centric and reactive to advancements of adversarial threats. While sound, these approaches have failed to fully anticipate a variety of needs. To stay ahead of the broad scope of threats is to accept the fleeting nature of dominance, envision futures of contested or lost dominance, and prepare plans for rapid transformation of capabilities and deployment. Indeed, this pandemic has revealed gaps in national infrastructures and functions that are necessary to ensure surveillance, accurate and reliable information transfer, and coordination and mobilization of existing resources, goods, and services that are essential to prompt, effective, and sustained response. One can defensibly argue that intelligence and deterrence of chemical, radiological, nuclear, and explosive risks and threats have been well maintained by intra- and international cooperation of various agencies and organizations as well as by the foci, scope, and tenor of international signatory treaties and weapons conventions.</p>		

The Defense Health Agency: Integrating Readiness and Health to Battle COVID-19		
Accession Number:	Report Date:	Access Restrictions:
AD1102908	7/14/2020	Approved for Public Release.
Author:	Place, Ronald J.	
Corporate Author:	Defense Health Agency, Falls Church, VA	
Descriptors:	Health Services, Military Medicine, Health Care, Information Exchange, Knowledge Management, Technical Information Centers, Infectious Diseases, Lessons Learned, Hospitals, Resource Management	
Identifiers:	Medical Readiness, CHIME (COVID-19 Hospital Impact Model For Epidemics)	

Today, we are in an unprecedented fight against an infectious disease, COVID-19, requiring a joint, synchronized effort across DoD. The Military Health System is serving on the front lines of this fight, enlisting our brightest medical experts and researchers and bringing to bear our vast, world-class system of health care and unique medical combat support capabilities. The Defense Health Agency (DHA) is prepared for this mission. We exist to ensure every Soldier, Sailor, Airman, and Marine is medically ready to fight tonight and to provide platforms for the uniformed medical force to sustain their medical skills. Along the way, we embrace our responsibility to care for military families so they can focus on the mission. All told, we serve 9.5 million service members, retirees, and family members every day across the globe.

Empowering Academic Labs and Scientists to Test for COVID-19		
Accession Number:	Report Date:	Access Restrictions:
AD1105943	6/25/2020	Approved for Public Release.
Author:	Steel, James J.; Stiko, John C.; Adkins, Matthew G.; Hasstedt, Steven C.; Rohrer, Joseph W.; Almand, Erin A.	
Corporate Author:	Air Force Academy, Colorado Springs, CO	
Descriptors:	Public Health, Infectious Diseases, Virus Diseases, Diagnosis (Medicine), Accelerated Testing, Diagnostic Techniques (Medicine), Laboratories, Universities, Scientists, Research Facilities	
Identifiers:	Asymptomatic, Academic Labs, Nonmedical Academic Scientists, QRT PCR (Quantitative Reverse Transcription PCR)	
<p>The lack of widespread COVID-19 testing and the prevalence of asymptomatic infections have been major factors in the current pandemic. Despite the improvements in clinical testing, as we move toward reopening USA, widespread surveillance testing becomes critical. Academic (nonmedical) labs can help provide such testing; the CDC-approved guidelines for COVID-19 testing require routine equipment and protocols that are commonly used in academic research labs around the country. Faculty at the authors' institution were successfully able to test asymptomatic students for COVID-19. By empowering nonmedical academic scientists with preexisting knowledge, expertise with the protocols, and access to the instruments, an additional 1.23.5 million COVID-19 tests could be processed each day at local universities and academic labs.</p>		

Department of Veterans Affairs' Potential Role in Addressing the COVID-19 Outbreak		
Accession Number:	Report Date:	Access Restrictions:
AD1099600	3/20/2020	Approved for Public Release.
Author:	Panangala, Sidath V.; Sussman, Jared S.; Dortch, Cassandra; Gaffney, Jonathan M.; Perl, Libby; Salazar, Heather M.	

Corporate Author:	Congressional Research Service, Library Of Congress, Washington DC
Descriptors:	Respiratory Tract Diseases, Department Of Veterans Affairs, Public Health Emergencies, Emergency Response, Public Health, Therapy, Medical Personnel
<p>This report provides an overview of VAs response thus far to this rapidly evolving COVID-19 pandemic. It does not provide an exhaustive description of all of the department's activities, and it is based on very limited publicly available information from VA.</p>	

Overview: The Department of Defense and COVID-19		
Accession Number:	Report Date:	Access Restrictions:
AD1099586	3/31/2020	Approved for Public Release.
Author:	Mcinnis, Kathleen J.	
Corporate Author:	Congressional Research Service, Library Of Congress, Washington DC	
Descriptors:	Department Of Defense, Missions, Unified Combatant Commands, National Guard, Personal Protective Equipment, Army Research Laboratories, Military Medicine, Military Capabilities, Humanitarian Assistance, Construction, Military Strategy	
Identifiers:	Defense Support To Civil Authorities, Combatant Commands, Defense Health Agency, Defense Logistics Agency, Undersecretary Of Defense (Policy), Military Laboratories, Defense Threat Reduction Agency, Defense Advanced Research Projects Agency, Medical Capabilities, Hospital Ships	
<p>The Department of Defense (DOD) is one of many U.S. government agencies participating in the Federal Emergency Management Agency (FEMA)-led COVID-19 national response framework. As developments unfold, interest has grown regarding what DOD might be able to contribute to the U.S. governments COVID-19 response. On March 24, 2020, Secretary of Defense Esper stated that DOD's top COVID-19 priorities are protecting the Defense Department's people, maintaining military readiness, and supporting the whole-of-government interagency response. With respect to whole-of-government response, below is a non-exhaustive survey of some DOD capabilities that might be applied to the current situation if directed to do so.</p>		

COVID-19: Industrial Mobilization and Defense Production Act (DPA) Implementation		
Accession Number:	Report Date:	Access Restrictions:
AD1099590	3/25/2020	Approved for Public Release.
Author:	Cecire, Michael H.; Peters, Heidi M.	

Corporate Author:	Congressional Research Service, Library Of Congress, Washington DC
Descriptors:	Acquisition, Emergencies, Medical Equipment And Supplies, Government Procurement, Military Acquisition, Health, Mobilization, Industrial Mobilization, National Security, Congress
Identifiers:	Defense Production Act Of 1950, Federal Priorities And Allocations System, Health Resources Priority And Allocations System
<p>On March 18, President Trump issued Executive Order 13909, Prioritizing and Allocating Health and Medical Resources to Respond to the Spread of COVID19, which announced the Presidents invocation of the Defense Production Act of 1950 (DPA) in response to the COVID-19 pandemic. The administration has yet to publicly provide direction to the private sector under this authority. This Insight considers possible future DPA implementation processes, industrial mobilization, and congressional considerations concerning the COVID-19 pandemic, and is a companion to CRS Insight IN11231. See CRS Report R43767 for a more in-depth discussion of DPA history and authorities. For additional related resources, see the CRS Coronavirus Disease 2019 homepage.</p>	

COVID-19 and the World Stage

<p>PEPFAR's response to the convergence of the HIV and COVID-19 pandemics in Sub-Saharan Africa</p>		
Accession Number:	Report Date:	Access Restrictions:
AD1105917	7/12/2020	Approved for Public Release.
Author:	Golin, Rachel; Godfrey, Catherine; Firth, Jacqueline; Lee, Lana, Minior; Thomas, Phelps; B. R., Raizes; Elliot G., Ake; Julie A., Siberry; George K.	
Corporate Author:	United States Agency For International Development, Washington DC	
Descriptors:	Saharan Africa, Infectious Diseases, HIV Infections, Patient Care, Public Health, Governments, Health Services, Health Care	
Identifiers:	HIV Care Continuum, PEPFAR, Readiness, Response	
<p>The COVID-19 pandemic reached the African continent in less than three months from when the first cases were reported from mainland China. As COVID-19 preparedness and response plans were rapidly instituted across sub-Saharan Africa, many governments and donor organizations braced themselves for the unknown impact the COVID-19 pandemic would have in under-resourced settings with high burdens of PLHIV. The potential negative impact of COVID-19 in these countries is uncertain, but is estimated to contribute both directly and indirectly to the morbidity and mortality of PLHIV, requiring countries to leverage existing HIV care systems to propel COVID-19 responses, while safeguarding PLHIV and HIV program gains. In anticipation of COVID-19-related disruptions, PEPFAR promptly established guidance to rapidly adapt HIV programs to maintain essential HIV services while protecting recipients of care and staff from COVID-19. This commentary reviews PEPFARs COVID-19</p>		

technical guidance and provides country-specific examples of program adaptations in sub-Saharan Africa.

Global Futures Report: Alternative Futures of Geopolitical Competition in a Post-Covid-19 World: A Collaborative Analysis with Foresight Practitioners and Experts

Accession Number:	Report Date:	Access Restrictions:
AD1108029	6/15/2020	Approved for Public Release.
Author:	Sotiriadis, Jake S.; Grove, Jairus V.; Cunzeman, Kara; Hunstock, Laura; Schenker, Jason; Zakem, Vera; McGurk, Shannon; Maziad, Marwa	
Corporate Author:	Strategic Foresight And Futures Branch, Air Force Warfighting Integration Capability, Washington DC	
Descriptors:	Air Force, Aerial Warfare, Aircrafts, Warfare, Foreign Relations, Artificial Intelligence, National Politics, National Security, Unmanned Aerial Vehicles, International Organizations, International Relations, Intergovernmental Organizations	
Identifiers:	Violent Extremist Organizations, Remotely Piloted Aircraft, Special Use Airspace), Unmanned Aerial Vehicle, Necessities Occupations Information Systems External, Personal Protective Equipment, Improvised Explosive Devise	

The COVID-19 pandemic sheds an important light on the criticality of futures-based thinking to move us beyond conventional assumptions and positions. In today’s chaotic cycle of rapid change, growing complexity, and radical uncertainty, the national security establishment must develop the skills and flexibility to adapt to the unexpected. To be sure, the fallout from COVID-19 has revealed overlooked vulnerabilities for our supply chains, our society, our economy, and most pertinent for this report our national security strategy, which relies on all three. The primary aim of this report is to disrupt how we conceptualize national security futures. Rather than arrive at definitive conclusions or prescribe budgetary, policy, or force structure recommendations, this document instead challenges us to consider how the future can defy accepted probabilities to affect the Department of Defense and the Department of the Air Force. We are living far from equilibrium system, when novel and even catastrophic change are most likely. However, in every alternative future no matter how severe or unexpected there are always winners and losers. The organizations best positioned to seize and incorporate the exploits of the new order will be those with the capability to perceive, learn, and adapt even when the signals from tomorrow may seem utterly ridiculous today. We develop four overarching, global scenarios that feature transformation, collapse, discipline, and continued growth outcomes. These global scenarios do not represent the most probable or likely outcomes rather, the report harnesses emerging weak signals from environmental scanning analysis (that likely seem improbable today) and weaves them into the possible futures of a post-COVID world.

COVID-19 and Indo-Pacific Strategy: Korea is Up, China is Down, and the US (For Now) is Out		
Accession Number:	Report Date:	Access Restrictions:
AD1104718	5/4/2020	Approved for Public Release.
Author:	Schaus, John; Freier, Nathan	
Corporate Author:	Army War College, Carlisle Barracks, PA	
Descriptors:	South Korea, China, Government (Foreign), United States Government, Strategy, Commerce, International Trade, Army, Department Of Defense	
Identifiers:	Indo Pacific Strategy	
<p>The COVID-19 pandemic has led to over three million confirmed infections and more than one hundred thousand dead globally. In the United States, over sixty thousand people have died and more than 1 million have been infected. According to epidemiologists, this is only the first phase. Thus, near-term success against the outbreak reflects a current snapshot in time, not necessarily a permanent outcome. In light of our very preliminary understanding of the long-term impact of the outbreak and national-level responses, there are discernible trends about how countries responses are impacting their standing in key regions and around the world. Few regions offer such stark contrast in stories as the Indo-Pacific. In that region, South Korea is up, China is down, and the United States is out. These shifts may or may not endure. What is increasingly clear, however, is that ineffective responses perceived at home or abroad will limit policy makers' freedom of action for some time to come.</p>		

Strategic Multilayer Assessment Special Topics Paper: The COVID Crisis: Implications for United States- and Global- Biosecurity		
Accession Number:	Report Date:	Access Restrictions:
AD1097149	4/22/2020	Approved for Public Release.
Author:	Venkatram, Vikram; Giordano, James	
Corporate Author:	Georgetown University, Washington DC	
Descriptors:	Disease Outbreaks, Public Health, Antiviral Agents, Health Services, Immune System, Antibodies, Serology, Infection, Medical Equipment And Supplies, Ventilators, Test Methods, Kits, Drug Therapy	
Identifiers:	Biosecurity, Polymerase Chain Reaction	
<p>The United States (US) engagement of public health resources to meet the current SARS-CoV-2 (COVID-19) crisis has revealed vulnerabilities in testing and treatment components of biosecurity. Facing a severe shortage of available testing kits, the US Centers for Disease Control (CDC) attempted to develop its own test for COVID-19, rather than following World Health Organization (WHO) recommendations for testing methods¹. The lack of tests has made it difficult to track exactly how</p>		

many people within each state, as well as the US at-large have been affected, which has implications both for the extent of public health response, and considerations for approaches to stabilize and sustain the national economy.

The Chinese Dream Has Awakened to a Global Nightmare: A Case for US-China Cooperative Security to Regain Stability in the Wake of Coronavirus

Accession Number:	Report Date:	Access Restrictions:
AD1107337	3/20/2020	Approved for Public Release.
Author:	Sutton, Edward L.	
Corporate Author:	Air Command And Staff College, Maxwell AFB, AL	
Descriptors:	Foreign Policy, International Relations, Public Health, Economic Development, Local Governments, Industrial Production, Agreements, China, National Politics	
Identifiers:	US China Cooperative Security, Domestic Policy Challenges	

Domestic reality in China during the reign of Xi Jinping has always been dichotomous. On one hand, most contemporary Chinese believe their lives have rapidly improved and will continue to do so. On the other hand, citizens suspect improvement comes at the cost of corruption by the insidiously repressive tiers of the Chinese Communist Party (CCP)--or cadre management system--and express discontent regarding asymmetries and inequities observed in development among different segments of society. The CCP is keenly aware of this tension and insecure that collective improvement--equitable or otherwise--will raise popular expectations for continued growth and development to levels difficult to sustain.

Defense Production Act

COVID-19: Defense Support of Civil Authorities

Accession Number:	Report Date:	Access Restrictions:
AD1099638	4/2/2020	Approved for Public Release.
Author:	Kapp, Lawrence; Ott, Alan	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
Descriptors:	Aeromedical Evacuation, Combat Support Hospitals, Disasters, Governments, Homeland, Emergencies, Care, Public Emergencies, Department of Defense, Department of Homeland, Hospitals, Medical Personnel, Public, Services	
Identifiers:	NRF (National Response Framework), ESF (Emergency Support Function)	

The U.S. military has a long history of providing support to civil authorities, particularly in response to disasters or emergencies (examples include responding to yellow fever epidemics in 1873 and 1878). The Department of Defense (DOD) defines defense support of civil authorities as Support provided by U.S. Federal military forces, DOD civilians, DOD contract personnel, DOD Component assets, and National Guard forces (when the Secretary of Defense, in coordination with the Governors of the affected States, elects and requests to use those forces in Title 32, U.S.C., status) in response to requests for assistance from civil authorities for domestic emergencies, law enforcement support, and other domestic activities, or from qualifying entities for special events. (DOD Directive 3025.18, 18.) Defense support of civil authorities for major incidents is typically carried out in accordance with the National Response Framework (NRF), which is a guide to how the Nation responds to all types of disasters and emergencies. (NRF, p. 2) Among other things, it establishes broad lines of authority for federal government agencies to prepare for and respond to any terrorist attack, major disaster, or other emergency.

COVID-19: Industrial Mobilization and Defense Production Act (DPA) Implementation		
Accession Number:	Report Date:	Access Restrictions:
AD1099590	3/25/2020	Approved for Public Release.
Author:	Cecire, Michael H.; Peters, Heidi M.	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
Descriptors:	Acquisition, Emergencies, Medical Equipment and Supplies, Government Procurement, Military Acquisition, Health, Mobilization, Industrial Mobilization, National Security, Congress	
Identifiers:	DPA (Defense Production Act of 1950), FPAS (Federal Priorities and Allocations System), HRPAS (Health Resources Priority and Allocations System)	
<p>On March 18, President Trump issued Executive Order 13909, Prioritizing and Allocating Health and Medical Resources to Respond to the Spread of COVID19, which announced the Presidents invocation of the Defense Production Act of 1950 (DPA) in response to the COVID-19 pandemic. The administration has yet to publicly provide direction to the private sector under this authority. This Insight considers possible future DPA implementation processes, industrial mobilization, and congressional considerations concerning the COVID-19 pandemic, and is a companion to CRS Insight IN11231. See CRS Report R43767 for a more in-depth discussion of DPA history and authorities. For additional related resources, see the CRS Coronavirus Disease 2019 homepage.</p>		

Defense Production Act: Purpose and Scope		
Accession Number:	Report Date:	Access Restrictions:
ADA501341	5-14-2009	Approved for Public Release.

Author:	Else, Daniel H.
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC
Descriptors:	Industrial Production, National Defense, Legislation, Defense Industry, Industrial Mobilization, Corporations, National Security, History, Supplies, Demand (Economics), Availability, Homeland Security, Weapon Systems, Industrial Modernization, Preparation, Investments, Department Of Defense, Military Equipment
Identifiers:	Defense Production Act, DHS (Department Of Homeland Security), Price Controls, Wage Controls, Corporate Mergers, Corporate Acquisitions, Legal Immunity, Energy Supplies, Defense Related Products, Military Preparedness, Foreign Investments, Defense Priority
<p>The Defense Production Act (DPA) was created at the outset of the Korean War to ensure the availability of the nation's industrial resources to meet the national security needs of the United States by granting the President powers to ensure the supply and timely delivery of products, materials, and services to military and civilian agencies. The DPA codifies a robust legal authority given the President to force industry to give priority to national security production and is the statutory underpinning of governmental review of foreign investment in U.S. companies. DPA authorities are not permanent. Rather, they are time-limited, undergoing periodic amendment and reauthorization. Of the seven titles contained within the original Act, four have been repealed. In 2008, Congress reauthorized the remaining titles of the DPA through September 30, 2009.</p>	

Drug Treatments

Baricitinib plus Remdesivir for Hospitalized Adults with Covid-19		
Accession Number:	Report Date:	Access Restrictions:
AD1118396	12/11/2020	Approved for Public Release.
Author:	Kalil, Andre C; Patterson, Thomas F; Mehta, Aneesh K; Tomashek, Kay M; Wolfe, Cameron R; Ghazaryan, Varduhi; Marconi, Vincent C; Ruiz-Palacios, Guillermo M; Hsieh, Lanny; Kline, Susan	
Corporate Author:	Nebraska University Medical Center, Omaha, NE	
Descriptors:	California, Disease Outbreaks, Geographic Regions, Health, Health Care, United States, Virus Diseases, Embolism And Thrombosis, Hospitals, Minority Groups, North America, Birds, Ethnic Groups, Patient Care, Therapy, Infectious Diseases, Airway Management, Health Services	

Relationship between Anti-Spike Protein Antibody Titers and SARS-CoV-2 In Vitro Virus Neutralization in Convalescent Plasma		
Accession Number:	Report Date:	Access Restrictions:
AD1105910	6/9/2020	Approved for Public Release.
Author:	Salazar, Eric; Kuchipudi, Suresh V.; Paulsen, Paul A.; Eagar, Todd N.; Yi, Xin; Zhao, Picheng; Jin, Zhicheng; Long, S. W.; Olsen, Randall J.; Chen, Jian; Castillo, Brian; Leveque, Christopher; Towers, Dalton M.; Lavinder, Jason; Gollihar, Jimmie D.; Cardona, Jose; Ippolito, Gregory C.; Nissly, Ruth H.; Bird, Ian M.; Greenawalt, Denver; Rossi, Randall M.; Gontu, Abinhay; Srinivasan, Sreenidhi; Poojary, Indira B.; Cattadori, Isabella M.; Hudson, Peter J.; Joselyn, Nicole; Prugar, Laura; Hule, Kathleen; Herbert, Andrew; Bernard, David W.; Dye, John; Kapur, Vivek; Musser, James M.	
Corporate Author:	Army Medical Research Institute Of Infectious Diseases, Fort Detrick, MD	
Descriptors:	Respiratory Tract Diseases, Infectious Diseases, Proteins, Blood Transfusions, Therapy, Antibodies, Blood Plasma, Clinical Trials, Assays, Pathogens	
Identifiers:	Virus Neutralization, VN Titers, Plasma Donation, Plasma Donors, Antibody Titers, Anti Receptor Binding Domain Igg Titers, Anti Spike Ectodomain Igg Titers	
<p>Newly emerged pathogens such as SARS-CoV-2 highlight the urgent need for assays that detect levels of neutralizing antibodies that may be protective. We studied the relationship between anti-spike ectodomain (ECD) and anti-receptor binding domain (RBD) IgG titers, and SARS-CoV-2 virus neutralization (VN) titers generated by two different in vitro assays using convalescent plasma samples obtained from 68 COVID-19 patients, including 13 who donated plasma multiple times. Only 23% (16/68) of donors had been hospitalized. We also studied 16 samples from subjects found to have anti-spike protein IgG during surveillance screening of asymptomatic individuals. We report a strong positive correlation between both plasma anti-RBD and anti-ECD IgG titers, and in vitro VN titer. Anti-RBD plasma IgG correlated slightly better than anti-ECD IgG titer with VN titer. The probability of a VN titer 160 was 80% or greater with anti-RBD or anti-ECD titers of 1:1350. Thirty-seven percent (25/68) of convalescent plasma donors lacked VN titers 160, the FDA-recommended level for convalescent plasma used for COVID-19 treatment. Dyspnea, hospitalization, and disease severity were significantly associated with higher VN titer. Frequent donation of convalescent plasma did not significantly decrease either VN or IgG titers. Analysis of 2,814 asymptomatic adults found 27 individuals with anti-RBD or anti-ECD IgG titers of 1:1350, and evidence of VN1:160. Taken together, we conclude that anti-RBD or anti-ECD IgG titers can serve as a surrogate for VN titers to identify suitable plasma donors. Plasma anti-RBD or anti-ECD titer of 1:1350 may provide critical information about protection against COVID-19 disease.</p>		

Just the facts: What drugs are safe and effective for COVID-19		
Accession Number:	Report Date:	Access Restrictions:
AD1105939	5/22/2020	Approved for Public Release.
Author:	Long, Brit; Liang, Stephen Y.; Rosenberg, Hans; Hicks, Christopher; Gottlieb, Michael	
Corporate Author:	Washington University School Of Medicine, St. Louis, Missouri	
Descriptors:	Respiratory Tract Diseases, Cardiovascular Physiological Phenomena, Infection, Therapy, Inhibitors, Antimalarials, Anti-Bacterial Agents, Drug Therapy, Biomedical Research	
Identifiers:	Remdesivir, Chloroquine, Hydroxychloroquin , Lopinavir, Ritonavir	
<p>A 53-year-old male presents with cough, fever, and myalgias for 7 days. Vitals include temperature, 38.0C; heart rate, 110; blood pressure, 118/70mm Hg; respiration rate, 28; and oxygen saturation 83% on room air. His only past medical history is hypertension. Your community is in the midst of the coronavirus disease 2019 (COVID-19) pandemic. The patient is hypoxic but responds to oxygen supplementation with nasal cannula and a face mask. His chest x-ray demonstrates multifocal infiltrates. Are there any therapeutic agents currently available for COVID-19?</p>		

Pandemic Plans and Managing Resources

COVID-19 Pandemic

Periodic Refresher Emails for Emergency Department Mass Casualty Incident Plans		
Accession Number:	Report Date:	Access Restrictions:
AD1087138	11/4/2020	Approved for Public Release.
Author:	Carlson, Krista R; Nelson, Jessie G; Hevesi, Sara; Welborn, Robert; Eide, Benjamin; Winkler, Meredith; Peterson, Marissa K; Ramey, Elizabeth	
Corporate Author:	59th Medical Wing, San Antonio, Texas	
Descriptors:	Patient Care, Curriculum, Education, Emergencies, Paramedics, Training, Casualties	
Identifiers:	MCI (Mass Casualty Incident)	
<p>Audience and type of curriculum: This mass casualty incident (MCI) curriculum is intended for use as refresher content in the months between more formal education, such as hands-on MCI training and drills. The target audience for each topic varies, but the majority of them apply to all disciplines such as direct patient care roles (emergency room technicians, nurses, paramedics, practitioners, etc.) and emergency department clerks/coordinators. Topics intended for only one or more discipline are labeled as such. See curriculum chart or email schedule (Appendix AK) for details.</p>		

Molecular Architecture of Early Dissemination and Massive Second Wave of the SARS-CoV-2 Virus in a Major Metropolitan Area		
Accession Number:	Report Date:	Access Restrictions:
AD1113840	10/30/2020	Approved for Public Release.
Corporate Author:	Methodist Hospital, Houston, TX	
Descriptors:	Public Health, Infectious Diseases	
<p>We sequenced the genomes of 5,085 severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) strains causing two coronavirus disease 2019 (COVID-19) disease waves in metropolitan Houston, TX, an ethnically diverse region with 7 million residents. The genomes were from viruses recovered in the earliest recognized phase of the pandemic in Houston and from viruses recovered in an ongoing massive second wave of infections. The virus was originally introduced into Houston many times independently. Virtually all strains in the second wave have a Gly614 amino acid replacement in the spike protein, a polymorphism that has been linked to increased transmission and infectivity. Patients infected with the Gly614 variant strains had significantly higher virus loads in the nasopharynx on initial diagnosis. We found little evidence of a significant relationship between virus genotype and altered virulence, stressing the linkage between disease severity, underlying medical conditions, and host genetics. Some regions of the spike protein--the primary target of global vaccine efforts--are replete with amino acid replacements, perhaps indicating the action of selection. We exploited the genomic data to generate defined single amino acid replacements in the receptor binding domain of spike protein that, importantly, produced decreased recognition by the neutralizing monoclonal antibody CR3022. Our report represents the first analysis of the molecular architecture of SARS-CoV-2 in two infection waves in a major metropolitan region. The findings will help us to understand the origin, composition, and trajectory of future infection waves and the potential effect of the host immune response and therapeutic maneuvers on SARS-CoV-2 evolution.</p>		

DARPA's Pandemic-Related Programs		
Accession Number:	Report Date:	Access Restrictions:
AD1106136	6/30/2020	Approved for Public Release.
Author:	Gallo, Marcy E.	
Corporate Author:	Congressional Research Service, Washington United States	
Descriptors:	National Security, Infectious Diseases, Pandemics, Biological Warfare, Biomedical Research	
<p>The Defense Advanced Research Projects Agency (DARPA) has contributed to the development of important military and commercial technologies, including stealth and personal electronics. DARPA's role and investments in defense-related research and development (R and D), including biological defense, has potential significance for the science and technology available to address the Coronavirus Disease 2019 (COVID-19) pandemic and any future biological threats. Advances in</p>		

genome sequencing and editing, along with the application of engineering principles and computing and information sciences to the field of biology, have created opportunities to accelerate and expand the development of biotechnology products and processes. Although DARPA has invested in biological research since its establishment in 1958, in 2014 the agency created the Biological Technologies Office, which focuses specifically on the biological sciences and biotechnology.

Assessment of the Angolan (CHERRT) Mobile Laboratory Curriculum for Disaster and Pandemic Response

Accession Number:	Report Date:	Access Restrictions:
AD1108696	4/13/2020	Approved for Public Release.
Author:	Owens, Michael D.; Lloyd, Michael L.; Brady, Tyler M.; Gross, Robin	
Corporate Author:	Naval Medical Center, Portsmouth, VA	
Descriptors:	Emergency Medicine, Ebola Virus, Public Health, Disease Outbreaks, Virus Diseases, Infectious Diseases, Health Services, Medical Personnel, Angola, Biomedical Research	
Identifiers:	Rapid Response	

Introduction: As of April 5, 2020, the World Health Organization reported over one million confirmed cases and more than 62,000 confirmed coronavirus (COVID-19) deaths affecting 204 countries/regions. The lack of COVID-19 testing capacity threatens the ability of both the United States (US) and low middle income countries (LMIC) to respond to this growing threat. The purpose of this study was to assess the effectiveness through participant self-assessment of a rapid response team (RRT) mobile laboratory curriculum. Methods: We conducted a pre and post survey for the purpose of a process improvement assessment in Angola, involving 32 individuals. The survey was performed before and after a 14-day training workshop held in Luanda, Angola, in December 2019. A paired t-test was used to identify any significant change on six 7-point Likert scale questions with < 0.05 (95% confidence interval).

Advanced Preparation Makes Research in Emergencies and Isolation Care Possible: The Case of Novel Coronavirus Disease (COVID-19)

Accession Number:	Report Date:	Access Restrictions:
AD1105931	3/30/2020	Approved for Public Release.
Author:	Brett-Major, David M; Schnaubelt, Elizabeth R; Creager, Hannah M; Lowe, Abigail; Cieslak, Theodore J; Dahlke, Jacob M; Johnson, Daniel W; Fey, Paul D; Hansen, Keith F; Hewlett, Angela L; Gordon, Bruce G; Kalil, Andre C; Khan, Ali S; Kortepeter, Mark G; Kratochvil, Christopher J; Larson, LuAnn; Levy, Deborah A; Linder, James; Medcalf, Sharon J; Rupp, Mark E; Schwedhelm,	

	Michelle M; Sullivan, James; Vasa, Angela M; Wadman, Michael C; Lookadoo, Rachel E; Lowe, John-Martin J; Lawler, James V; Broadhurst, M J.
Corporate Author:	University Of Nebraska Medical Center, Omaha, NE
Descriptors:	Virus Diseases, Infectious Diseases, Respiratory Tract Diseases, Health Care, Public Health Emergencies, Public Health, Therapy, Quarantine, Health Services, Viruses
<p>The optimal time to initiate research on emergencies is before they occur. However, timely initiation of high quality research may launch during an emergency under the right conditions. These include an appropriate context, clarity in scientific aims, preexisting resources, strong operational and research structures that are facile, and good governance. Here, Nebraskan rapid research efforts early during the 2020 coronavirus disease pandemic, while participating in the first use of U.S. federal quarantine in 50 years, are described from these aspects, as the global experience with this severe emerging infection grew apace. The experience has lessons in purpose, structure, function, and performance of research in any emergency, when facing any threat.</p>	

General Pandemic Plans and Responses

Development of a New, More Effective Live-Attenuated Influenza Vaccine: An Essential Platform for Future Pandemic Protection		
Accession Number:	Report Date:	Access Restrictions:
AD1088156	9/1/2019	Approved for Public Release.
Author:	Dewhurst, Stephen	
Corporate Author:	University Of Rochester, Rochester, NY	
Descriptors:	Influenza, Respiratory Tract Diseases, Vaccines, Therapy, Safety	
Identifiers:	Live Attenuated Influenza Vaccine, Efficacy	
<p>Vaccination is the most cost-effective approach by which the spread of a pandemic influenza virus could be prevented, and severe disease reduced. However, current influenza vaccines have had poor efficacy. Thus, it is very important to develop a new and more effective live-attenuated influenza vaccine (LAIV). We hypothesize that by understanding the molecular basis for the temperature sensitive (ts) and attenuated (att) phenotypes of LAIV, it will be possible to develop a new, more effective live-attenuated influenza vaccine that leverages LAIVs superior ability to protect against infection by diverse influenza viruses. Our goal is to develop a new and improved LAIV that has enhanced safety and efficacy, due to (1) a greater temperature sensitivity than current LAIVs, resulting in viral replication only in the lower temperatures of the nasal cavity and extreme upper airway and (2) high levels of virus gene expression but poor replication resulting in abundant protein expression (and immunogenicity) but minimal production of infectious progeny virus.</p>		

Department of Defense Armed Forces Health Surveillance Branch Integrated Biosurveillance Section Northeastern DRC Ebola Surveillance Summary		
Accession Number:	Report Date:	Access Restrictions:
AD1097328	1/25/2019	Approved for Public Release
Corporate Author:	Defense Health Agency, Falls Church, VA	
Descriptors:	Ebola Virus, Health Services, Surveillance, Virus Diseases	
<p>From 30 APR 2018 to 22 JAN 2019, the Democratic Republic of the Congo (DRC) Ministry of Health (MOH) has reported 713 (+50) confirmed and probable Ebola virus disease (EVD) cases, from 18 (+1, Kayna) health zones (HZs) in North Kivu and Ituri provinces in northeastern DRC with an additional 203 suspected cases are under investigation. While EVD cases initially peaked in early AUG 2018, a second and third peak occurred in mid-and late-NOV 2018, with an increase in incidence throughout NOV compared to previous months (see WHO's epidemic curve). Katwa HZ continues to account for the majority of newly confirmed and probable cases; from 15-22 JAN 2019, this HZ has reported 60% of all newly confirmed and probable cases. According to the MOH, families from confirmed EVD cases in Katwa HZ are reluctant to be vaccinated; this may explain why the HZ continues to report the majority of new cases. Among the confirmed and probable cases, there have been 439 (+32) deaths (case fatality proportion 62%). As of 22 JAN 2019, confirmed and probable cases have been reported from Beni(226 (+1)), Katwa(146 (+30)), Mabalako (106 (+1)), Kalunguta(53 (+1)), Butembo (52 (+2)), Oicha(27 (+2)), Kyondo(12 (+1)), Vuhovi(11 (+2)), Masereka (8), Musienene(7(+1)), Kayna(5), Biena(4(+2)), Manguredjipa(3 (+2)) and Mutwanga(3) HZsin North Kivu Province. In Ituri Province, cases have been reported from Komanda(27), Mandima(20), Tchomia(2), and Nyankunde(1) HZs. From 1 DEC 2018 to 14 JAN 2019, 36% of newly confirmed cases have occurred in children <15 years of age, according to WHO. As of 23 JAN 2019, no confirmed EVD cases have been reported outside of the DRC; however, the high level of population movement between the affected areas and neighboring countries continues to create opportunities for cross-border disease transmission. As of 28 SEP 2018, WHO assessed the risk of EVD spread at the national and regional levels as very high and the global risk as low.</p>		

A Model Of Creating Inpatient Hospital Surge Capacity Through Early Discharge		
Accession Number:	Report Date:	Access Restrictions:
AD1065361	9/1/2018	Approved for Public Release.
Author:	Dunne, William J	
Corporate Author:	Naval Postgraduate School, Monterey, CA	
Descriptors:	Emergency Response, Infectious Diseases, Physicians, Emergencies, Disaster Management, Disasters, Health Care Facilities, Health Care, Patient Care, Medical Personnel, Health Services	

Identifiers:	Mass Casualty, Reverse Triage, Crisis Care, Surge Capacity, Incident Management, Mass Casualty Incident, Modified Early Warning System For Clinical Deterioration, Sequential Organ Failure Assessment
<p>When catastrophic disasters strike, health care systems are often faced with overwhelming volumes of patients to treat (patient surge). While many governmental and policy organizations have outlined recommendations to build surge capacity, there has been little research on specific strategies to accommodate these significant patient loads. Specifically, a concept known as reverse triage, which allows clinicians to assess current patients for possible discharge or reduction in the level of their clinical care, is still poorly understood. This research study investigated the utility of a structured assessment tool to predict the ability of a current patient to be discharged or downgraded in the event of a catastrophic disaster. Clinicians were provided a mock scenario and asked to use their clinical judgment or a structured assessment tool. The charts of patients were then reviewed 96 hours after the assessments were completed to determine whether predictions were accurate. This pilot study showed that the assessment tool was slightly better at predicting which patients could be safely discharged and which needed to remain admitted. This project serves as a first foray of research into this area and will initiate broader discourse and additional studies. The goal is to provide clinicians with stronger guidance vetted in scientific evidence and supported in ethical, legal, and moral context to make difficult decisions in the face of catastrophic disaster situations.</p>	

<p>If We Don't, Who Will? The Employment of the United States Army to Combat Potential Pandemic Outbreaks in West Africa</p>		
Accession Number:	Report Date:	Access Restrictions:
ADA623976	6/12/2015	Approved for Public Release.
Author:	Smith, Sylvan A.	
Corporate Author:	Army Command And General Staff College, Fort Leavenworth, KS	
Descriptors:	Ebola Virus, Humanitarian Assistance, Military Forces (United States), West Africa, Army, Influenza, Medical Services, National Security, Nongovernmental Organizations, Strategy	
Identifiers:	Ebola Virus Disease, United States Army, American Red Cross, Civilian Response Corps, Crisis Surge Support Staff, Joint Task Force United Assistance, Line Of Effort, National Security Strategy, Operation United Assistance, Quadrennial Defense Review, United States Agency For International Development, Legal Authority, Morals	
<p>A glance at a newspaper or news program between May through June of 2014 tells the story. The Ebola virus developed into the foremost major crisis in West Africa, more specifically Liberia. The Liberian government became increasingly unable to manage the situation and the pandemic outbreak threatened to de-stabilize civil society. But what does this have to do with the United States? Why should Americans worry about a virus affecting people 4,600 miles away? Beyond providing medical aid and money, why would the U.S. deploy the Army into this crisis area? What would such a military</p>		

operation look like? These questions will be explored in order to support or refute use of the Army in response to potential pandemic outbreaks in West Africa.

Surviving the Storm: Expanding Public Health's Capabilities in Response to the Increasing Threats Posed by Novel Viruses		
Accession Number:	Report Date:	Access Restrictions:
ADA621630	12/1/2013	Approved for Public Release.
Author:	Mackie, Daniel P.	
Corporate Author:	Naval Postgraduate School, Monterey, CA	
Descriptors:	Antiviral Agents, Influenza Virus, Medicine, Public Health, Antibiotics, Chemotherapy, Cytokines, Drugs, Epidemiology, Filters, Global, Pipelines, Population, Preventive Medicine, Response, Stockpiles, Therapy, Theses, Threats, Viruses	
Identifiers:	Pandemic Influenza, H1N1, H5N1, H7N9, MERS (Middle Eastern Respiratory Syndrome), HCOV (Human Coronavirus), Prophylaxis, ARDS (Acute Respiratory Distress Syndrome), Medications, Therapies, Antibiotics, Corticosteroids, Interferons, Herbal Medications, Lipitor, Zocor, Gemfibrozil, Herbal Medicines	
<p>As the planet's population continues to grow at rate that will see a global population of nine billion people by the year 2050, is an era being entered into which pandemics involving novel viruses are the new norm? If that idea is possible, then are drug therapies (approved by the FDA or in the pipeline for its approval) available that either limit virus replication within a host cell, or reduce the body's hyper-immune response (also known as cytokine storm) to novel or pandemic strain viruses with which states could supplement their existing stockpiles? This research explores six classes of medications that could potentially assist state-level governments in expanding their state-level stockpiles, to include more treatment and prophylaxis options, in the face of pandemics involving novel viruses. The results of this research were filtered through three criteria (medical efficacy, cost, logistical considerations) that narrow the field of candidate therapies down to four specific findings: one generic version of the antiviral called Ribavirin, and generic versions of the statins called Lipitor, Zocor and Gemfibrozil. This research may be applied to state and local-level public health agencies interested in bolstering their existing stockpiles for pandemic preparedness.</p>		

Lessons from the 1918 Influenza Pandemic: Using Historical Examples to Inform the Department of Defense's Response to the Next Pandemic		
Accession Number:	Report Date:	Access Restrictions:
ADA601783	4/1/2013	Approved for Public Release.

Author:	Grindel, Kevin S.
Corporate Author:	Marine Corps Command And Staff College, Quantico, VA
Descriptors:	Department Of Defense, History, Influenza, Humanitarian Assistance, Lessons Learned, Lethality, Operational Readiness, Planning, Policies, Quarantine, Response, Strategy
Identifiers:	1918 Influenza, Diseases Of Operational Significance, H1N1 Flu, International Quarantine, Pandemic Influenza, Spanish Influenza, National Strategy For Pandemic Influenza
<p>Pandemic influenza has had an impact on militaries and societies in the past, and will again, because the virus remains endemic worldwide and mutates rapidly, negating human immunity. Based on the lessons from the 1918 pandemic and the US National Strategy for Pandemic Influenza the Department of Defense should expand its implementation plan in order to enforce containment of a future pandemic and respond to humanitarian assistance needs of partner nations. The influenza pandemic of 1918 was the most rapidly lethal pandemic in history and provided lessons that should inform current policy. The National Strategy for Pandemic Influenza presents clear guidance on the priorities of protecting the United States through isolation and supporting allied and partner nations in the event of the next pandemic. In order to maintain a credible readiness, DOD should seek to align the Department of Defense Implementation Plan for Pandemic Influenza with the broader goals of the National Strategy.</p>	

Toward Integrated DoD Biosurveillance: Assessment and Opportunities		
Accession Number:	Report Date:	Access Restrictions:
ADA591427	1/1/2013	Approved for Public Release.
Author:	Moore, Melinda; Fisher, Gail; Stevens, Clare	
Corporate Author:	Rand Arroyo Center, Santa Monica, CA	
Descriptors:	Biological Warfare, Bioterrorism, Department Of Defense, Detection, Early Warning Systems, Infectious Diseases, Mass Destruction Weapons, Surveillance, Animals, Epidemics, Food Poisoning, Humans, Military Budgets, Missions, Natural Disasters, Plants (Botany), Policies, Public Health, Situational Awareness, Threats	
Identifiers:	Biosurveillance, All Hazards Threats, Animal Health, Plant Health, Environmental Disasters, Food Borne Illnesses, Force Health Protection, Performance Measures, Health Surveillance	
<p>Biosurveillance is a cornerstone of public health. In July 2012, the White House issued the National Strategy for Biosurveillance, which defines the term and sets out key functions and guiding principles. The Department of Defense (DoD) carries out biosurveillance to monitor the health of military and affiliated populations and supports biosurveillance in other countries through a range of programs</p>		

across the department. The Deputy Secretary of Defense issued interim guidance in June 2013 for implementation of the new National Strategy. This begins to set formal policy for DoD's biosurveillance enterprise. The Office of Management and Budget (OMB) recognized the importance of effective DoD biosurveillance not only for the department itself but also within the context of the National Strategy. With this in mind, OMB tasked DoD to carry out a comprehensive examination of its biosurveillance enterprise to determine priority missions and desired outcomes, the extent to which DoD biosurveillance programs contribute to these missions, and whether the current funding system is appropriate and how it can be improved to ensure stable funding. DoD leaders designated the Armed Forces Health Surveillance Center (AFHSC) to lead this assessment effort. AFHSC sought objective external analytic support from the RAND Arroyo Center, a component of the RAND Corporation, to respond to the tasks specified by OMB: Task 1: Identify a prioritized list of the program's missions and desired outcomes, and develop performance measures and targets to track progress toward achieving those outcomes; Task 2: Evaluate how the current array of DoD biosurveillance program assets contributes to achieving these prioritized missions; and Task 3: Assess whether the current funding system is appropriate and how it can be improved to assure stable funding.

Hospital Viability during a Pandemic Influenza Outbreak		
Accession Number:	Report Date:	Access Restrictions:
ADA501495	6/1/2009	Approved for Public Release.
Author:	Blackwell, Jeffrey K.	
Corporate Author:	Army Command And General Staff College, Fort Leavenworth, KS	
Descriptors:	Crisis Management, National Security, Epidemics, Influenza, Protective Equipment, Emergencies, Health Care Facilities, Catastrophic Conditions, Law Enforcement, Public Safety, Health Care Management, Hospitals, Viability, Hazards, Disasters, Methodology, Logistics	
Identifiers:	Pandemic Influenza, Spanish Flu Of 1918, Emergency Management, Hurricane Katrina, Influenza National Health Services, Swine Influenza, Viability Checklist, Human Health, Animal Health, Continuity Of Operations, Avian Influenza, Critical Infrastructure, World Health Organization	
<p>In the past 8 years since September 11, many improvements have been made to the National response capabilities; however, the "all hazards" approach is still inadequate to respond to a moderate pandemic outbreak. Shortcomings of our fragile healthcare framework combined with the prolonged duration of a pandemic make it difficult to prepare for such a catastrophic disaster. Therefore, the purpose of this study was to investigate the factors ensuring hospital viability during a pandemic influenza outbreak. To accomplish this, the study employed a comparative case study methodology utilizing four prominent emergency management events: 1918, Spanish flu (H1N1); 2003, SARS outbreak; 2005, Hurricane Katrina, and the 2009, Swine flu (H1N1) outbreak, for the purpose of finding common measures enabling a hospital to mitigate, prepare, respond, and recover</p>		

from a pandemic. After reviewing the case study literature, 117 viability measures were identified. Furthermore, the concepts from the literature review coupled with the case study results led to discovery of seven hospital viability measures that will assist in mitigating a moderate pandemic, which are: maintaining a hospital's critical axis, staffing, security, logistics, surge capacity, public affairs, and emergency operations planning. Focusing preparedness efforts in these areas will provide protection from the next pandemic.

Protection Through PPE and Decontamination

Aerosol Particles

Aerosol and surface contamination of SARS-CoV-2 observed in quarantine and isolation care		
Accession Number:	Report Date:	Access Restrictions:
AD1105922	7/29/2020	Approved for Public Release.
Author:	Santarpia, Joshua L., Rivera, Danielle N., Herrera, Vicki L., Morwitzer, M. J., Creager, Hannah M., Santarpia, George W., Crown, Kevin K., Brett-Major, David M., Schnaubelt, Elizabeth R., Broadhurst, M. J., Lawler, James V., Reid, Patrick, Lowe, John J.	
Corporate Author:	University Of Nebraska, Omaha, NE	
Descriptors:	Infectious Diseases, Respiration Disorders, Respiratory Tract Diseases, Aerosols, Contamination, Quarantine, Patient Care, Biomedical Research, Public Health, Virus Diseases, Health Services, Medical Personnel, Coronaviruses	
Identifiers:	Surface Contamination, Isolation Care, Airborne	
<p>The novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) originated in Wuhan, China in late 2019, and its resulting coronavirus disease, COVID-19, was declared a pandemic by the World Health Organization on March 11, 2020. The rapid global spread of COVID-19 represents perhaps the most significant public health emergency in a century. As the pandemic progressed, a continued paucity of evidence on routes of SARS-CoV-2 transmission has resulted in shifting infection prevention and control guidelines between classically-defined airborne and droplet precautions. During the initial isolation of 13 individuals with COVID-19 at the University of Nebraska Medical Center, we collected air and surface samples to examine viral shedding from isolated individuals. We detected viral contamination among all samples, supporting the use of airborne isolation precautions when caring for COVID-19 patients.</p>		

Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1		
Accession Number:	Report Date:	Access Restrictions:
AD1094854	3/17/2020	Approved for Public Release.

Author:	Van Doremalen, Neeltje; Bushmaker, Trenton; Morris, Dylan H.; Holbrook, Myndi G.; Gamble, Amandine; Williamson, Brandi N.; Tamin, Azaibi; Harcourt, Jennifer L.; Thornburg, Natalie J.; Gerber, Susan I.; Lloyd-Smith, James O.; De Wit, Emmie; Munster, Vincent J.
Corporate Author:	National Institute Of Allergy And Infectious Diseases, Hamilton, MT
Descriptors:	Infectious Diseases, Viruses, Diseases And Disorders, Disease Outbreaks, Virus Diseases, Respiratory Tract Diseases, Environment, Aerosols, Surfaces, Stainless Steel, Microorganisms
Identifiers:	Surface Stability, Decay Rate, Plastic, Copper, Cardboard, Stability Kinetics, Half Life
<p>A novel human coronavirus that is now named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (formerly called HCoV-19) emerged in Wuhan, China, in late 2019 and is now causing a pandemic.¹ We analyzed the aerosol and surface stability of SARS-CoV-2 and compared it with SARS-CoV-1, the most closely related human coronavirus.²We evaluated the stability of SARS-CoV-2 and SARS-CoV-1 in aerosols and on various surfaces and estimated their decay rates using a Bayesian regression model (see the Methods section in the Supplementary Appendix, available with the full text of this letter at NEJM.org). SARS-CoV-2nCoV-WA1-2020 (MN985325.1) and SARS-CoV-1Tor2 (AY274119.3) were the strains used. Aerosols(<5 micron) containing SARS-CoV-2 (105.25 50%tissue-culture infectious dose [TCID50] per milliliter)or SARS-CoV-1 (106.75-7.00 TCID50 per milliliter)were generated with the use of a three-jet Collison nebulizer and fed into a Goldberg drum to create an aerosolized environment. The inoculum resulted in cycle-threshold values between20 and 22, similar to those observed in samples obtained from the upper and lower respiratory tract in humans.</p>	

Asymptomatic Shedding of Respiratory Virus Among an Ambulatory Population Across Seasons		
Accession Number:	Report Date:	Access Restrictions:
AD1090961	7/11/2018	Approved for Public Release.
Author:	Birger, Ruthie; Morita, Haruka; Comito, Devon; Filip, Ioan; Galanti Marta; Lane, Benjamin; Ligon, Chanel; Rosenbloom, Daniel; Shittu, Atinuke; Ud-Dean, Minhaz; Desalle, Rob; Planet, Paul; Shaman, Jeffrey	
Corporate Author:	Columbia University, New York	
Descriptors:	Respiratory Tract Diseases, Public Health, Human Population, Influenza, Diseases And Disorders, Environmental Health, Sampling, Infection, Pain	
Identifiers:	Asymptomatic Infection, Population Health, Respiratory Viruses	
<p>Most observation of human respiratory virus carriage is derived from medical surveillance; however, the infections documented by this surveillance represent only a symptomatic fraction of the total infected population. As the role of asymptomatic infection in respiratory virus transmission is still largely unknown and rates of asymptomatic shedding are not well constrained, it is important to</p>		

obtain more-precise estimates through alternative sampling methods. We actively recruited participants from among visitors to a New York City tourist attraction. Nasopharyngeal swabs, demographics, and survey information on symptoms, medical history, and recent travel were obtained from 2,685 adults over two seasonal arms. We used multiplex PCR to test swab specimens for a selection of common respiratory viruses. A total of 6.2% of samples (168 individuals) tested positive for at least one virus, with 5.6% testing positive in the summer arm and 7.0% testing positive in the winter arm. Of these, 85 (50.6%) were positive for human rhinovirus (HRV), 65 (38.7%) for coronavirus (CoV), and 18 (10.2%) for other viruses (including adenovirus, human metapneumovirus, influenza virus, and parainfluenza virus). Depending on the definition of symptomatic infection, 65% to 97% of infections were classified as asymptomatic. The best-fit model for prediction of positivity across all viruses included a symptom severity score, Hispanic ethnicity data, and age category, though there were slight differences across the seasonal arms. Though having symptoms is predictive of virus positivity, there are high levels of asymptomatic respiratory virus shedding among the members of an ambulatory population in New York City.

Opto-aerodynamic Focusing of Aerosol Particles		
Accession Number:	Report Date:	Access Restrictions:
AD1094867	9/26/2017	Approved for Public Release.
Author:	Pan, Yong-Le; Kalume, Aimable; Wang, Chuji; Santarpia, Joshua L.	
Corporate Author:	Army Research Lab, Adelphi, MD	
Descriptors:	Aerosols, Particles, Measurement, Laser Beams, Scattering	
Identifiers:	Particle Focusing, Optical Forces, Aerosol Particles, Drag Forces, Co Axial Nozzles, Particle Stream, Photophoretic Forces	
<p>We describe a new method for focusing and concentrating a stream of moving micron-sized aerosol particles in air. The focusing and concentrating process is carried out by the combined drag force and optical force that is generated by a double-layer co-axial nozzle and a focused doughnut-shaped hollow laser beam, respectively. This method should supply a new tool for aerosol science and related research.</p>		

An Experimental Investigation of the Performance of a Collison Nebulizer Generating H1N1 Influenza Aerosols		
Accession Number:	Report Date:	Access Restrictions:
ADA623663	4/4/2015	Approved for Public Release.
Author:	Ibrahim, Essam; Harnish, Delbert; Kinney, Kimberly; Heimbuch, Brian; Wander, Joseph	

Corporate Author:	Air Force Civil Engineer Center (Detachment 1 East), Tyndall AFB, FL
Descriptors:	Aerosols, Atomization, Influenza Virus, Particle Size, Viability
Identifiers:	Bioaerosols, Collison Nebulizer, H1N1 Virus, Count Median Diameter, Particle Size Distribution, Virus Viability
<p>The performance of a Collison nebulizer delivering viable H1N1 influenza aerosols was assessed in terms of particle size distribution (PSD) and survivability of the virus upon generation. An H1N1 influenza virus preparation in egg allantoic fluid was diluted in sterile deionized water to a concentration of 3.4 10⁶ TCID₅₀/mL. The virus suspension was aerosolized at air flow rates of 2, 6 and 12 L/min using a 1-jet, 3-jet and 6-jet Collison nebulizer, respectively. A scanning mobility particle sizer measured the PSD of the viral aerosol after steady-state delivery times of 1, 15, 30, 45 and 60 min. After 60 min of continuous aerosolization, the viral titre was unchanged and the count median diameter (CMD) of the aerosol PSD was 38 nm for the 2 L/min flow rate, 35 nm for the 6 L/min flow rate and 33 nm for the 12 L/min flow rate. The CMDs were much smaller than the influenza virus (80-120 nm), indicating the aerosol distribution comprised mainly nonviable materials. The PSD produced by the Collison nebulizer exhibited a 20% increase in peak particle concentration after 60 min of continuous operation at 12 L/min. This progressive increase in particle counts may be attributed to a combination of evaporation and shear and impact stresses imparted on components by the Collison nebulizer. The possible slight loss in H1N1 influenza viability over the course of 60 min of continuous aerosolization at 12 L/min is consistent with previous bioaerosol studies using a Collison nebulizer.</p>	

Decontamination

A Multi-Layered Air Defense Model to Protect Shared Air in Critical Infrastructure Sectors		
Accession Number:	Report Date:	Access Restrictions:
AD1109781	7/13/2020	Approved for Public Release.
Author:	Nelson,Paul H.; Ervin,Mark D.; Norton,Robert A.; Galvagno,Samuel M.	
Corporate Author:	Air University Maxwell AFB, United States	
Descriptors:	Decontamination, Department of Defense, Respiratory Tract Diseases, Respirators, Disinfection, Biomedical Research	
Identifiers:	Clean Air, Multi Layered Air Defense	
<p>The authors recommend using the NIOSH hierarchy of controls model when addressing COVID mitigation. They recommend investing in research to externally validate technologies as part of a multi-layered air defense model to protect critical infrastructure sectors.</p>		

Use of Ultraviolet Germicidal Irradiation (UVGI) for COVID-19 Decontamination Purposes		
Accession Number:	Report Date:	Access Restrictions:

AD1110390	5/3/2020	Approved for Public Release.
Author:	Hope, Janiece; Harrington, Lawrence	
Corporate Author:	711 Human Performance Wing Wright-Patterson AFB United States	
Descriptors:	Decontamination, Department of Defense, Respiratory Tract Diseases, Respirators, Disinfection, Biomedical Research	
Identifiers:	Irradiation, UVGI (ultraviolet germicidal irradiation), Respirators	
<p>This document was crafted in response to multiple inquiries regarding the use of Ultraviolet Germicidal Irradiation (UVGI) for decontamination and includes general information on the use of UVGI. More specifically, this document includes detailed responses for two specific areas of concern that have been of interest in the DoD, decontamination and reuse of filtering facepiece respirators and the use of UVGI to disinfect an occupied space.</p>		

<p>Evaluation of the Performance of Iodine-Treated Biocidal Filters Under the Influence of Environmental Parameters</p>		
Accession Number:	Report Date:	Access Restrictions:
ADA586855	2/1/2013	Approved for Public Release.
Author:	Woo, Myung-Heui, Li, Hsing-Wang, Wu, Chang-Yu	
Corporate Author:	Florida University, Gainesville, Department Of Environmental Engineering Sciences	
Descriptors:	Air Filters, Disinfection, Iodine, Biological Aerosols, Contamination, Humidity, Irradiation, Microorganisms, Threats, Ultraviolet Lamps, Viruses	
Identifiers:	Antimicrobials, Bioaerosols, Ms2 Coli Phage, Respiratory Protection, Viral Aersols, Triiodide Resin Filters, Pe0909999F, Wuafrlgovtl0X0Cj, Ql102008	
<p>This project final report summarizes a collaborative effort to evaluate the ability of a patented product in which a contact-transfer disinfectant, poly(4-styrene[trimethylammonium]methyl triiodide) [PSTI] is incorporated into an air filter medium to disinfect penetrating bioaerosols. After several false starts a quenching experiment capturing MS2 phage particles filtered through PSTI and captured in thiosulfate solution in an impinger showed that the iodine--aerosol chemistry is slow, and that earlier work based on capture-and-culture methods are blinded by the efficiency of kill by iodine in any aqueous medium. Moderate dependencies of bioaerosol characteristics and stability on environmental conditions and delivery medium were measured and reported. A device and method to achieve reproducible, controlled deposition of viable viral and bacterial aerosol droplets was developed, which created a tool for "standardized contamination" of test articles that can be used to quantify and compare cleaning and decontamination methods. Alternative approaches to on-the-fly disinfection were developed and tested as possible alternatives to PSTI or another reactive air</p>		

filtration medium as an enhancement to protectivity of next-generation individual and collective respiratory protective gear---particularly in potentially infective environments---and HVAC filters.

Inactivation of Aerosolized Biological Agents using Filled Nanocomposite Materials		
Accession Number:	Report Date:	Access Restrictions:
ADA574012	2/1/2013	Approved for Public Release.
Author:	Grinshpun, S. A., Schoenitz, M., Dreizin, E., Adhikari, A., Reponen, T., Yermakov, M.	
Corporate Author:	Cincinnati University, OH	
Descriptors:	Biological Agents, Composite Materials, Air Flow, Airborne, Bacillus Subtilis, Biological Aerosols, Combustion, Energetic Properties, Iodine, Pathogenic Microorganisms, Spores, Viruses	
Identifiers:	Bio Agent Defeat, Bioaerosol Inactivation, Energetic Materials	
<p>In this multi-institutional grant, a new method for inactivating aerosolized biological agents was developed utilizing a new class of energetic materials: filled nanocomposite materials. The implemented approach enabled a controllable release of iodine-based oxidizing species in the combustion environment to inactivate viable airborne bio-agents, such as stress-resistant bacterial spores and viruses. Composites with adjustable Al/I2 ratios were produced. A state-of-the-art experimental facility was developed for studying how novel energetic formulations and their combustion products affect the viability of aerosolized spores and viruses during a short (< 1 s) exposure times. Controlled bioaerosol dispersal and sample collection protocols were developed and optimized. The dry-heat inactivation of aerosolized spores was quantified separately from chemical effects and linked to DNA repair mechanisms. It was concluded that the iodine-containing powder provided significantly more effective inactivation of airborne spores than non-iodinated powders. The results of this research help to better understand physical, physicochemical, and biological properties associated with inactivation of aerosolized bio-agents in combustion environments.</p>		

Disinfection of Airborne Organisms by Ultraviolet-C Radiation and Sunlight		
Accession Number:	Report Date:	Access Restrictions:
ADA566495	7/1/2012	Approved for Public Release.
Author:	Kesavan, Jana; Sagripanti, Jose-Luis	
Corporate Author:	Army Edgewood Chemical Biological Center, APG, MD	
Descriptors:	Biological Aerosols, Ultraviolet Radiation, Aerosol Generators, Decontamination, Disinfection, Sunlight	

Identifiers:	Kill Curves
<p>This report provides background information on UV radiation, selected organisms of potential interest to aerosol researchers, and an overview of the effects of UV light on aerosolized organisms. Aerosol generation methodology and equipment, as well as test methodology used at U.S. Army Edgewood Chemical Biological Center (ECBC), are provided as examples for researchers to compare to their own methodology or as guidance for those newer to this field.</p>	

<p>Improving Protection against Viral Aerosols Through Development of Novel Decontamination Methods and Characterization of Viral Aerosol</p>		
Accession Number:	Report Date:	Access Restrictions:
ADA564821	4/1/2012	Approved for Public Release.
Author:	Woo, Myung-Huei	
Corporate Author:	Florida University, Gainesville, Department Of Environmental Engineering Sciences	
Descriptors:	Influenza Virus, Aerosols, Air Filters, Decontamination, Disinfection, Filtration, Protective Treatments, Respirators, Theses	
Identifiers:	Bioaerosols, Respiratory Protection, Relative Humidities, Microwave Irradiation, Flu Pandemics, Decontamination Of Used Respirators, Pe0609120, Wuafrlql102008	
<p>Although respirators and filters are designed to prevent the spread of pathogenic aerosols, a stockpile shortage is anticipated during the next flu pandemic. Contact transfer and reaerosolization are also concerns. An option to address these potential problems is to decontaminate used respirators/filters for reuse. In this research a droplet/aerosol loading chamber was built and used in decontamination testing to prove a fair comparison of the performance of different decontamination techniques, including antimicrobial chemical agents, microwave irradiation and ultraviolet (UV) irradiation, which were incorporated into filtration systems and tested. The inactivation efficacy of dialdehyde cellulose and starch filters s biocidal filters was investigated. In sufficiently humid conditions both media showed higher removal efficiency and better disinfection capability at lower pressure drop than conventional media. In microwave-assisted filtration systems temperature (T) was found to be a key factor. Relative humidity (RH) was another pivotal parameter at warm-to-hot-water temperatures but became insignificant above 90 C. An examination of the effect of T and RH on UV inactivation revealed that absorption of UV by water and shielding of viruses inside aggregates suppressed inactivation. Varying the spray medium showed that artificial saliva (AS) and beef serum extract (BE) produce a protective effect against UV compared to deionized (DI) water, that RH was not a factor in stability of MS2 coli phage sprayed in AS or BE, and that infectious MS2 particles in DI water displayed a volume-based size distribution but in AS and in BE the size dependence was of a lower order. Whereas AS and BE enhanced stability, adding salts had the opposite effect.</p>		

Personal Protective Equipment

Personal Protective Equipment Optimization Validation		
Accession Number:	Report Date:	Access Restrictions:
AD1116959	9/24/2020	Approved for Public Release.
Author:	Stanek, Clay; Werner, Thomas	
Corporate Author:	Research Facilitation Laboratory And Army Analytics Group, Monterey, AL	
Descriptors:	Personal Protective Equipment, Optimization, Validation, Annealing, Logistics, Simulations, Evolutionary Algorithms, Ventilators	
Identifiers:	Supply, Demand, PPE (Personal Protective Equipment), Digital Annealer, Simulated Annealing, Evolutionary Algorithm, Ventilators	
<p>The Research Facilitation Laboratory (RFL) investigated the logistical benefit to the COVID-19 pandemic using a specialized optimization HW platform known as a Digital Annealer manufactured by the Fujitsu Corporation. The goal of using the DA is to show that highly computationally and combinatorically complex problems are solvable in a fraction of the time on standard CPUs and also capable of generating near-theoretically optimal solutions. This particular problem involved the logistics of transferring PPE supply to PPE demand areas that minimized the mileage traveled while also meeting the demand need as close to full as possible given supplies.</p>		

DIY Face Mask Effectiveness Against COVID-19		
Accession Number:	Report Date:	Access Restrictions:
AD1106208	5/3/2020	Approved for Public Release.
Author:	Trice, Joshua; Mainolfi, James	
Corporate Author:	711th Human Performance Wing, Wright-Patterson AFB, Ohio	
Descriptors:	Protective Masks, Public Health, Personal Protective Equipment, Standards, Bacteriophages, Hygiene, Quarantine, Exposure (Physiology), Vulnerability, Respirators	
Identifiers:	Face Covering, Face Mask, Do It Yourself, Mask Care, Surgical Masks, Effectiveness	
<p>This paper addresses the question of how effective Do It Yourself (DIY) Personal Protective Equipment (PPE), i.e. face masks, are within the general population in mitigating the spread of COVID-19. It references studies comparing the effectiveness of various materials in DIY masks alongside surgical masks and respirators. This is associated with the Department of Defense's COVID-19 announcement for all Total Force members (military personnel, civilian employees, contractors and their family members) to wear a cloth face covering in public settings where social-physical distancing measures are difficult to maintain, especially in areas of significant community-based transmission. Studies have</p>		

shown that holistically given a variety of factors that are discussed in depth in this paper a single layer pillowcase or a 100% cotton t-shirt are the most suitable household materials for an improvised (DIY) face mask. This is due to their breathability, fit factor, and their ability to reduce viral particle transmission by up to 50%. In general, using any type of face mask can decrease viral transmission. However, it is important not to focus on a single intervention in the case of a pandemic, but rather to integrate all effective interventions for optimal protection.³ A DIY face mask will not completely eliminate the possibility of infection with COVID-19, particularly given that there are multiple routes of transmission. But the underlying consensus of all research suggests that DIY cloth facemasks are better than nothing at all. It is vital to note that all DIY face masks, regardless of the efficiency of their filtration or seal, will only have partial effectiveness on their own. They must be used in conjunction with other preventative measures, which include: isolation of infected individuals, immunization, maintaining healthy eating/fitness standards, cough and respiratory etiquette, and regular hand hygiene.

Aerosol Filtration Efficiency of Common Fabrics Used in Respiratory Cloth Masks		
Accession Number:	Report Date:	Access Restrictions:
AD1097926	4/24/2020	Approved or Public Release.
Author:	Konda, Abhiteja; Prakash, Abhinav; Moss, Gregory A.; Schmoltdt, Michael; Grant, Gregory D.; Guha, Supratik	
Corporate Author:	Argonne National Lab, IL	
Descriptors:	Protective Masks, Personal Protective Equipment, Aerosols, Coronaviruses, Respiratory Tract Diseases, Filtration, Efficiency, Fabrics, Textiles, Particle Size, Disease Outbreaks, Particulates, Communicable Disease Control, Infectious Disease Transmission, Porosity, Hygiene, Fibers	
Identifiers:	Cloth Masks, Personal Protection, Face Masks, Respiratory Protection, Respiratory Virus Transmission, Thread Count	
<p>The emergence of a pandemic affecting the respiratory system can result in a significant demand for face masks. This includes the use of cloth masks by large sections of the public, as can be seen during the current global spread of COVID-19. However, there is limited knowledge available on the performance of various commonly available fabrics used in cloth masks. Importantly, there is a need to evaluate filtration efficiencies as a function of aerosol particulate sizes in the 10 nm to 10 micron range, which is particularly relevant for respiratory virus transmission. We have carried out these studies for several common fabrics including cotton, silk, chiffon, flannel, various synthetics, and their combinations. Although the filtration efficiencies for various fabrics when a single layer was used ranged from 5 to 80 and 5 to 95 for particle sizes of <300 nm and >300 nm, respectively, the efficiencies improved when multiple layers were used and when using a specific combination of different fabrics. Filtration efficiencies of the hybrids (such as cotton-silk, cotton-chiffon, cotton-flannel) was >80 (for particles <300 nm) and >90 (for particles >300 nm). We speculate that the enhanced performance of the hybrids is likely due to the combined effect of mechanical and</p>		

electrostatic-based filtration. Cotton, the most widely used material for cloth masks performs better at higher weave densities (i.e., thread count) and can make a significant difference in filtration efficiencies. Our studies also imply that gaps (as caused by an improper fit of the mask) can result in over a 60 decrease in the filtration efficiency, implying the need for future cloth mask design studies to take into account issues of "fit" and leakage, while allowing the exhaled air to vent efficiently. Overall, we find that combinations of various commonly available fabrics used in cloth masks can potentially provide significant protection against the transmission of aerosol particles.

Challenge of N95 Filtering Facepiece Respirators with Viable H1N1 Influenza Aerosols (Postprint)		
Accession Number:	Report Date:	Access Restrictions:
ADA617607	5/1/2013	Approved for Public Release.
Author:	Wander, Joseph D.; Harnish, Delbert A.; Heimbuch, Brian K.; Lumley, April E.; Kinney, Kimberly; Husband, Michael; Shaffer, Ronald E.	
Corporate Author:	Applied Research Associates Inc, Panama City, FL	
Descriptors:	Efficiency, Filtration, Respirators, Biological Aerosols, Exposure (Physiology), Flow Rate, Influenza Virus, Inhalation, Particle Size, Protective Equipment	
Identifiers:	Airborne Influenza Virus, Airstream, Chemical Dynamics, FFR (Filtering Facepiece Respirators), Infectious Aerosols, Inhalation Exposure, Material Surfaces And Interfaces, Pathogenic Bioaerosols, PPE (Personal Protective Equipment), Respiratory Protection, Toxic Aerosols	
<p>Specification of appropriate personal protective equipment for respiratory protection against influenza is somewhat controversial. In a clinical environment, N95 filtering facepiece respirators (FFRs) are often recommended for respiratory protection against infectious aerosols. This study evaluates the ability of N95 FFRs to capture viable H1N1 influenza aerosols. METHODS. Five N95 FFR models were challenged with aerosolized viable H1N1 influenza and inert polystyrene latex particles at continuous flow rates of 85 and 170 liters per minute. Virus was assayed using Madin-Darby canine kidney cells to determine the median tissue culture infective dose (TCID50). Aerosols were generated using a Collison nebulizer containing H1N1 influenza virus at 1×10^8 TCID50/mL. To determine filtration efficiency, viable sampling was performed upstream and downstream of the FFR. RESULTS. N95 FFRs filtered 0.8-microns particles of both H1N1 influenza and inert origins with more than 95% efficiency. With the exception of 1 model, no statistically significant difference in filtration performance was observed between influenza and inert particles of similar size. Although statistically significant differences were observed for 2 models when comparing the 2 flow rates, the differences have no significance to protection. CONCLUSIONS. This study empirically demonstrates that a National Institute for Occupational Safety and Health-approved N95 FFR captures viable H1N1 influenza aerosols as well as or better than its N95 rating, suggesting that a properly fitted FFR reduces inhalation exposure to airborne influenza virus. This study also provides evidence that filtration efficiency is based primarily on particle size rather than the nature of the particle's origin.</p>		

Development of an Advanced Respirator Fit Test Headform (Postprint)		
Accession Number:	Report Date:	Access Restrictions:
ADA594887	11/1/2012	Approved for Public Release.
Author:	Bergman, Michael S.; Zhuang, Ziqing; Palmiero, Andrew; Shaffer, Ronald E.; Hanson, David; Heimbuch, Brian K.; McDonald, Michael; Husband, Michael; Wander, Joseph D.	
Corporate Author:	National Institute For Occupational Safety And Health, Pittsburgh, PA	
Descriptors:	Respirators, Test Equipment, Aerosols, Breathing Masks, Leakage(Fluid), Mannequins, Particles	
Identifiers:	Fit Test, Headforms, N95 Respirators	
<p>Improved respirator test headforms are needed to measure the fit of N95 filtering facepiece respirators (FFRs) for protection studies against viable airborne particles. The objective of this study was to develop and evaluate a medium-size Static (i.e., non-moving, non-speaking) Advanced headform (StAH) for fit testing N95 FFRs. The StAH was developed based on the anthropometric dimensions of a digital headform reported by the National Institute for Occupational Safety and Health and has a silicone polymer skin with defined local tissue thicknesses. Quantitative fit tests were performed on seven N95 FFR models of various sizes and designs. Donnings were performed with and without a pre-test seal checking method. For each method, four replicate FFR samples were tested of each of the seven models with two donnings per replicate, resulting in a total of 56 tests per donning method. Each fit test was comprised of three one-minute exercises: "Normal Breathing" (NB, 11.2 liters per minute (lpm)), "Deep Breathing" (DB, 20.4 lpm), then NB again. A fit factor (FF) for each exercise and an overall test FF were obtained. Analysis of variance methods were used to identify statistical differences among FFs (analyzed as logarithms) for different FFR models, exercises, and donning methods. For each FFR model and for each donning method, the NB and DB FF data were not significantly different ($p > 0.05$). Significant differences were seen in the overall exercise FF data for the two donning methods among all FFR models (pooled data) and in the overall exercise FF data for the two donning methods within certain models. A seal-checking method improved the frequency of obtaining overall exercise FFs > 100. The FFR models, which are expected to achieve FFs > 100 on human subjects, achieved FFs > 100 on the StAH. Further research is needed to evaluate the correlation of FFR fit on the StAH to FFR fit on people.</p>		

Vaccines

A SARS-CoV-2 Vaccine Candidate Would Likely Match All Currently Circulating Variants		
Accession Number:	Report Date:	Access Restrictions:
AD1108657	8/31/2020	Approved for Public Release.

Author:	Dearlove, Bethany; Lewitus, Eric; Bai, Hongjun; Li, Yifan; Reeves, Daniel B.; Joyce, M. G.; Scott, Paul T.; Amare, Mihret F.; Vasan, Sandhya; Michael, Nelson L.; Modjarrad, Kayvon; Rolland, Morgane
Corporate Author:	Jackson (Henry M) Foundation, Bethesda, MD
Descriptors:	Vaccines, Antibodies, Infectious Diseases, Respiratory Tract Diseases, Mutations, Genetic Variation, Statistical Analysis, Viruses
<p>The magnitude of the COVID-19 pandemic underscores the urgency for a safe and effective vaccine. Many vaccine candidates focus on the Spike protein, as it is targeted by neutralizing antibodies and plays a key role in viral entry. Here we investigate the diversity seen in severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) sequences and compare it to the sequence on which most vaccine candidates are based. Using 18,514 sequences, we perform phylogenetic, population genetics, and structural bioinformatics analyses. We find limited diversity across SARS-CoV-2 genomes: Only 11 sites show polymorphisms in >5% of sequences; yet two mutations, including the D614G mutation in Spike, have already become consensus. Because SARS-CoV-2 is being transmitted more rapidly than it evolves, the viral population is becoming more homogeneous, with a median of seven nucleotide substitutions between genomes. There is evidence of purifying selection but little evidence of diversifying selection, with substitution rates comparable across structural versus nonstructural genes. Finally, the Wuhan-Hu-1 reference sequence for the Spike protein, which is the basis for different vaccine candidates, matches optimized vaccine inserts, being identical to an ancestral sequence and one mutation away from the consensus. While the rapid spread of the D614G mutation warrants further study, our results indicate that drift and bottleneck events can explain the minimal diversity found among SARS-CoV-2 sequences. These findings suggest that a single vaccine candidate should be efficacious against currently circulating lineages.</p>	

Accelerating Development of SAR-CoV-2 Vaccines- The Role for Controlled Human Infection Models		
Accession Number:	Report Date:	Access Restrictions:
AD1108663	7/1/2020	Approved for Public Release.
Author:	Deming, Meagan E., Michael, Nelson L., Robb, Merlin, Cohen, Myron S., Neuzil, Kathleen M.	
Corporate Author:	Maryland University, Baltimore, MD.	
Descriptors:	Vaccines, Infection, Safety, Public Health, Biological Therapy, Infectious Diseases	
<p>The third coronavirus outbreak in the past 20years, the SARS-CoV-2 pandemic has caused unprecedented morbidity, mortality, and economic disruption. Safe, effective, and deployableSARS-CoV-2 vaccines are urgently needed to mitigate the consequences of the pandemic and protect from future outbreaks. The accelerated response to Covid-19includes investments in preclinical and clinical</p>		

testing and manufacture of multiple vaccine candidates, with efficacy trials in the United States anticipated to start in July 2020.

Emerging Infectious Disease Diagnostic via Novel Optoelectronic Halo Effect		
Accession Number:	Report Date:	Access Restrictions:
AD1104173	5/1/2020	Approved for Public Release.
Author:	Naughton, Michael J.	
Corporate Author:	Boston College Chesnut Hill	
Descriptors:	Quantum Dots, Biosensors, Genetic Markers, Bioassay, Plasmonics, Nanotechnology, Refractive Index, Tuberculosis, Infectious Diseases, Military Personnel, Sensitivity, Photolithography, Finite Element Analysis	
Identifiers:	Biomarker, Finite Element Modeling, Index Of Refraction, Functionalize, Spectroscopy, Nanofabrication, Metal Nanoparticle, Plasmon Enhanced, Material Optimization, Electron Microscopy, Finite Element Modeling	
<p>Forward deployed military units have a critical need for a robust, low cost, easy to use diagnostic system providing realtime, quantitative, and multiplex capability of identifying biomarkers for infectious disease, including tuberculosis. This is a project to develop a new diagnostic device for detection of a tuberculosis biomarker based on a novel plasmonic halo effect. Various halo nanodevices using a set of chosen metals and dielectrics were simulated and fabricated, and their plasmonicoptical response / sensitivity characterized. A major new finding is that a modified structure has been investigated and shows promise for response in the near infrared, and the architecture may be amenable to rapid detection of viruses.</p>		

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