

Improving health care for veterans with deployment-related lung diseases

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Although research studies have demonstrated an association between military deployment in southwest Asia and lung diseases in veterans—such as asthma, bronchiolitis, or other small airways

disease—there are still research gaps and challenges that veterans can face in getting a diagnosis.

University of Colorado Department of Medicine faculty member Silpa Krefft, MD, MPH, a pulmonary and critical care physician, is leading efforts to improve research and identify potentially beneficial diagnostic and treatment strategies.

Krefft serves as the director of the Post-Deployment Cardiopulmonary Evaluation Network at the Rocky Mountain Regional Veterans Affairs Medical Center, where she oversees a clinical and research program that involves [lung diseases](#) related to military deployment to Iraq and Afghanistan. She also works at National Jewish Health in occupational lung disease research.

"It's important for physicians to have an increased awareness of the spectrum of conditions, and the approach to diagnosis and medical treatment plans need to be tailored to each patient," said Krefft, an assistant professor in the CU Division of Pulmonary Sciences and Critical Care Medicine, during a Grand Rounds presentation.

From burn pits to sandstorms: How deployment can affect respiratory health

Researchers began investigating the potential relationship between military deployment and respiratory diseases after a significant number of service members returned from deployment and were unable to meet physical fitness requirements, sometimes resulting in early medical retirement and an abrupt end to their military career.

"Most commonly reported symptoms included shortness of breath on exertion, cough, wheezing, and chest tightness," Krefft said. "It caused

both veterans in the scientific and medical community to ask if these exercise impairments and respiratory symptoms are related to something in the air."

Over the past 30 years, more than 3.5 million people have been deployed to southwest Asia and nearby regions. Deployment to these locations is associated with complex inhalation hazards that may include burn pit emissions, smoke from fires, desert dust, diesel, combat dust, and debris.

"Multiple studies have reported respiratory symptoms and illnesses following southwest Asia military deployment," Krefft said. "There has been accumulating, compelling evidence that service members deployed to southwest Asia may be at risk of developing a spectrum of respiratory conditions."

The [VA recognizes several respiratory conditions](#) that are presumptively related to burn pit and other toxic exposures among Gulf War era and post-9/11 veterans. These conditions include asthma diagnosed after service, [chronic bronchitis](#), [interstitial lung disease](#), chronic rhinitis, and [chronic obstructive pulmonary disease](#).

Historically, there have been gaps in research of deployment-related respiratory diseases due to a lack of exposure data, both personal monitoring and area sampling.

Struggle to get a diagnosis

Although there are clear diagnostic criteria for some airway diseases like sinus disease and asthma, there have been a substantial number of cases where testing could not lead to a clear diagnosis for veterans or active-duty personnel with certain respiratory symptoms.

"After going through pulmonary function testing, chest imaging, and in

some cases, methacholine challenges in cardiopulmonary exercise testing, these patients were left without a clear diagnosis while still having career-limiting and career-ending symptoms," Krefft said.

One study of military personnel found that, after going through extensive non-invasive evaluations, many had normal test results or only subtle abnormalities. However, the health of these military personnel had clearly declined, so the pulmonary team referred them to get a surgical lung biopsy—a procedure where a small piece of lung tissue is removed through an incision in the chest.

Of the 49 people who did the surgery, 38 had small airways abnormalities, identified as constrictive bronchiolitis.

"Small airways abnormalities are often missed on CT scans and lung function testing, which are really better at picking up large airways abnormalities," she said. "This study highlighted that some of our testing was still not enough, and that people may be at risk for some other conditions."

This prompted researchers and health care providers to think about their diagnostic approach when it comes to [veteran](#) patients with respiratory issues.

The [VA developed a toolkit](#) for health care providers to use, offering a clinical guide on helping veteran patients with airborne hazards and respiratory concerns. Krefft said that if a patient has a persistent and unexplained cough, shortness of breath, wheezing, or chest tightness, this indicates a diagnostic referral may be needed. Another indicator is if the patient has had an excessive decline in post-deployment fitness testing.

"Sometimes, what we'll hear is somebody was able to run two miles in 12 minutes before their deployment, and after coming back, they had added

on two or three minutes," she said.

Although there has been progress in developing an understanding of how to diagnose and treat conditions like asthma or sinus disease, Krefft said non-invasive markers of deployment-related small airways disease are still needed.

"Spirometry, or traditional lung function testing, often misses these diagnoses, and we don't want to be sending people to surgical lung biopsy," she said.

Advancing pivotal research

Addressing the need for non-invasive markers is a goal of a current research project Krefft is leading, called "[Clinical Markers and Monitoring for Post-9/11 Deployment Lung Diseases](#)."

In the project's abstract, Krefft, the project's principal investigator, explains this research will look at how the newer technique called the "lung clearance index (LCI) test" may have a role in disease detection as a non-invasive marker of deployment-related distal lung disease.

"We anticipate that LCI testing will be a useful early marker of distal lung injury in deployers and will correlate with abnormalities on surgical lung biopsy better than spirometry," the abstract said. "This study should help inform a standardized approach to managing symptomatic post-9/11 veterans in the larger VA system, where consistent evaluation and care is currently lacking."

In 2023, the VA gave Krefft a research career development award for this project, which also aims to recruit and characterize a VA-based cohort of veterans with post-9/11 southwest Asia, Afghanistan, and Djibouti deployment.

This cohort will include veterans with and without deployment-related lung diseases—such as asthma, bronchiolitis, and other small airways/distal airways disease—with the goal of identifying clinical markers to accurately diagnose and monitor longitudinal lung function and health outcomes.

Kreffft said this will help future research efforts to identify treatment and health management strategies to avoid unnecessary medical testing, understand and reduce disability, and improve the health of veterans.

Beyond this project, Krefft is also contributing to a [study](#) that will test whether a medication called L-citrulline is a safe medication that can improve the health of veterans with deployment-related asthma.

"One of the exciting points of this is it really is a collaborative study, leveraging expertise in multiple institutions. It's also one of the first clinical trials in veterans with these exposures," Krefft said. "We've spent so much time in the past three decades trying to identify what the abnormalities are. It's exciting to now start to segue into thinking about treatment and prevention."

Looking ahead at research needs and priorities, Krefft said there must be improvements in exposure assessments, prevention efforts, and a better understanding of deployment-related respiratory diseases pathogenesis to inform treatment. Further validation of non-invasive markers of lung disease is also needed, as well as large epidemiological studies of respiratory outcomes.

"Our understanding of exposure-related respiratory diseases is still unfolding," Krefft said. "We hope that with increased recognition and multidisciplinary approaches, including team science, we'll continue to advance our understanding of this emerging set of conditions."

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