

E-cigarettes may trigger unique and potentially damaging immune responses

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E-cigarettes may not be healthier alternative to traditional cigarettes. Credit: ATS

E-cigarettes appear to trigger unique immune responses as well as the same ones that cigarettes trigger that can lead to lung disease, according to new research published online in the American Thoracic Society's *American Journal of Respiratory and Critical Care Medicine*.

In ["E-Cigarette Use Causes a Unique Innate Immune Response in the Lung, Involving Increased Neutrophilic Activation and Altered Mucin Secretion."](#) Mehmet Kesimer, PhD, senior study author and associate

professor of pathology at the University of North Carolina Chapel Hill, and coauthors report findings from what they believe is the first study to use human airway samples to explore the harmful effects of e-cigarettes.

"There is confusion about whether e-cigarettes are 'safer' than cigarettes because the potential adverse effects of e-cigarettes are only beginning to be studied," Dr. Kesimer said, noting that this study looked at possible biomarkers of harm in the lungs. "Our results suggest that e-cigarettes might be just as bad as cigarettes."

A 2016 Surgeon General's report found that [e-cigarette](#) use increased by 900 percent among high school students from 2011 to 2015. Also in 2016, the Food and Drug Administration extended its regulatory oversight of tobacco products to include e-cigarettes.

The study compared sputum samples from 15 e-cigarette users, 14 current cigarette smokers and 15 non-smokers. They found e-cigarette users uniquely exhibited significant increases in:

- Neutrophil granulocyte- and neutrophil-extracellular-trap (NET)-related proteins in their airways. Although neutrophils are important in fighting pathogens, left unchecked neutrophils can contribute to inflammatory lung diseases, such as COPD and cystic fibrosis.
- NETs outside the lung. NETs are associated with cell death in the epithelial and endothelium, the tissues lining blood vessels and organs. The authors write that more research is necessary to determine if this increase is associated with systemic inflammatory diseases, such as lupus, vasculitis, and psoriasis.

The study also found that e-cigarettes produced some of the same negative consequences as cigarettes. Both e-cigarette and cigarette users exhibited significant increases in:

- Biomarkers of oxidative stress and activation of innate defense mechanisms associated with [lung disease](#). Among these biomarkers are aldehyde-detoxification and oxidative-stress-related proteins, thioredoxin (TXN), and matrix metalloproteinase-9 (MMP9).
- Mucus secretions, specifically mucin 5AC, whose overproduction has been associated with pathologies in the lung including chronic bronchitis, bronchiectasis, asthma, and wheeze.

Study limitations include the fact that of the 15 e-cigarette users, 5 said they occasionally smoked cigarettes and 12 identified themselves as having smoked cigarettes in the past.

"Comparing the harm of e-cigarettes with cigarettes is a little like comparing apples to oranges," Dr. Kesimer said. "Our data shows that e-cigarettes have a signature of harm in the [lung](#) that is both similar and unique, which challenges the concept that switching from cigarettes to e-cigarettes is a healthier alternative."

Provided by American Thoracic Society

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