

Exposure to cigarette smoke and flu virus may prevent lung medications working properly

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Pills. Credit: Public Domain

New study backs up observations in Chronic Obstructive Pulmonary Disease (COPD) patients showing reduced effectiveness of symptom-reliever medication (β 2-adrenoceptor agonists) in flare-ups linked to cigarette smoking and infection with viruses such as influenza.

Research suggests a need for new drugs to treat COPD patients in these categories and a model that could be used to test new medications.

According to the study, which is published in the Portland Press journal *Clinical Science*, the effectiveness of the commonly used COPD symptom-reliever medication salbutamol is reduced on exposure to cigarette smoke and influenza A infection in an animal model of the respiratory disease.

"There is a clear need for new therapies that can overcome the limitations of current drugs used to treat COPD and associated flare-ups. When combined with knowledge gained through clinical research, animal models utilizing cigarette smoke exposure are a valuable tool in the quest to identify new therapies for this life-changing condition," commented senior study author Dr Ross Vlahos, Associate Professor at RMIT University in Melbourne, Australia.

COPD is the collective name for [lung diseases](#) including emphysema, chronic bronchitis and chronic obstructive airways disease. Smoking is currently the main cause of COPD and the chances of developing COPD increases the longer an individual has been smoking. Patients suffering from COPD have difficulties breathing, mainly due to the airflow

becoming obstructed, persistent production of phlegm and frequent chest infections. Over time, the inflammation leads to permanent changes in the lung and walls of the airways thicken with more mucus being produced. This inflammation is caused by inflammatory proteins, for example tumour necrosis factor-alpha and interleukin-1 beta, which are involved in systemic inflammation or chronic activation of the immune system.

Cigarette smoke is a major contributor to COPD as it alters immunity and can increase a patient's susceptibility to infection, which can worsen symptoms and cause flare-ups.

One of the most common reliever drugs used to treat flare-ups of the common lung disease known as COPD is salbutamol, a β 2-adrenoceptor agonist. This drug, which is also used to treat asthma, works by dilating a patient's airways making it easier for them to breathe. The effectiveness of drugs such as salbutamol in cigarette smoke-induced lung diseases such as COPD is limited. To date, the mechanisms involved in loss of responsiveness to therapy remain poorly understood.

The study assessed sections of lung exposed to cigarette smoke and a version of the influenza A virus. Overall, the researchers found that the lung tissue exposed to cigarette smoke and viral infection was less responsive to salbutamol than tissue that was not.

Commenting on the research, lead author Dr Chantal Donovan, from Monash University in Victoria, Australia, said: "By understanding the mechanisms responsible for reduced sensitivity to current bronchodilators, we can then design alternative, more efficacious agents to help treat people with COPD, especially during a viral exacerbation".

The researchers hope that their technique will help identify new targets that can be exploited therapeutically to help patients with COPD who do

not respond to current therapy.

A commentary article accompanying this paper will shortly be published in *Clinical Science* to accompany this research.

Discussing the significance of the study, Professor Sebastian Johnston from Imperial College London, UK, one of the authors of the upcoming commentary, said: "The findings of this study suggest that cigarette smoke and respiratory virus infections may impair the ability of salbutamol to effectively bronchodilate the airways. These findings emphasise yet again that smoking is bad for you, and especially so if you have asthma or COPD".

He added: "It would be interesting to determine whether the other commonly used reliever bronchodilator ipratropium bromide, which acts via a different mechanism, is similarly impaired by [cigarette smoke](#) and/or viral infection".

More information: *Clinical Science*, [dx.doi.org/10.1042/CS20160093](https://doi.org/10.1042/CS20160093)

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