

# Bioaerosols

## (Bacteria, Mold, Viruses, Endospores)

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Bioaerosols are a broad group of air pollutants that include bacteria, mold, viruses, and endospores. Bioaerosols can have a major impact on human health, from triggering allergy and asthma reactions, to transmitting diseases, to causing complex health problems.

Traditional air purifiers can only capture some larger bioaerosols, but they cannot deactivate or

destroy them. In fact, studies have shown that bioaerosols can grow on traditional filters and be re-released into the air even if they are captured initially.

# Molekule's PECO Technology Repeatedly Removed Mold, Bacteria and Viruses, in Rigorous Air Purification Test

## PURPOSE

This study tested the effectiveness of Molekule's PECO technology in destroying bioaerosol pollutants, including bacteria, viruses, mold, and endospores.

## SET-UP

Air continuously flowed through a unit with Molekule's PECO technology. The various bioaerosol pollutants were injected into the airflow upstream of Molekule's PECO technology, and samples were collected downstream. This type of test is known as a single-pass test because the air flows through the unit only once; making it the most challenging test of air purification. Each species of pollutant was injected three separate times to ensure the consistency and repeatability of the results.

## RESULT

Molekule's PECO technology was able to reduce the concentrations of bacteria, viruses, mold, and endospores in the air by more than 99.99%, (or a greater than 4-log). These results demonstrate the efficiency of PECO technology.

Testing Parameter	Challenge Microorganism	Log Reduction	Percent Reduction
<b>Virus</b>	MS2 bacteriophage	4.19 log +/-0.23	<b>99.9935%</b>
<b>Virus</b>	Phi-X174 bacteriophage	4.19 log +/-0.51	<b>99.9935%</b>
<b>Mold Spore</b>	Aspergillus niger spores	5.07 log +/-0.13	<b>99.9991%</b>
<b>Endospore</b>	Bacillus subtilis endospores	4.86 log +/- 0.23	<b>99.986%</b>
<b>Bacteria</b>	Staphylococcus epidermis	4.33 log +/-0.22	<b>99.9953%</b>
<b>Bacteria</b>	Escherichia coli	4.91 log +/-0.24	<b>99.9988%</b>



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# Bacteria Was Completely Destroyed on the Surface of Molekule's PECO-Filter

## PURPOSE

This study demonstrates the destruction of bioaerosols on the surface of a PECO-Filter at different temperatures and over different time periods. This experiment was performed over a range of temperatures from 45 deg F to 110 deg F, and at both long and short catalyst exposure times .

## SET-UP

The bioaerosols were injected upstream from the filters and deposited using typical air purifier flow rates in a single-pass test. After collecting the bioaerosols, the filters were illuminated by UV light to activate the catalyst for a short time (20 minutes for live organisms, 24 hours for spores) or a long time (24 hours for live organisms, 72 hours for spores). PECO filters were exposed to 45 deg F, 72 deg F, and 110 deg F temperatures to compare performance. The experiment was repeated three times to ensure consistency and repeatability.

## RESULT

Molekule's PECO technology was effective at destroying bioaerosols on the filter at all temperatures tested. At short time periods, effectiveness ranged from 97% to 99.9%, while at long time periods, effectiveness was over 99.99% in all cases.

Testing Parameter	Challenge Microorganism	Log Reduction Short Time	Percent Reduction	Log Reduction Extended Time	Percent Reduction
<b>Virus</b>	MS2 bacteriophage	2.64 log	<b>99.771%</b>	4.44 log	<b>99.996%</b>
<b>Virus</b>	Phi-X174 bacteriophage	2.81 log	<b>99.845%</b>	4.68 log	<b>99.998%</b>
<b>Mold Spore</b>	Aspergillus niger spores	2.09 log	<b>99.187%</b>	4.04 log	<b>99.991%</b>
<b>Endospore</b>	Bacillus subtilis endospores	1.55 log	<b>97.182%</b>	4.31 log	<b>99.995%</b>
<b>Bacteria</b>	Staphylococcus epidermis	3.73 log	<b>99.981%</b>	4.80 log	<b>99.998%</b>
<b>Bacteria</b>	Escherichia coli	3.62 log	<b>99.976%</b>	4.70 log	<b>99.998%</b>



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