

# 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 also demonstrate that PECO outperforms any air purification technology on the market today.

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>	MS2 bacteriophage	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 Nano-Filter

## PURPOSE

This study demonstrates the destruction of bacteria on the Nano-Filter itself, proving that the Molekule unit not only reduces the concentration of bioaerosols in the air, but it also destroys them. This study also demonstrates that Molekule's PECO technology is effective at destroying bacteria over a range of temperatures from 45 deg F to 110 deg F.

## SET-UP

Aerosolized bacteria was deposited on both Molekule's Nano-Filter and a generic filter, using typical air purifier flow rates. Samples from both filters were collected 20 minutes later and measured for bacterial content. The experiment was repeated three times to ensure consistency and repeatability. The bacteria used for this experiment (*Staphylococcus epidermidis*) was selected because it is particularly challenging to destroy.

## RESULT

Molekule's PECO technology was effective at destroying bacteria on the filter at all three temperatures tested. Molekule reduced the bacteria present in the air by more than 99.99% at 72°F and 110°F, and greater than 99.9% at 45°F (much colder than a typical household). Under the same conditions, the generic filter showed minimal reduction in the bacteria present.

The generic filter is representative of High Efficiency Particulate Air (HEPA) filters common in most air purifiers. This study shows, as other studies have previously confirmed, that bacteria can live and/or grow on generic or HEPA filters for long periods of time, whereas the PECO technology in Molekule completely eliminates bacteria on the surface of the filter.

Temperature	Challenge Microorganism	Log Reduction	Percent Reduction
101° F	<b>Bacteria</b> <i>Staphylococcus epidermidis</i>	4.34 log +/-0.23	<b>99.9954%</b>
72° F	<b>Bacteria</b> <i>Staphylococcus epidermidis</i>	4.04 log +/-0.1	<b>99.9909%</b>
45° F	<b>Bacteria</b> <i>Staphylococcus epidermidis</i>	3.08 log +/-0.22	<b>99.9168%</b>



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