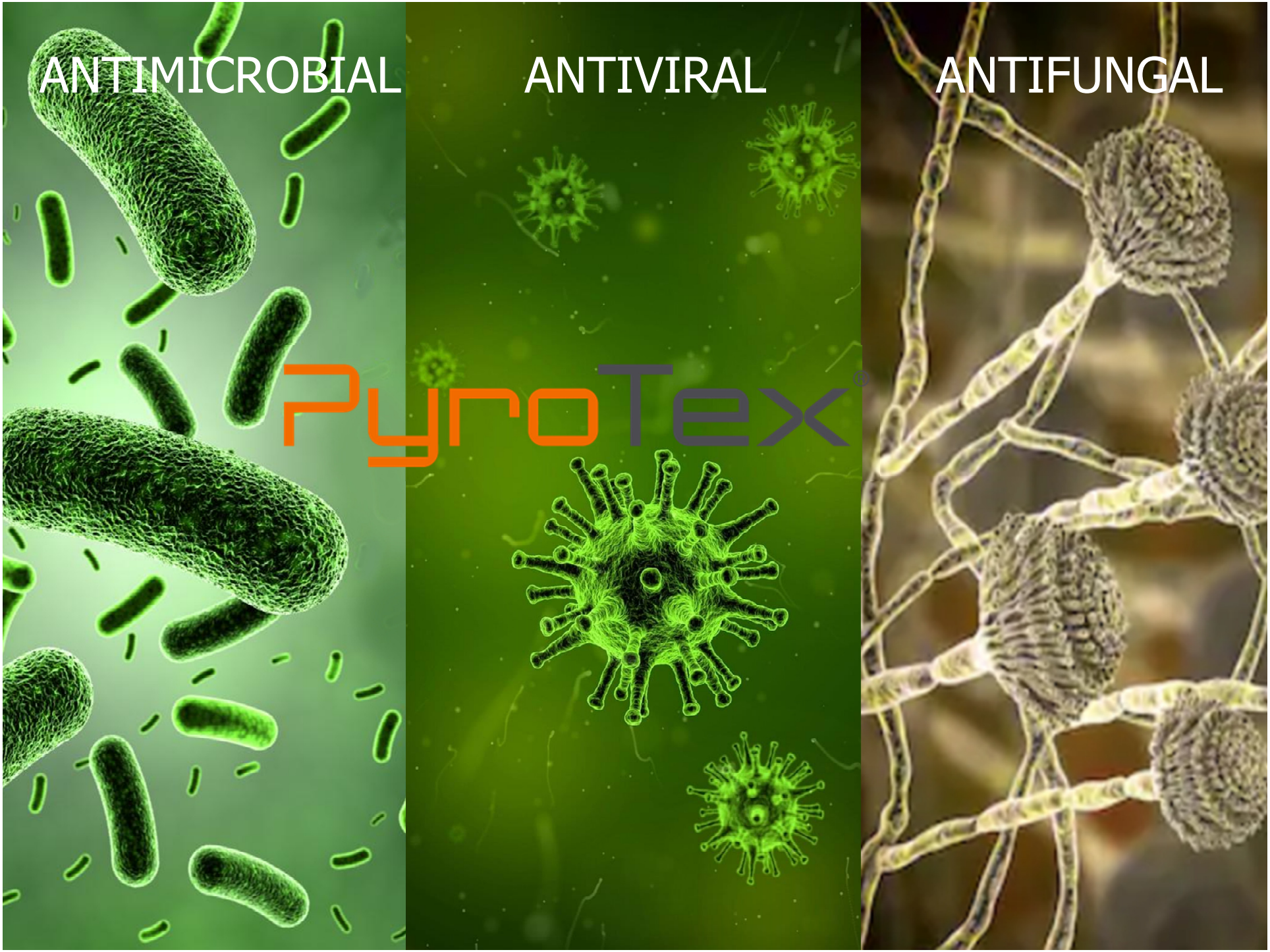
ANTIMICROBIAL
ANTIVIRAL
ANTIFUNGAL
PyroTex®

Introduction

Important information on the virus, bacteria and fungus chosen:

Klebsiella Pneumoniae

Klebsiella Pneumoniae is more dangerous these days compared to other bacteria such us MRSA or E. Coli etc. because:

1. They are commonly found and more commonly encountered as resistant variant in hospital settings.

2. Their resistance is related to ESBL production to thrive. We call them ESBL strains. (Extended-spectrum beta-lactamases, or ESBLs, are enzymes produced by certain types of bacteria. These enzymes can break down the active ingredients in many common antibiotics, making them ineffective)

3. Being gram negative they spread fast in the body. They are facultatively aerobic in nature.

Staphylococcus Aureus Bacteria

A usual member of the microbiota of the human body, frequently found in the upper respiratory tract and on the skin.

Escherichia Coli Bacteria

Commonly found in the lower intestine of warm-blooded organisms.

PyroTex®

MS2 Bakteriophage Virus

Due to its environmental resistance, it is used as a surrogate virus particularly in place of Picornaviruses such as Poliovirus and human Norovirus. With its size (23nm) it is smaller than Influenza and SARS. It is a (+)ssRNA linear virus.

Aspergillus Niger Fungus

One of the most common species of the genus Aspergillus which can produce potent mycotoxins

Determining the antibacterial properties of PyroTex® (general test: ASTM E2149 13a)

Sample	Test Organism	No. of Bacteria per sample (CFU/ml)	Percentage Reduction of Bacteria	Percentage Reduction of Bacteria
		at 0 hrs. (B)	at 1h (R)*	at 24h (R)*
PyroTex	Staph. aureus	1.79×10^5	93.74%	99.07%
	Esch. coli	1.91×10^5	89.89%	97.70%

CFU: Colony Forming Units = No. of bacteria

Interpretation

PyroTex® has shown 93.74% and 89.89% after 1 hour contact and 99.07% and 97.70% reduction of bacteria after 24 hours contact towards Staphylococcus aureus and Escherichia coli respectively.

Determining the antibacterial properties of a PyroTex® blend (general test: ASTM 100-2012)

Sample	Test Organism	No. of Bacteria per sample (CFU/ml)	Percentage Reduction of Bacteria
		at 0 hrs. (C)	at 24h (R)*
78% PyroTex/ 22% Polyester	Staph. aureus	1.63x 10^5	99.69%
	Klebsiella Pneumoniae	1.72 x 10^5	98.97%

CFU: Colony Forming Units = No. of bacteria

Interpretation

The PyroTex®/Polyester blend has shown 99.69% and 98.97% reduction of bacteria after 24 hours contact towards Staphylococcus aureus and Klebsiella Pneumoniae respectively.

Does PyroTex® stay antimicrobial?

Staphylococcus aureus at 1.80 x 10^8 cfu/ml was sprayed on individual (in triplicate) pieces in 3 sets in the same manner on all sets on Day 1, Day 2 and Day 3.
After 24 hours the surviving bacterial count was determined on Set 1.
Sets 2 and 3 were again inoculated at the end of Day 1.
Set 2 was evaluated for surviving bacteria after the second 24 hour period.
Set 3 was again inoculated at the end of Day 2.
Set 3 was evaluated for surviving bacteria after the third 24 hour period.

	Sample	No. of Staphylococcus aureus (CFU/Sample)		Percentage Reduction of Bacteria
Day		Inoculated Sample at 0 hours (B)	Inoculated Sample at 24 hours (A)	(R)
End of Day 1	Set 1	1.6 x 10^5	< 10	>99.99%
Re-inoculation / End of Day 2	Set 2	1.49 x 10^5	< 10	>99.99%
Re-inoculation / End of Day 3	Set 3	1.51 x 10^6	<10	>99.99%

Interpretation

The samples have on all the three days (Day 1, Day 2 and Day 3) shown >99.99% reduction of bacteria when analyzed as per AATCC 100 - 2012 test.

How long is PyroTex® antimicrobial and is there any regrowth?

Staphylococcus aureus at 1.80 x 10^8 cfu/ml was sprayed on all 3 samples in the same manner on all three sets on Day 1, Day 2 and Day 3.
After 24 hours the surviving bacterial count was determined from Set 1.
No re-inoculations were made.
After the second 24 hours the surviving bacterial count was determined from Set 2.
No re-inoculations were made.
After the third 24 hours the surviving bacterial count was determined from Set 3.
Additionally the 0 hours bacterial count was determined at the start of each day to have the base line count of Staphylococcus aureus.

	Sample	No. of Staphylococcus aureus (CFU/Sample)		Percentage Reduction of Bacteria
Day		Inoculated Sample at 0 hours (B)	Inoculated Sample at 24 hours (A)	(R)
End of Day 1	Sample 1	1.4 x 10^5	< 10	>99.99%
No Re-inoculation End of Day 2	Sample 2	1.55 x 10^5	< 10	>99.99%
No Re-inoculation End of Day 3	Sample 3	1.80 x 10^6	<10	>99.99%

Interpretation

The samples have shown on Day 1, Day 2 and Day 3 >99.99% reduction of bacteria. No regrowth was determined (AATCC 100 – 2012).

Determining the antiviral properties of PyroTex® (AATCC 100:2012)

Sample	Test Organism	Avg. PFU/ carrier	Percentage Reduction of Virus	Percentage Reduction of Virus
		at 0 hrs.	at 2 hrs	at 24 hrs
PyroTex	MS2 Bacteriophage	1.62×10^5	93.82%	99.29%

PFU: Plaque Forming Unit = No. of Microorganisms

Interpretation

PyroTex® has shown 93.82% after 2 hours and 99.29% reduction of virus after 24 hours towards MS2 Bacteriophage as surrogate virus.

Determining the resistance against fungi of PyroTex® (AATCC 30, III 2017)

Sample	Test Organism	Growth on Specimen*	Interpretation
PyroTex	Aspergillus Niger	0	Resistant against Fungus

Evaluation Criteria:

For the evaluation of the relative resistance of textile materials, the percentage of surface growth of Aspergillus Niger is rated according to the following scheme:

*Growth on specimen Rating

No Growth	0
Trace of Growth (< 10 %)	1
Light Growth (10 to 30 %)	2
Medium Growth (30 to 60 %)	3
Heavy Growth (60% to 100%)	4

CONCLUSION

The data generated during the laboratory tests conclude that PyroTex® is antibacterial, antiviral and antifungal in nature – even in specific blends.

These properties are maintained at all times without regrowth of the bacteria

Application Examples based on the Permanent Antimicrobial and Antiviral Properties of PyroTex®

Application - Blanket

Where:

- Hospitals (stationary and temporary)
- Firefighters
- Trains
- Airplanes
- Army/Navy/Air Force
- Leisure/Camping
- Homes
- Cars

Application - Medical

Surgical Mask
FFP2/N95
FFP3/N99

Medical Scrubs

Bedsheets
Curtains

<u>Superior because:</u>

- Permanently Antimicrobial
- Permanently Antiviral
- Resistant to Fungi
- Permanent Flame-resistant
- OekoTex Class 1

Application - PPE

Baselayer:

- Antibacterial = Odor control
- OekoTex class 1 = skin friendly
- Hydrophilic = Comfortable
- Flame Resistant = Protective

For more detailed information please do not hesitate to contact us.

PyroTex Industries GmbH
Lerchenstr. 28a
22767 Hamburg
Germany
info@pyro-tex.de / www.pyro-tex.de