

# ***Trevira Bioactive Trevira CS Bioactive***

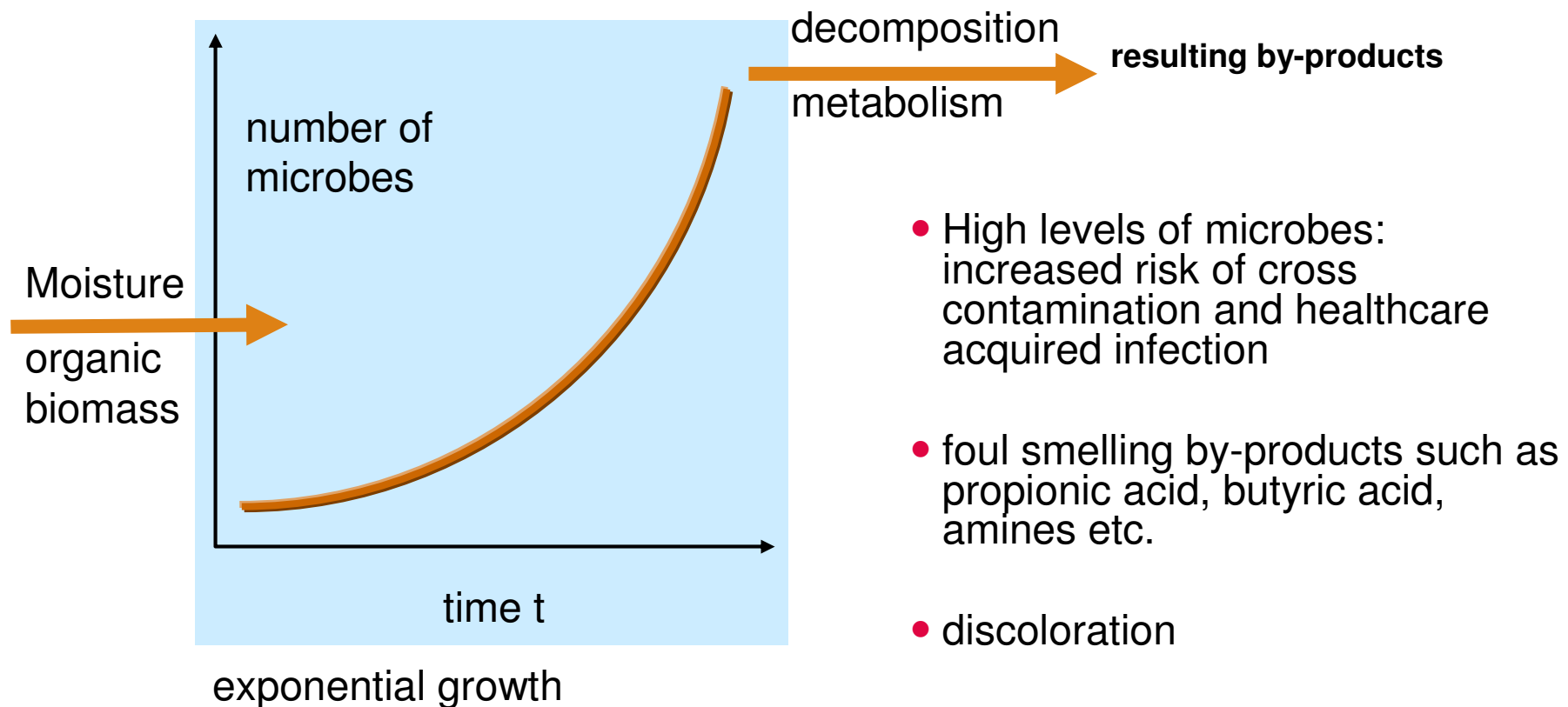


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Manager Business Development Trevira CS  
January 2011

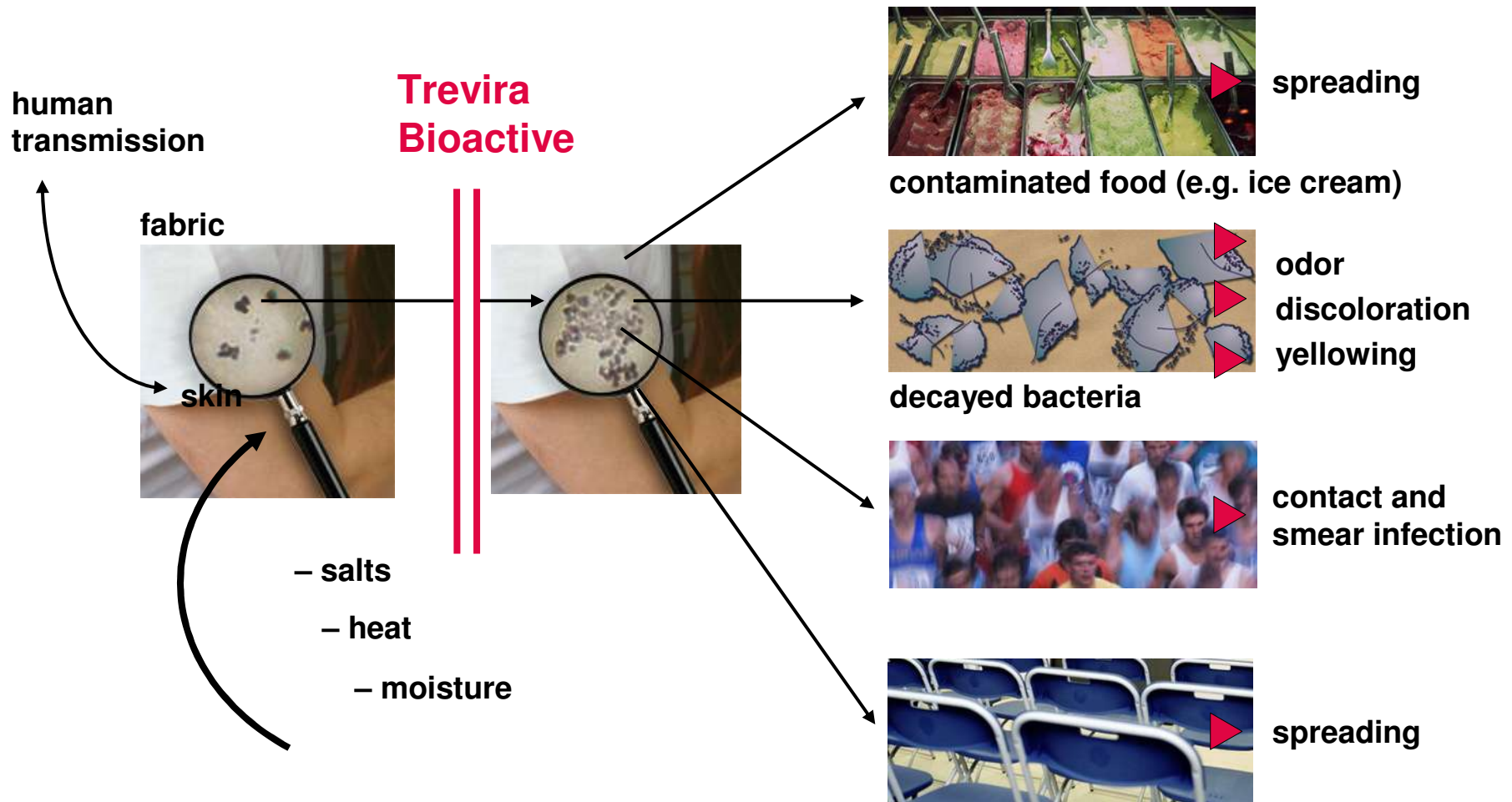
# ***Contents***

- Microbes and their consequences
- Trevira Approach
- Trevira Bioactive Brands
- Certificates
- Field Tests
- Skin Flora Tests
- Comparison (Trevira Bioactive versus organic disinfectants)
- Applications
- Product Examples
- Summary

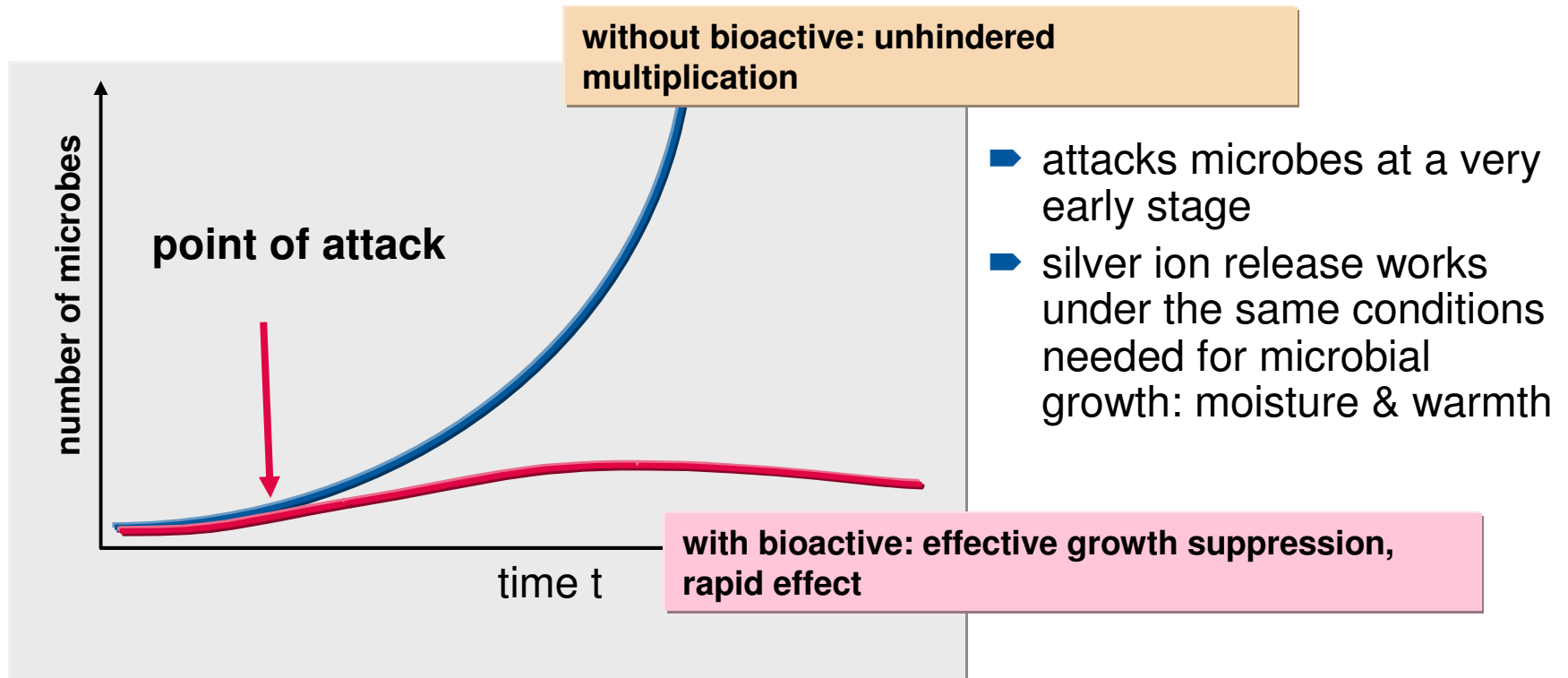
## ***Microbial multiplication – and its consequences in textiles***



# ***Trevira Bioactive inhibits the multiplication of bacteria on textiles***

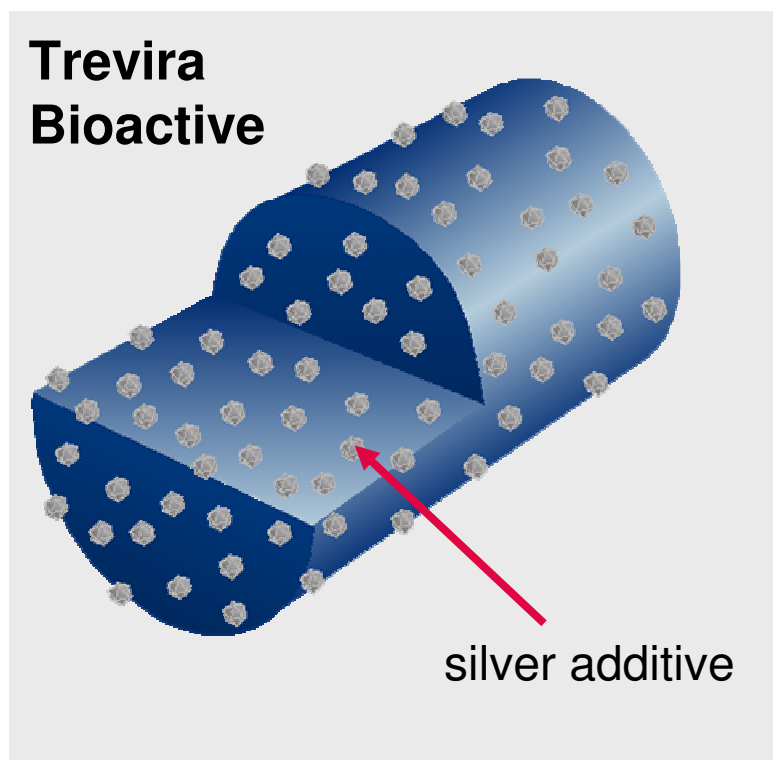


## ***Effective when needed most***



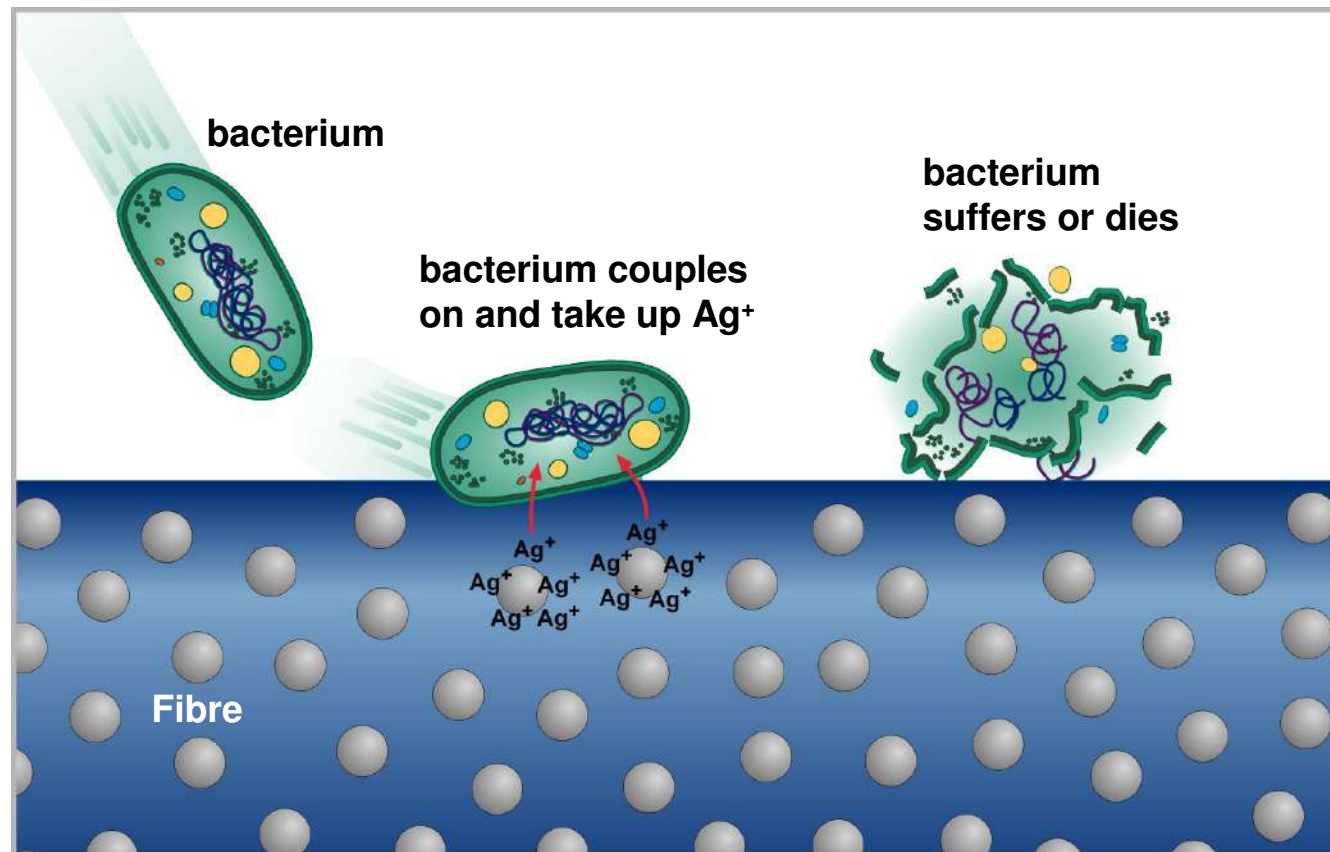
- blocks odour development
- reduces the build up of microbes in textiles

## ***Trevira Bioactive uses the anti – microbial effect of silver (Ag)***



- well known effects of silver since antique times
- very small amounts of silver ions are available to protect the fiber
- silver ions are a broad – spectrum antimicrobial (Gram-neg./pos.)
- low propensity of cells to develop resistance to silver ions
- no migration of additive

## ***Trevira CS Bioactive in action***

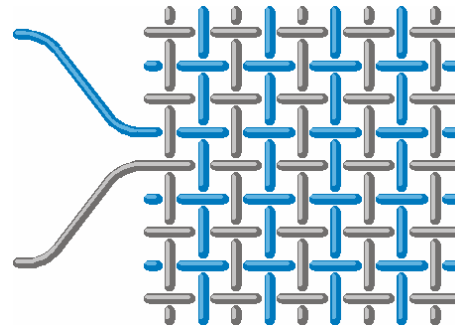


cell physiology damaged, enzymatic processes disturbed – bacteria suffer or die

## ***Trevira Bioactive Brand - ensures textiles contain antimicrobial fibres***

**Trevira Bioactive  
≥ 50%**

hybrids such as  
CO, etc.



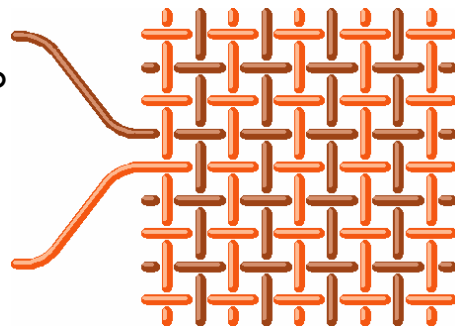
tested by Trevira



inherently antimicrobial

**Trevira CS  
Bioactive ≥ 50%**

**Trevira CS  
(0-50%)**



tested by Trevira



inherently flame retardant and  
antimicrobial



## ***Antimicrobial protection without sacrificing fire safety***

Flame retardant fabrics are often specified in the healthcare sector

Trevira CS flame retardant textiles meet the most stringent health & safety demands

With Trevira CS **Bioactive** antimicrobial protection is built into the textile as an additional feature



- 
- ▶ flame retardant plus antimicrobial protection
-

## ***Antimicrobial protection without sacrificing established fabric properties***

Textiles with inherent antimicrobial action retain the **same fabric properties** as standard polyester:

- colour brilliance
- good wearability
- breathable, good heat and moisture regulation
- elasticity and good dimensional stability
- easy to clean and durable
- soft to handle and low pill



- 
- antimicrobial function does not impact on other textile properties
  - Allows construction of diverse fabric types
-

# Proved Antimicrobial activity

<b>IMSL</b>		INDUSTRIAL MICROBIOLOGICAL SERVICES LTD	
<b>CERTIFICATE OF ANALYSIS</b>		<b>CERTIFICATE NO.</b>	1011054.2
<b>CUSTOMER</b> Trevira GmbH Werk Bobingen Max-Fischer-Strasse 11 86397 Bobingen Germany		<b>CUSTOMER REF.</b>	
<b>SAMPLE DETAILS</b> Trevira Fibre		<b>DATE RECEIVED</b>	03-Jul-09
<b>METHOD:</b> (Determination of Antibacterial Activity using Test Based on JIS L 1802)			
<b>DATE ANALYSED</b>	07-Jul-09	<b>DATE REPORTED</b>	10-Jul-09
<b>RESULTS (AS CFU G-1)</b>			
<b>SAMPLE</b>	<b>CONTACT TIME</b> 0 24	<b>LOG REDUCTION</b>	<b>% REDUCTION</b>
Control Fabric <i>Staph aureus</i>	1.2E+06 1.0E+06	-	-
Type 270 CS Bioactive <i>Staph aureus</i>	4.7E+06 1.0E+02	4.0	> 99.99
Control Fabric <i>K. pneumoniae</i>	1.1E+06 2.1E+09	-	-
Type 270 CS Bioactive <i>K. pneumoniae</i>	4.4E+06 2.1E+03	6.0	99.95
The above data shows the difference in the population following contact with the surface of the samples listed for 24 hours at 35°C under a RH of > 95% relative to the Control Sample.			
Bactericidal activity was detected in the Fibre Type 270 CS Bioactive against <i>Staph aureus</i> and <i>K. pneumoniae</i>			
The differences between the size of the populations recovered from the test material compared to the control were statistically significant.			
INDUSTRIAL MICROBIOLOGICAL SERVICE LTD PALE LANE HARTLEY WINTNEY HANTS RG27 8DH UK		PETER D ASKEW MANAGING DIRECTOR	

<b>IMSL</b>		INDUSTRIAL MICROBIOLOGICAL SERVICES LTD	
<b>CERTIFICATE OF ANALYSIS</b>		<b>CERTIFICATE NO.</b>	IMSL 2008/02/001.1B
<b>CUSTOMER</b> Trevira GmbH Werk Bobingen GCC Flat Max-Fischer-Strasse 11 D-86397 Bobingen Germany		<b>CUSTOMER REF.</b>	
<b>SAMPLE DETAILS</b> Sample of Polyester prepared with a silver based biocide as supplied by Trevira GmbH.		<b>DATE RECEIVED</b>	
<b>METHOD:</b> (Determination of Antibacterial Activity Using a Modified AATCC 100)			
<b>DATE ANALYSED</b>	01-Mar-08	<b>DATE REPORTED</b>	14-Mar-08
<b>RESULTS (AS CFU CM -2)</b>		<b>ORGANISMS</b>	<i>K. pneumoniae</i> ATCC 4352 <i>Staph aureus</i> ATCC 6538
<b>SAMPLE</b>	<b>ORGANISM</b>	<b>CONTACT TIME</b> 0 24	<b>LOG REDUCTION</b> <b>% REDUCTION</b>
CS Filament Bioactive (5)	<i>K. pneumoniae</i>	1.2E+04 < 1.00	> 4.00 > 99.99%
Polyester / cotton control	<i>K. pneumoniae</i>	1.2E+04 6.3E+03	
CS Filament Bioactive (5)	<i>Staph aureus</i>	8.0E+03 1.7E+00	3.7 99.98%
Polyester / cotton control	<i>Staph aureus</i>	8.0E+03 6.6E+03	
The above data shows the difference in the population following contact with the surface of the samples listed for 24 hours at 35°C under a RH of > 95% with 1/500 Nutrient Broth relative to the initial population.			
INDUSTRIAL MICROBIOLOGICAL SERVICE LTD PALE LANE HARTLEY WINTNEY HANTS RG27 8DH UK		PETER D ASKEW MANAGING DIRECTOR	

Certificates are available on our website:

<http://www.trevira.com/en/our-service/download-centre/our-certificates-and-expert-reports/certificates-trevira-bioactive.html>

**Hohenstein Institute and Industrial Microbiological Services confirm: significant antimicrobial effect  
(test strains: staphylococcus aureus and klebsiella pneumoniae)**

# ***Effective against MRSA (= Methicillin resistant staphylococcus aureus)***

<b>IMSL</b>		INDUSTRIAL MICROBIOLOGICAL SERVICES LTD	
CERTIFICATE OF ANALYSIS		CERTIFICATE NO.	1011954.4
CUSTOMER Trevira GmbH Werk Bobingen Max-Fischer-Strasse 11 86397 Bobingen Germany		CUSTOMER REF.	
SAMPLE DETAILS Trevira Fibre		DATE RECEIVED	03-Jul-09
METHOD: (Determination of Antibacterial Activity using Test Based on JIS L 1902)			
DATE ANALYSED	07-Jul-09	DATE REPORTED	10-Jul-09
RESULTS (AS CFU G -1)			
SAMPLE		CONTACT TIME 0 24	LOG REDUCTION % REDUCTION
Control Fabric MRSA	1.2E+06	2.5E+05	-
Type 270 CS Bioactive MRSA	3.5E+06	6.2E+01	4.8
			> 99.99
The above data shows the difference in the population following contact with the surface of the samples listed for 24 hours at 35°C under a RH of > 95% relative to the Control Sample.			
Bactericidal activity was detected in the Fibre Type 270 CS Bioactive against MRSA			
The differences between the size of the populations recovered from the test material compared to the control were statistically significant.			
INDUSTRIAL MICROBIOLOGICAL SERVICE LTD PALE LANE HARTLEY WINTNEY HANTS RG27 5DH UK		PETER D ASKEW MANAGING DIRECTOR	

**MRSA is one of the most important pathogene in hospitals, taking part in nosocomial infections**

**Certificates are available on our website:**

<http://www.trevira.com/en/our-service/download-centre/our-certificates-and-expert-reports/certificates-trevira-bioactive.html>

## ***Field tests show effective in practice***

- Institute for Hygiene, Humboldt Clinic Berlin: uniforms for nurses and cleaners
- Institute for Hygiene, Humboldt Clinic Berlin: hospital curtains
- Augsburg children's clinic
- Endurance test by the Swiss army
- Ladies' professional volleyball team, Bayer Leverkusen
- Spanish national basketball team



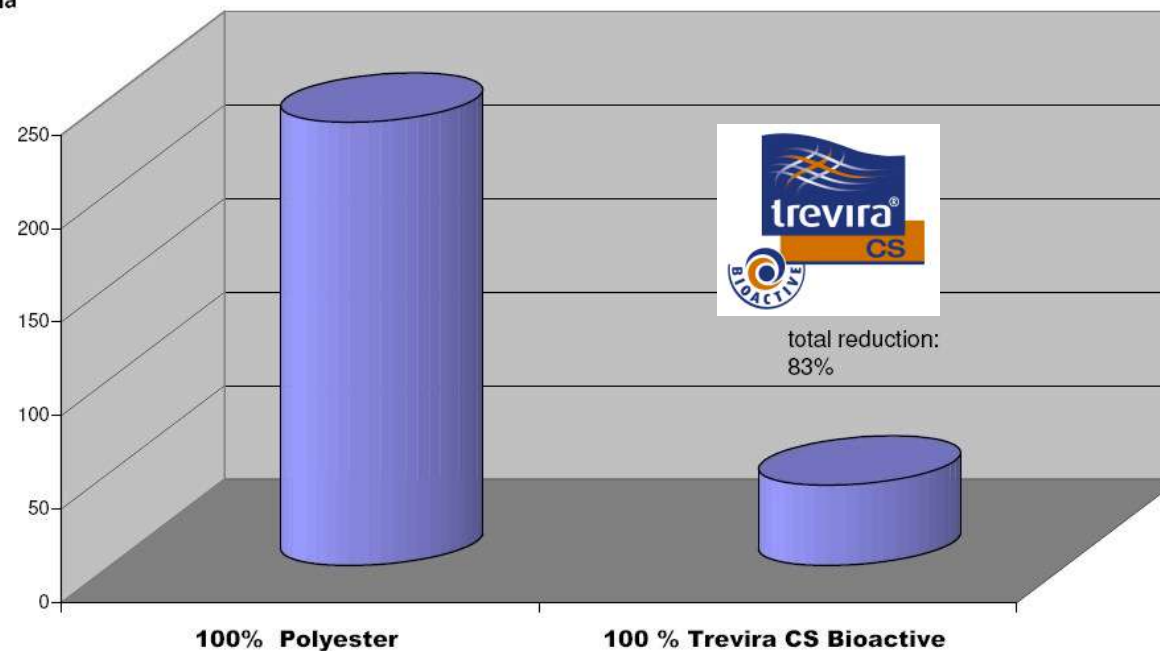
Die Schweizer Armee hat das 4-Lagen-System von ComforTrust ausführlich getestet und für gut befunden.



**600 samples over a period of 6 weeks time revealed a germ count reduction of 83% on Trevira CS Bioactive fabrics**

Reduction of germs on Trevira CS Bioactive hospital curtains

Number of  
Staph.aureus  
Streptokokken  
Klebsiella

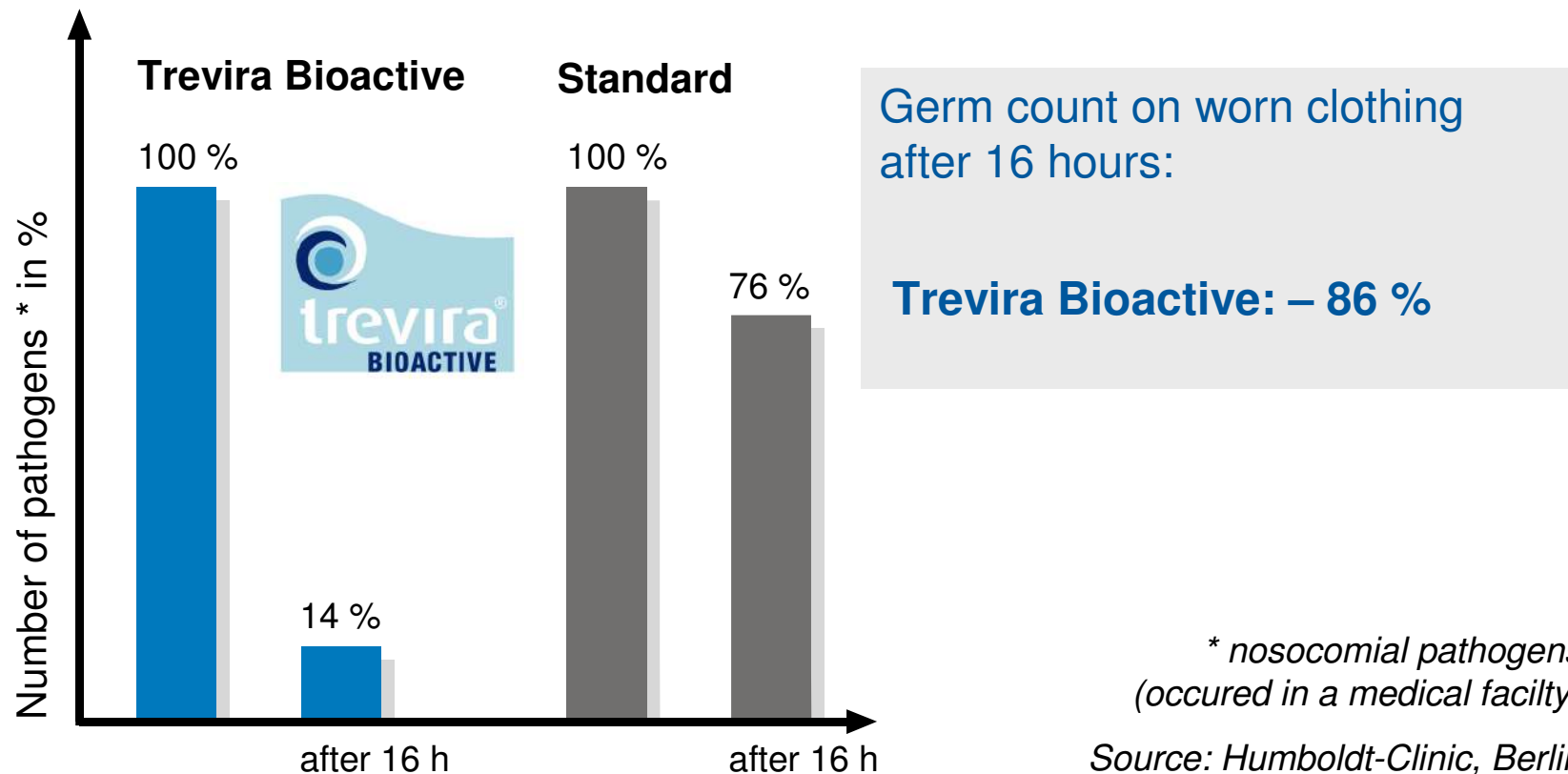


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“Trevira CS Bioactive textiles make a significant contribution to a multi-barrier approach to combating nosocomial infections“ *Dr. K-D Zastrow*

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## Test results on home care clothing



“Trevira Bioactive has the potential to play a significant role in reducing germs in work clothing due to its anti-pathogen effect” Dr. K-D Zastrow



## ***Skin flora tests***

Antimicrobial fibres come into direct and prolonged contact with the skin.

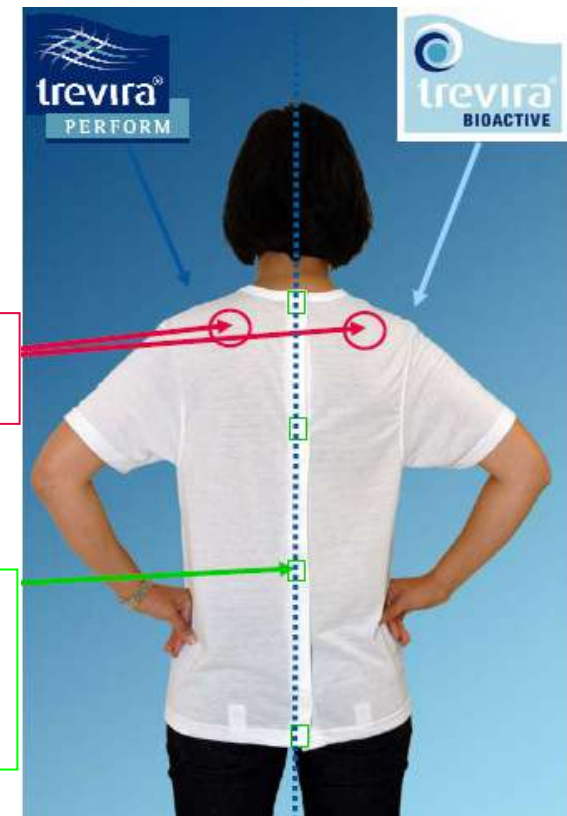
**What effect does this have on the skin?**

World's first study of its kind.  
Designed in cooperation with and performed by **Hohensteiner Institute**

Six month trial  
32 people wore T-shirts made of separate halves, every night

**Intense contact at point of measurement**

**independent washing (ISO 6330) – no transfer of effect in washing machine**





# ***Skin flora tests***

Report by the Hohenstein Institute  
on compatibility with the skin of bioactive PES textile fibre  
December 2007

## **Results:**

⇒ **No harmful effects on skin flora**

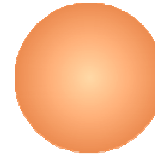
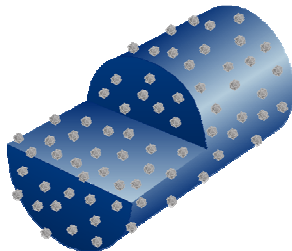
- no change in the total microbe count
- no fluctuation in the spectrum of microbes
- no change in the pH- value of the skin
- no change in skin temperature
- No interference with trans-epidermal water loss





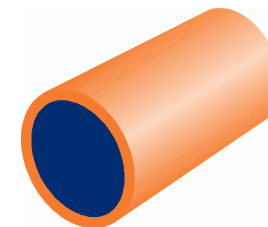
## ***Trevira Bioactive versus***

- active agent bonded into fibre
- no health concerns
- reliable in effects
- no additional coating on fabric
- no migration into skin
- washfast
- permanently effective



## ***Silver coating (Organic Disinfectants)***

- active agent can move into skin (migration)
- active agent can cause allergies and damage to health
- can damage natural bacterial flora of skin
- bacteria can develop resistance to active organic disinfectants



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➔ **Trevira Bioactive – permanent, anti - microbial and washfast**

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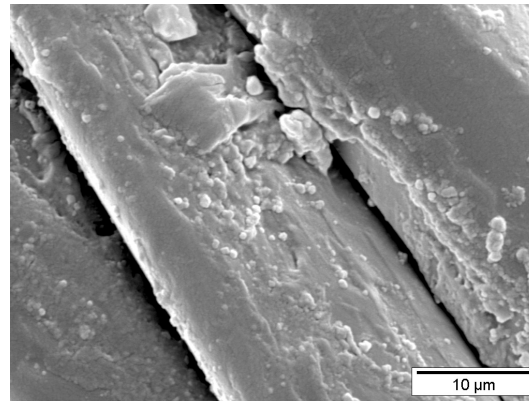
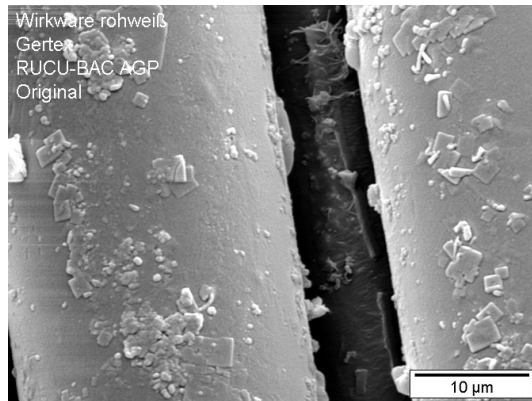
## ***Silver availability after washing***

	<b>silver coating (organic disinfectants)</b>	<b>Trevira Bioactive</b>
Original fabric	100%	100%
After 1 wash cycle	28%	100%
After 5 wash cycles	0%	100%
After 10 wash cycles	0%	100%
After 50 wash cycles	0%	99%
After 10.000 cycles Martindale	76%	100%
After 10.000 cycles M. +1 wash cycle	10%	98%*
After 10.000 cycles M. + 5 wash cycles	0%	98%*

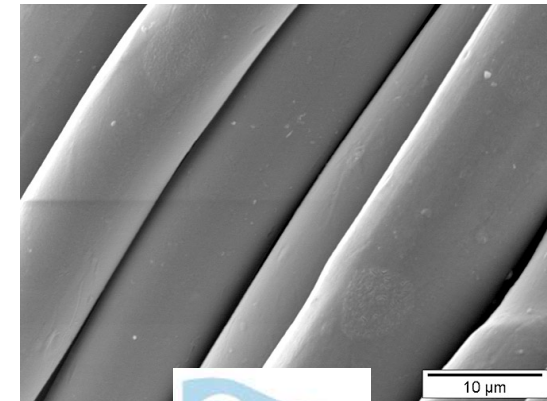
**\* after 70.000 cycles Martindale**

# Original fabric before and after abrasion test

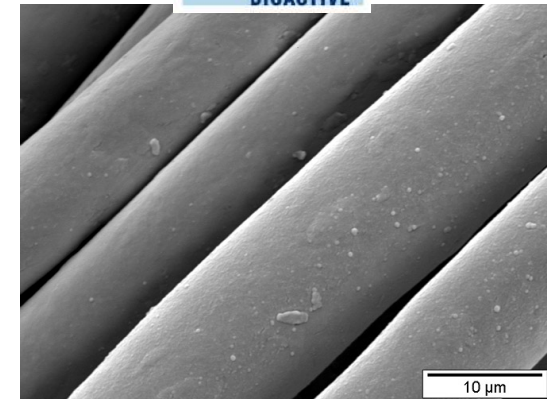
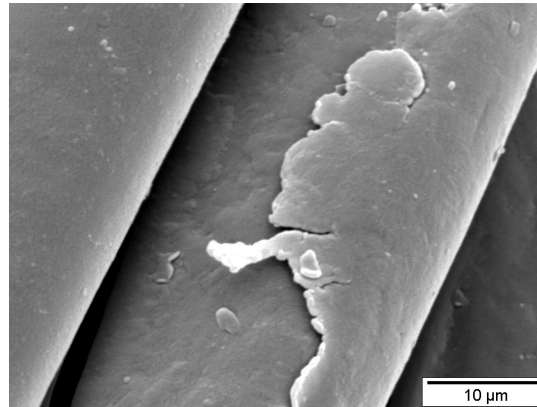
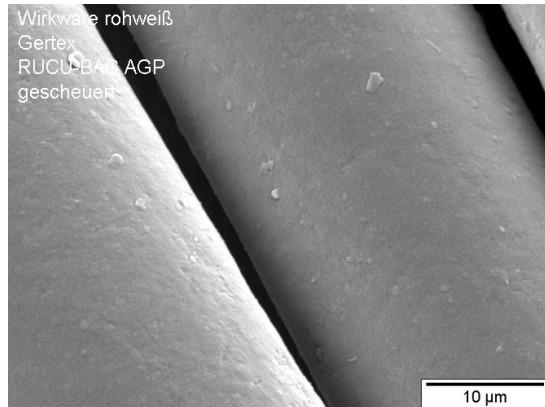
After treatment with silver containing substance



Trevira Bioactive



after 70.000 cycles Martindale



**Silver treatment worked off  
means no antimicrobial effect**

**Full antimicrobial effect**

# Applications



## **Personal Use**

- Sportswear
- Underwear
- Socks
- Shoe Linings / Soles



## **Work wear**

- Catering
- Military
- Police
- Customs
- Fire service



## **Healthcare**

- Curtains
- Upholstery
- Bedding & Nightwear
- Incontinence sheets
- Bandages
- work wear



## **Home Textiles**

- Duvets & Pillows
- Sheets
- Mattresses
- Towels
- Curtains
- Upholstery

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► provides the potential to serve many markets

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# ***Product examples***



photo: GIT Verlag



## ***Advantages of Trevira Bioactive***

- **permanent antimicrobial** protection **built into the polymer** backbone:  
permanent effect throughout the life cycle of the textile
- eliminate the need for additional antimicrobial coating or treatment
- stop the build up of microbes in the textile
- inhibit formation of bacterial odours in the textile and reduce discolouration
- versatile fibres and yarns, enabling the construction of a wide range of fabrics with antimicrobial protection for diverse textile applications
- provide added functionality and value