Chemicals

devan

The Chemistry of Textiles

Antimicrobial Finishes

November 17th 2011

Ing. Alain Langerock

Antimicrobial Finishes

- Devan Chemicals
- Microorganisms and Dust Mites
- Typical Applications
- Antimicrobials
- The ægis™ Technology
- Processing & Quality Control
- Safety profile & Registrations
- NEW: Multi-functional finish program
- Conclusions

The Devan Group

PROTECTING and MODIFYING

TEXTILE SURFACES

creating new and innovative properties and functionality

taking into consideration

SUSTAINABILITY

Sustainability strategy: 1990

Since 1990, Ecology has been the DNA of Devan

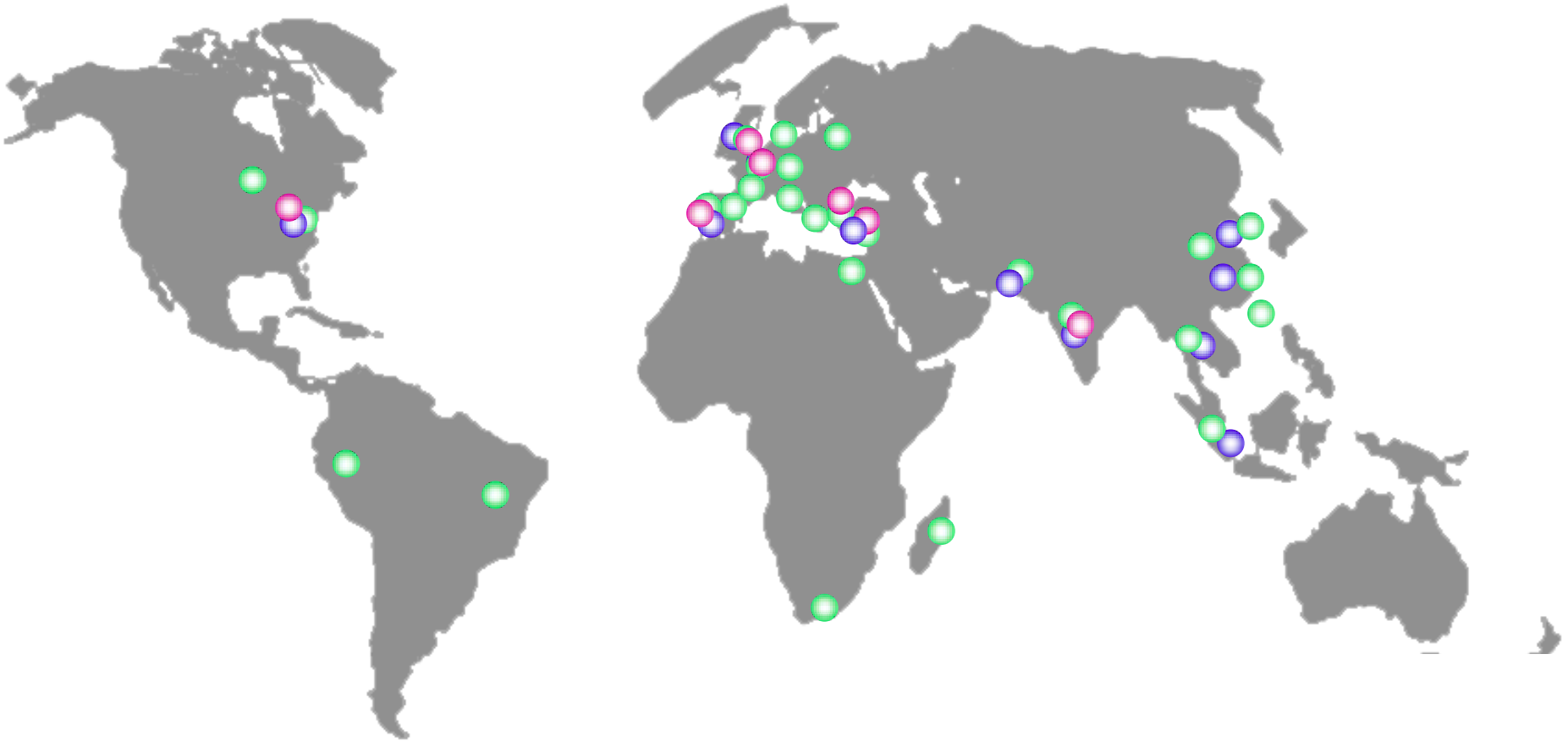
- 1995: Halogen-free flame retardants (*eco-flam*™)
- 1999: Non migrating antimicrobial (**ægis**™)
- 2001: Masterbatch for inherent performance properties (*@2spin*™)
- 2002: Non-chlorine wool shrink-resist (Dylan™)
- 2005: Environmentally more acceptable insect resist (insecta™)
- 2008: Reactive capsules (no need of binders) (Thermic™)
- 2011: Reactive multi-functional finishes (&Fresh™)

The team

- Highly qualified, technically driven company
  - 60% Graduates in appropriate disciplines
    - Chemistry
    - Textile technology
    - Marketing
    - Finance and administration
- 40 % of staff works in R&D
- 10% of turnover invested in R&D (internal & external)

We are not a chemical company, but a technology company.

Global thinking, local acting…



Devan Offices Production Centers Technical Service and/or Warehouse

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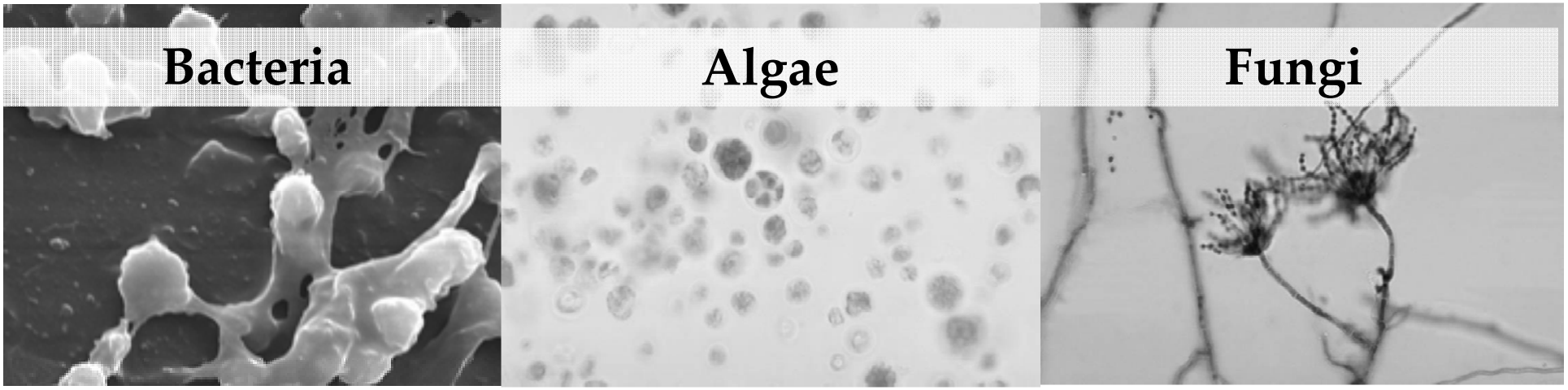
Microorganisms



Microorganisms are single-celled organisms that cannot be seen with the naked eye

Microbes

To find virtually everywhere

- In the air we breath
- On our skin and bodies
- In the soil
- On practically all surfaces around us

Microbial growth

Microbes require certain conditions to grow such as

- Food (dirt, fibre, perspiration)
- Warm temperatures
- Moisture (humidity, spills)
- Surface (skin, fabric)

Our modern life and work style are beneficial for microbial growth.

The Woolmark Company

Microbes

Microbial growth can result in

- Objectionable Odours
- Unsightly stains
- Product deterioration
- Loss in Storage and Transport
- Disease and Infection
- Allergenic responses

Dust mites

Dermatophagoides pteronyssinus

Dust mites

Major cause of

- Allergies
- Skin irritations
- Asthma
- Other respiratory diseases

The Woolmark Company

Dust mites

… what is a dust mite?

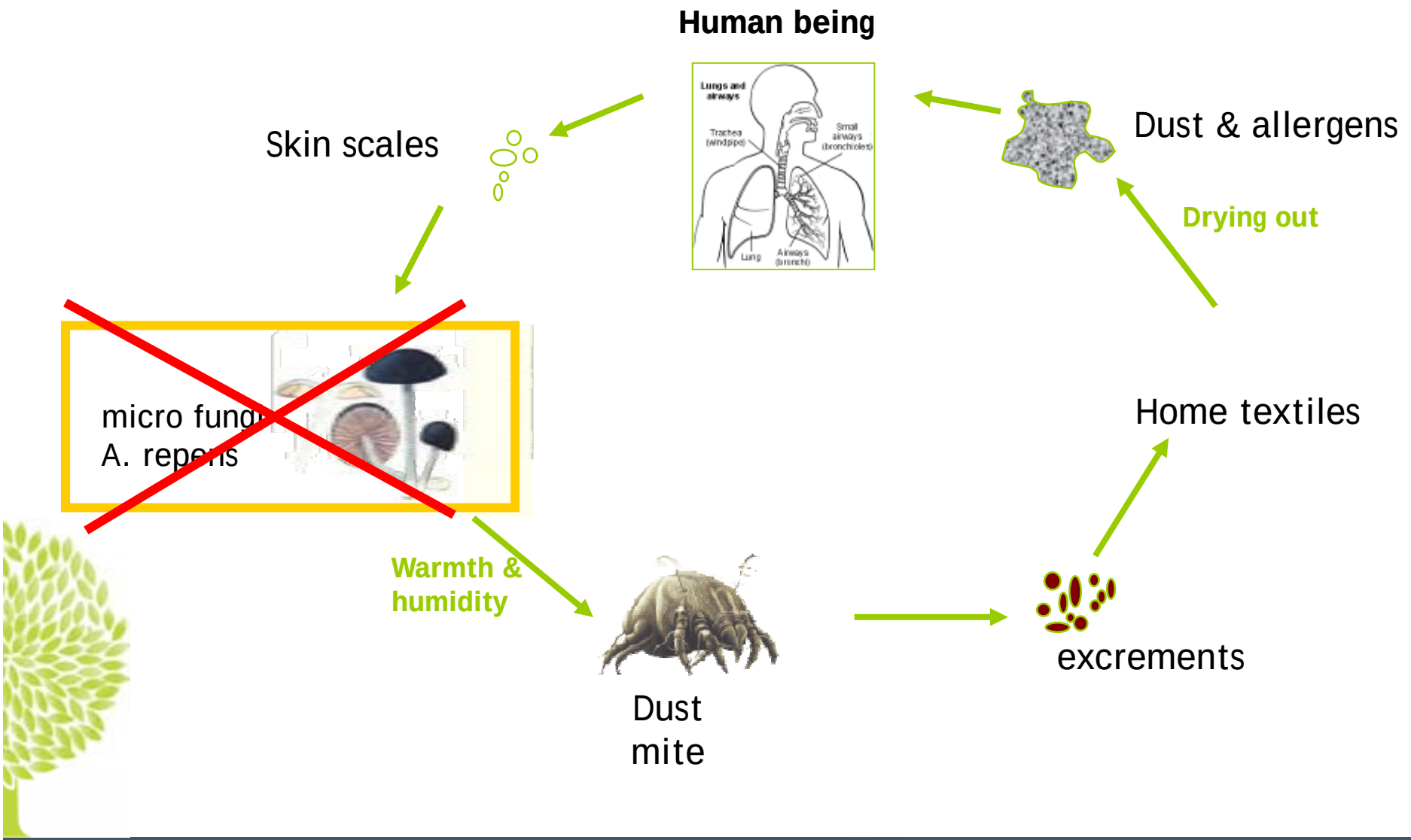
- Spider like animal (8 legs)
- Size 0.1 – 0.5 mm (not visible by eye)
- Nutrition: Skin scales and fungi
- Ideal living condition:

  15-30°C and 55-85% relative humidity: Bedding, Upholstery, Carpets,…
- Proliferation

  through about 150 eggs in a life cycle,

  Life duration: ca. 2-4 months
- Problem: excrements contain allergen ‘DerP1’

Dust mites


Human being
Lungs and airways
Trachea (windpipe)
Small airways (bronchioles)
Lung
Airways (bronchi)
Skin scales
Dust & allergens
Drying out
micro fungi
A. repens
Home textiles
Warmth & humidity
Dust mite
excrements

Dust mites

An antimicrobial technology eliminates the *Aspergillus repens* and thus breaks the dust mite's food chain.

- An antimicrobial technology is not a insecticide or a pesticide.
- An antimicrobial technology prevents the growth of dust mites populations through interruption of their nutrition chain.

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Benefits of an antimicrobial technology

- Long-lasting freshness
- Eliminates the smells created by yeast, fungus and bacteria in the product
- Controls or eliminates microbial staining of the treated article
- Eliminates Dust Mites

Typical textile applications

- Socks, hosiery, footwear
- Underwear
- Sportswear
- Shirts
- Work wear
- Towels
- Outdoor Equipment

Typical bedding applications

Bedding articles

- Mattress ticking
- Mattress interlining
- Mattress protection
- Bed sheets
- Pillows & Quilts
- Filling fibre (Fibrefill)

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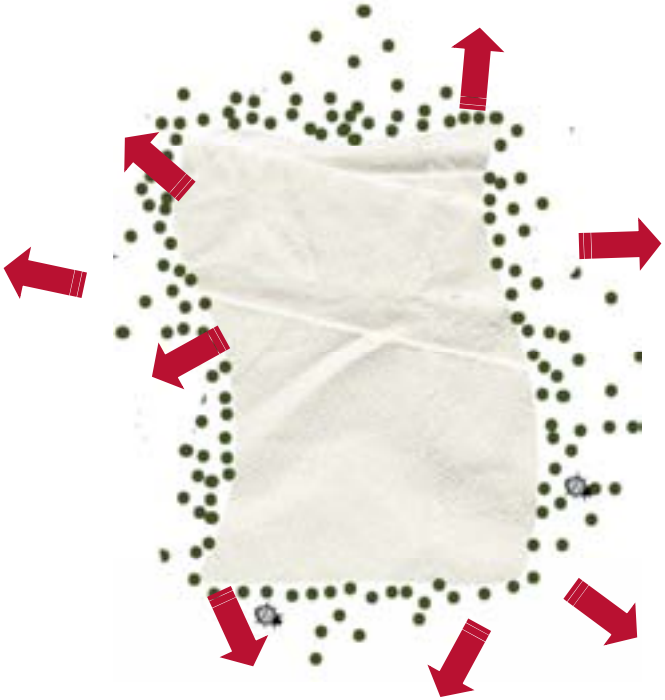
Antimicrobial agents

Capable of destroying or suppressing the growth of micro-organisms.
Differ in their:

- Chemical Nature
- Mode of operation
- Durability
- Effectiveness
- Safety
- Cost
- Verification
- Registrations

Mode of action

Migration
from substrate to bacteria
for antimicrobial action

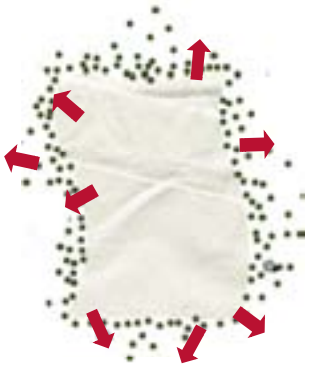


Conventional organic and
inorganic active substances

No migration
mechanical process
for antimicrobial action

aegis™

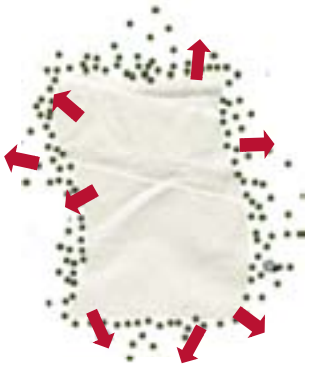
Migrating antimicrobials



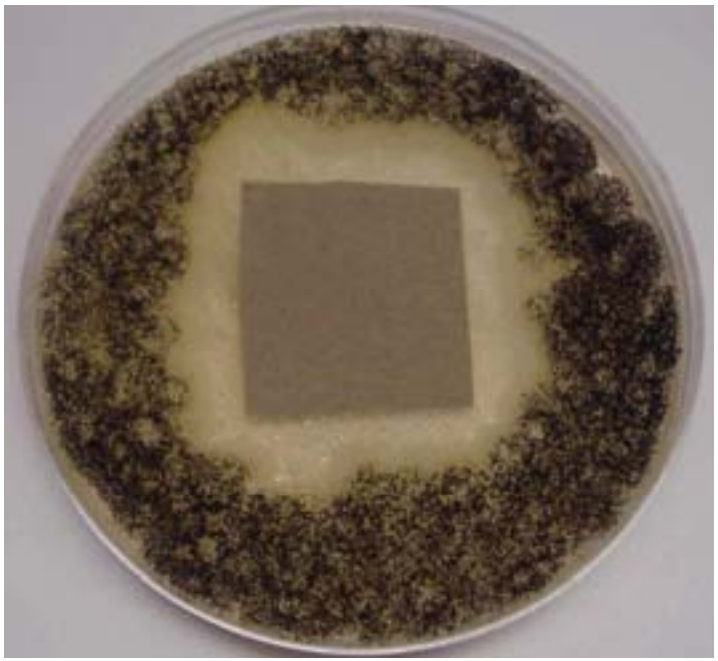
Diffuse from the substrate to the microbe

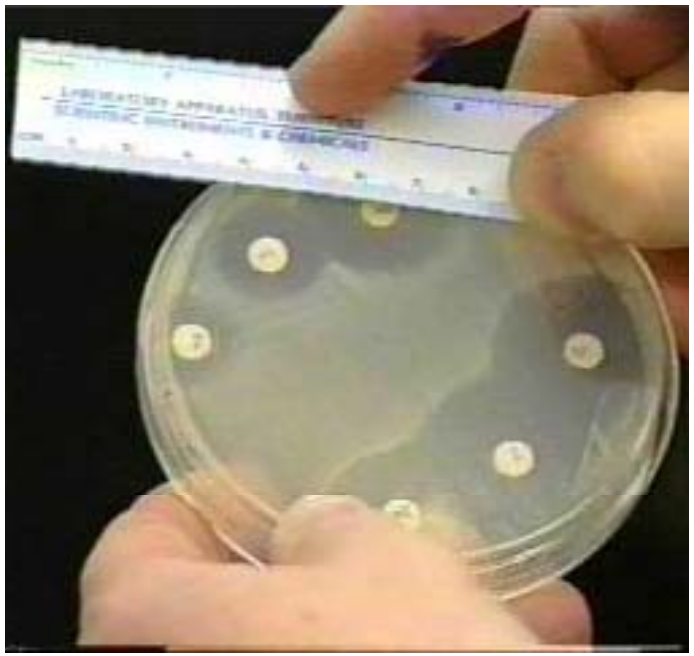
- Leach or migrate out of the substrate into the environment
- Are consumed by micro-organisms
- Chemically interrupt (poison) the cell
- May cause adaptive micro-organisms
- Leach out in contact with water or humid conditions

Migrating antimicrobials

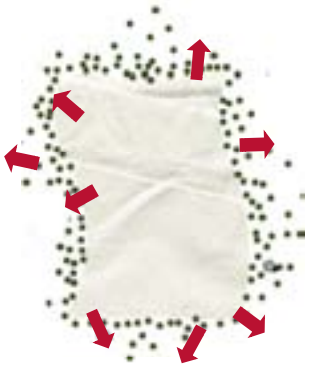


Zone of inhibition in Agar diffusion tests





Migrating antimicrobials



Antimicrobial active substances that require migration for their action are for example:

- Bis chlorinated phenols (triclosan)
- Organo tins (i.e.TBT)
- Heavy metals organo complexes (Pb,Hg,As,…)
- Water Soluble Quats
- Ag & CU Zeolites
- Biguanide
- Chitin

Non migrating antimicrobials

Are bounded to the substrate and require a contact by the microbe

- Are bonded to the product surface
- Are not consumed by micro-organisms
- Mechanically interrupts (stabs) the cell wall
- Remain functional for the life of the product
- Will not cause adaptive micro-organisms

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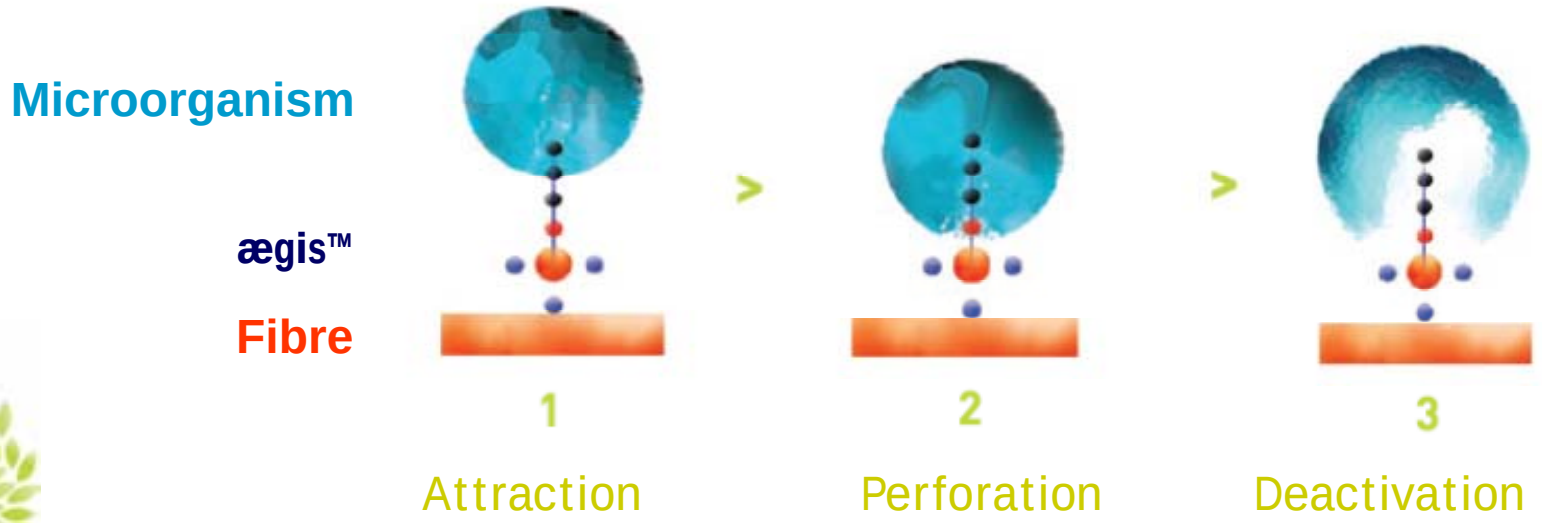
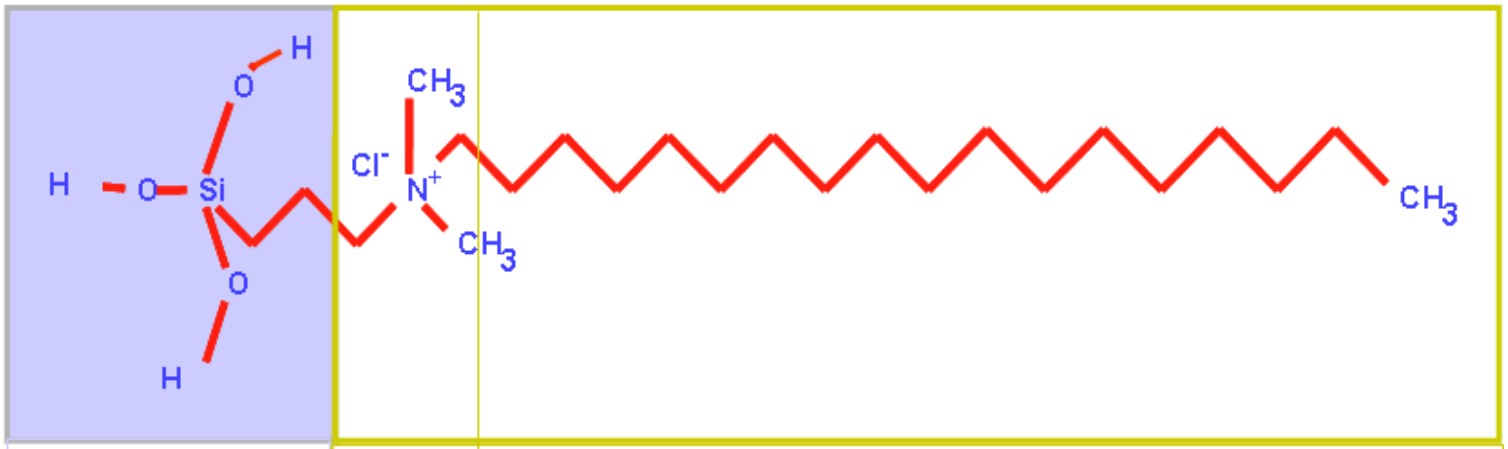
The ægis™ technology

Only the microorganisms which are in contact with the substrate will be deactivated, not the beneficial microorganisms living on our skin.



The ægis™ technology

3-(Trihydroxysilyl) propyl dimethyloctadecyl ammoniumchloride



Anchor

Reacts with fibre and itself

Durability

⊕

Cell wall

Attraction

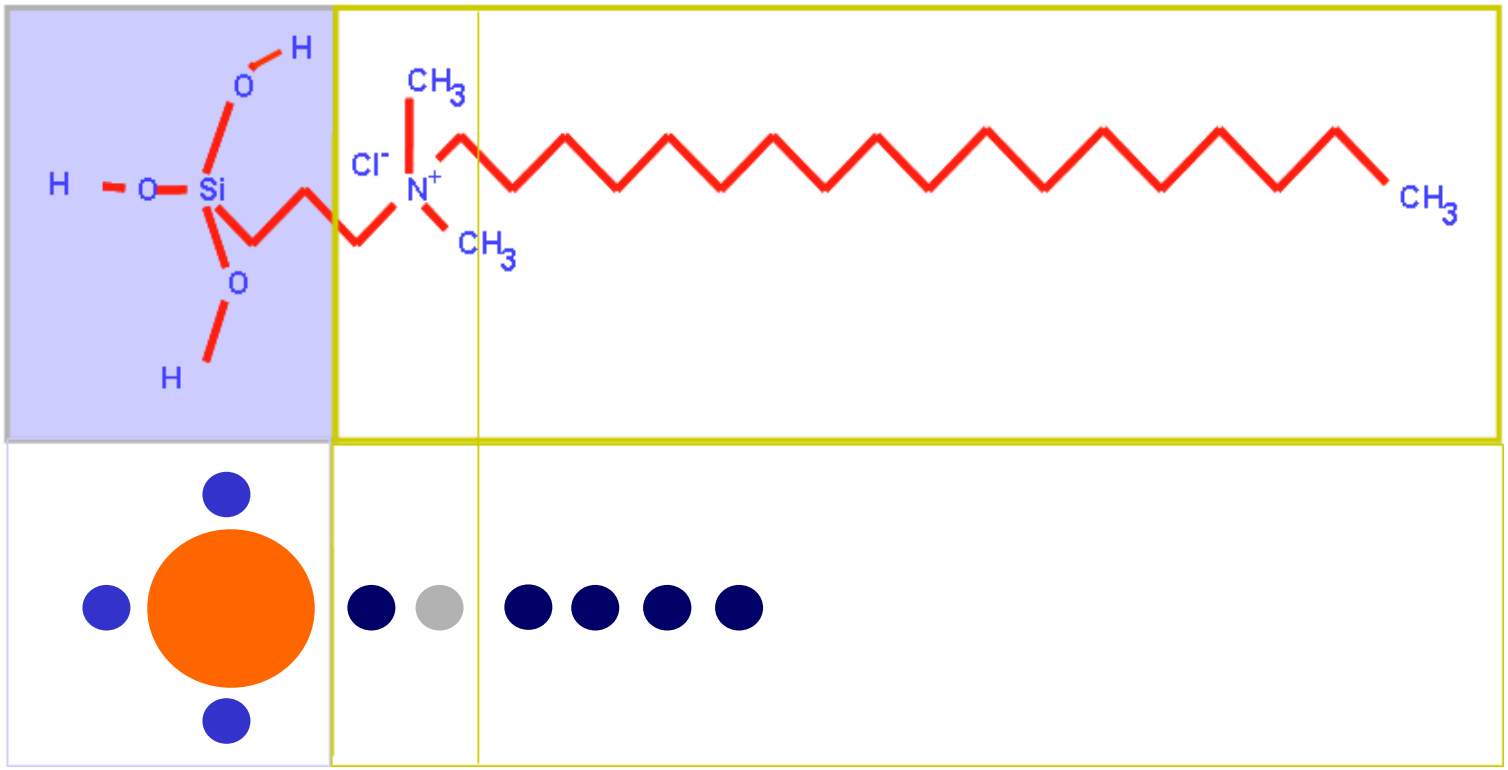
Aliphatic C18 chain

Lipophilic properties (loves fat)

Disruption

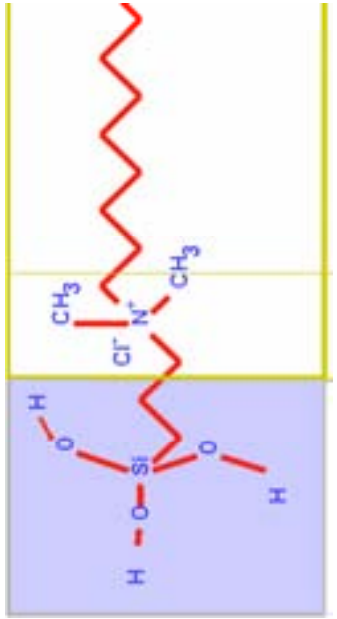
The ægis™ technology

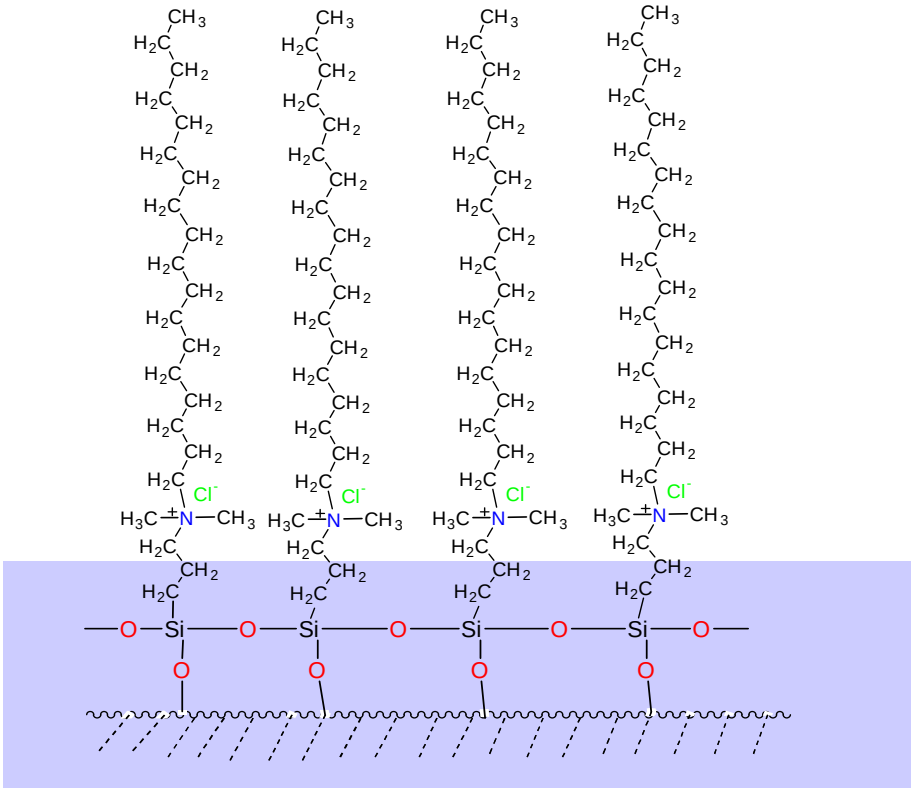
3-(Trihydroxysilyl) propyl dimethyloctadecyl ammoniumchloride



The ægis™ technology

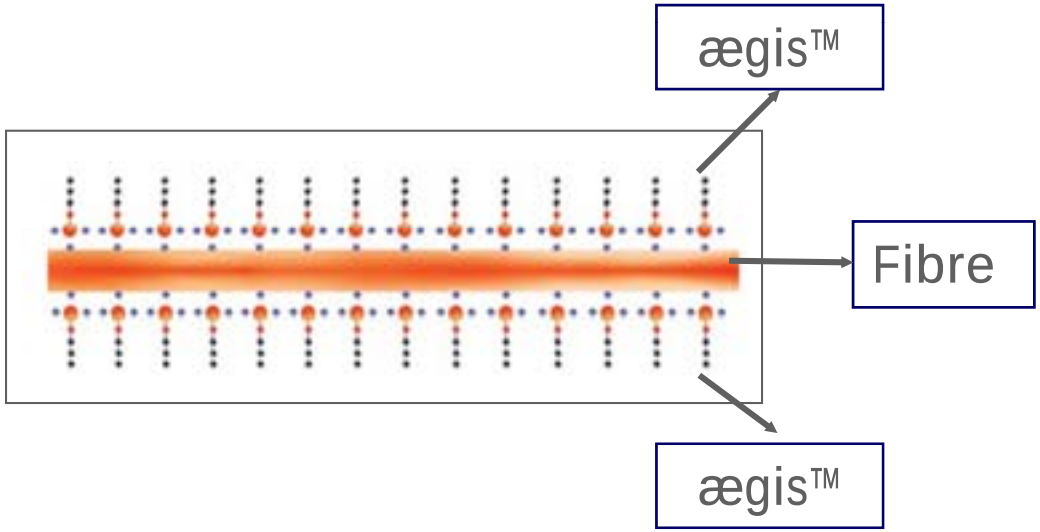
Bonding to the textile and cross-linking with itself



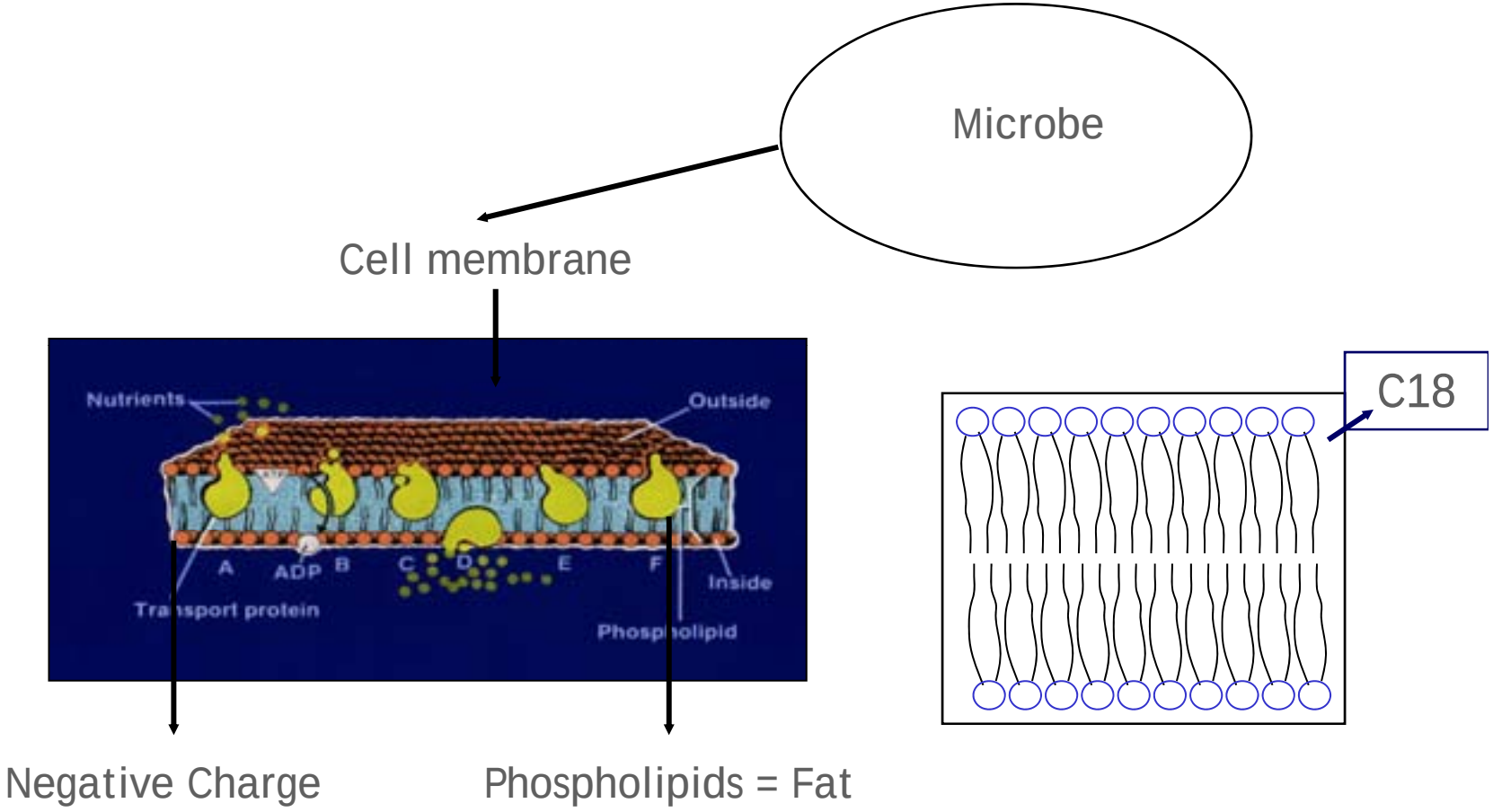


Polymerisation: monomer => polymer

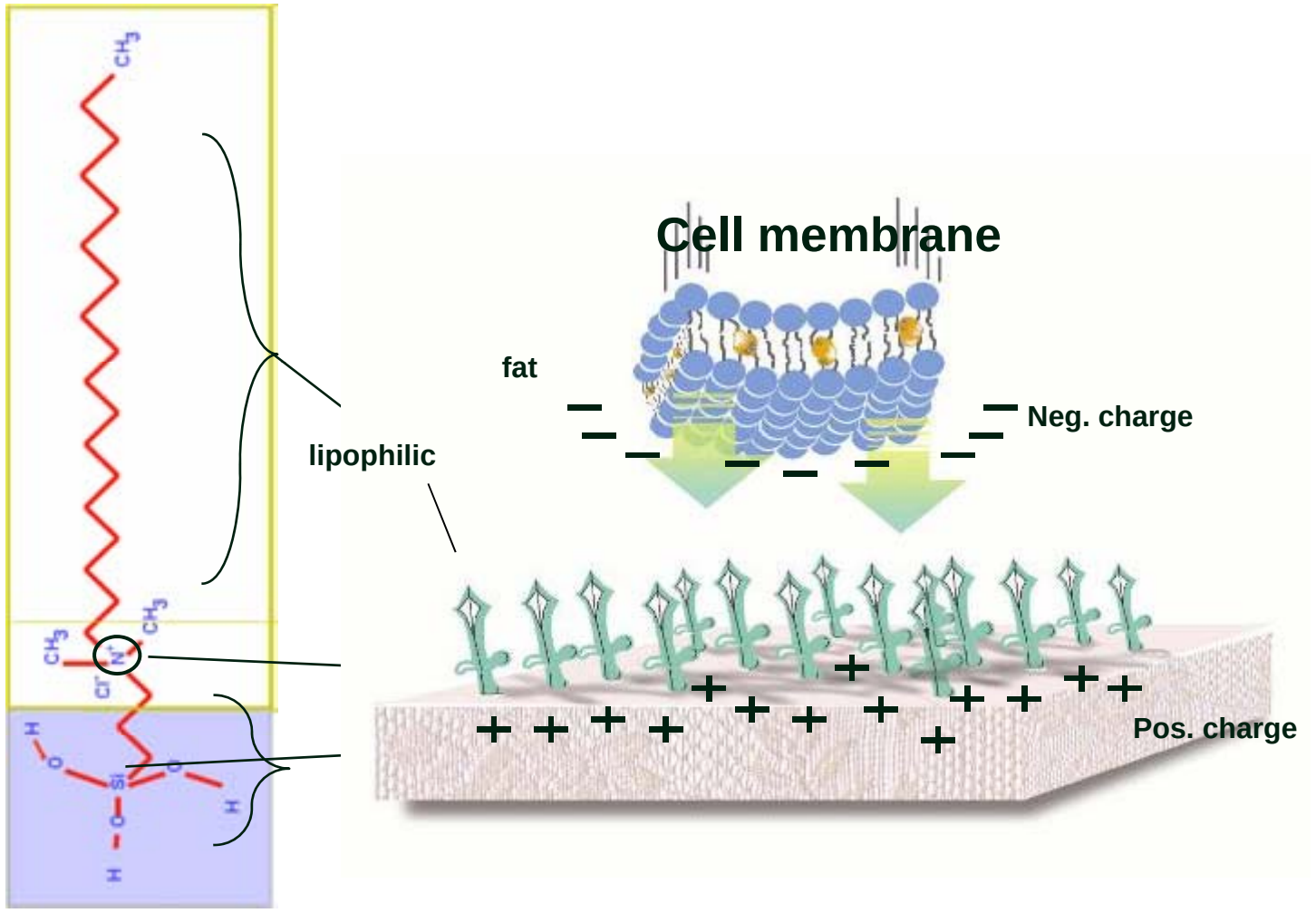
The ægis™ technology is based on the fixation of a non migrating permanent coating on the fibres



The cell membrane



The ægis™ technology



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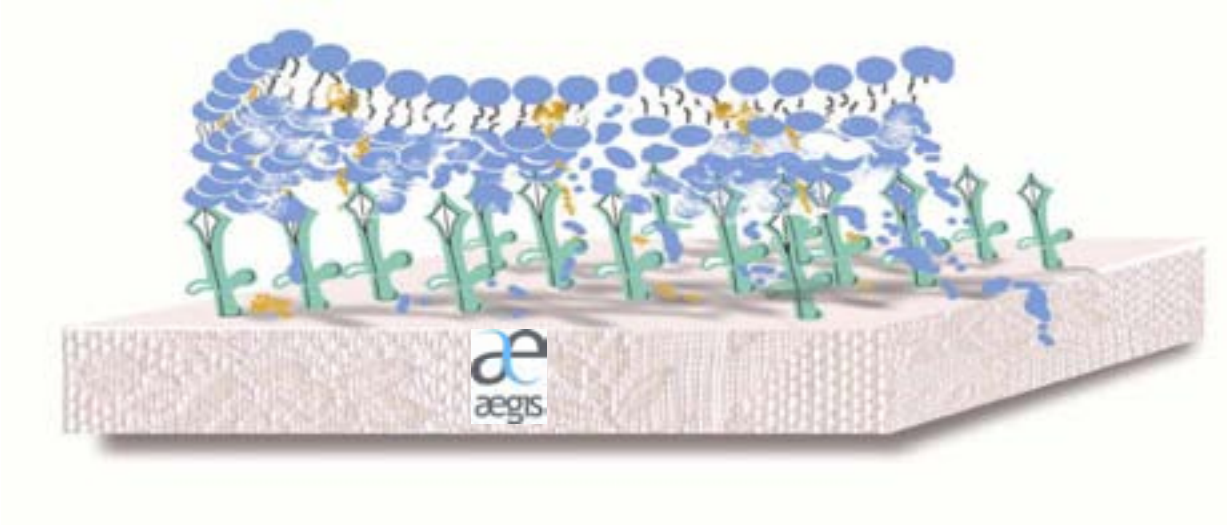


The microorganisms are killed by two actions:

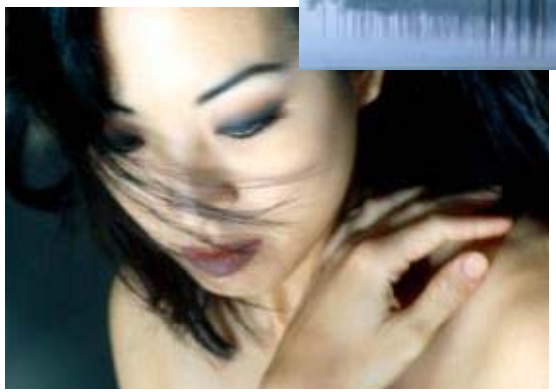
1) Electrical short-cut: Neg. et Pos. meet

2) Physically disrupts the cell membrane through physical penetration

The ægis™ technology

There are approximately 25.000 swords available for 1 microorganism.

The ægis™ technology
=
Non-toxic and respect for the environment



The chemical bonding causes the surface to become antimicrobially active

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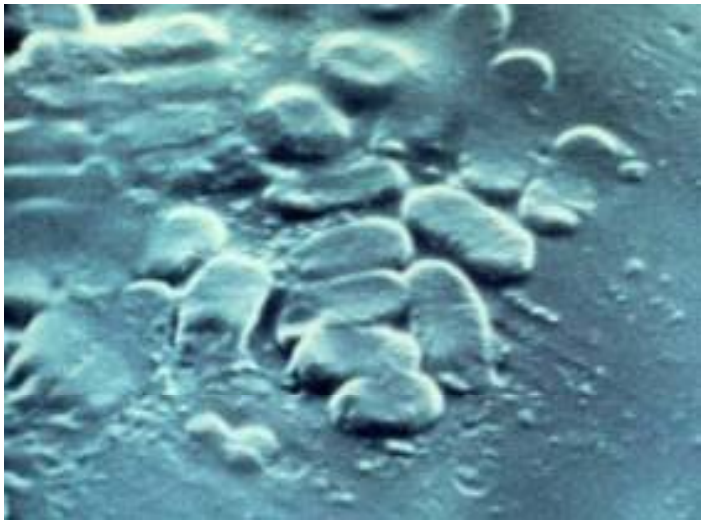
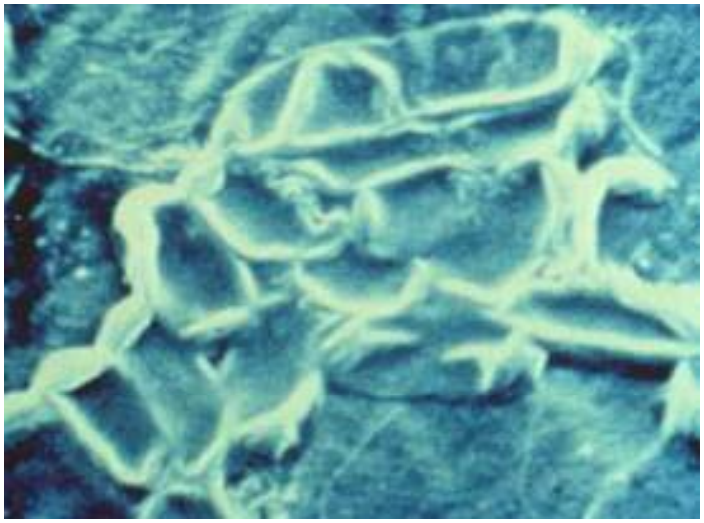
- No migration to the skin
- No migration to the environment

Cell wall disruption



untreated



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Qualitative 1 minute test

Bromophenol blue (BPB) staining test

Blue test kit

powered by
Devan

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Safety profile

- Excellent skin tolerance (OECD 406, HRIPT)
- Free of heavy metals, Silver, TBT, Formaldehyde, Triclosan, Arsenic,…
- Non toxic to waste water bacteria (activated sludge) to and biodegradable (OECD 209 and 302B

Registrations

Unique registration profile

- C.A.S., Nr. 27668-52-6
- BPD Notification in Europe, Nr. N605
- EPA in the USA, Nr. 64881-2
- Öko-Tex Standard 100, Class 1-4 (ed. 01/07)
- Only product registered for Belgian Market, Nr. 6606B
- Canada PMRA # 28541 (DSL)
- Japan ENCS # 2-2095X
- Australia AICS
- Korea ECL # KE-34384
- China: Listed in approved chemical Inventory

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Multi-functional finishes: “& Fresh”

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Conclusion

Feature and benefits for the end consumer

Active Freshness: stops bacterial and fungal growth, the major cause of most fabric odour problems.

Active Hygiene: controls the development of dust mites by destroying some fungi necessary in the dust mite's food chain.

Permanent: Durable for the useful life of most products.

Not a chemical poison: No arsenic, heavy metals, or polychlorinated phenols, unmatched safety profile: not harmful for human or environment

No Migration: Won't leach into the environment or transfer to other articles or to the skin - no "zone of inhibition".

Multi-functional finishes: Moisture management, shape retention & after wash appearance

powered by

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