

A single **teaspoon** of productive soil generally contains

I BILLION BACTERIA



Therefore, every **acre** of soil contains ONE TON OF BACTERIA



12.5 BILLION TONS OF BACTERIA WITH 2.6 X 10 29 BACTERIAL CELLS





THEY COLONISE PLANT ROOTS, STIMULATE GROWTH, RECYCLE NUTRIENTS AND CONTROL PATHOGENS

Biofilms are therefore an integral part of the



WORLD'S \$3,700BN OF AGRICULTURAL ACTIVITY



ANTIBACTERIAL PRODUCTS IN AGRICULTURE

particularly fruit and vegetables and can be applied to foliage, the soil or even injected into trunks.

The global market for these materials is estimated to be







ORAL PLAQUE IS A BIOFILM THAT FORMS
BETWEEN TEETH AND ALONG THE GUMLINE





Without removal by cleaning, it leads to the

DEMINERALISATION OF TEETH

AND THE FORMATION OF CAVITIES

AS WELL AS INFLAMMATION OF THE GUMS

This includes **routine oral hygiene products** such as:

The global **oral care/ hygiene market** totals



Drivers for growth include rising awareness among consumers of dental treatments as means to

IMPROVE AESTHETICS



TOOTHBRUSHES

The **toothbrush** and **mouthwash** segment is expected to exhibit the **highest growth** due to innovative products such as

ELECTRIC TOOTHBRUSHES



You have just as many bacterial cells living on your body as human cells inside it.

3.0 X 10¹³ (10,000 BILLION) THE BODY



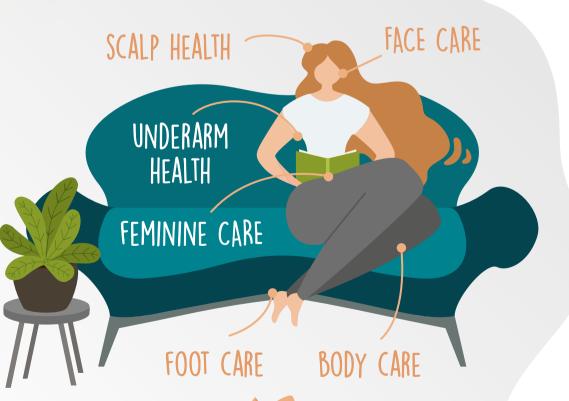
3.0 X 10^B (10,000 BILLION) BACTERIA IN THE HUMAN BODY

1000 DIFFERENT BACTERIAL

What areas do we consider biofilms present and why it is important to consumers?

CONSUMER DESIRE TO MANAGE THEIR SKIN FOR AESTHETIC AND FUNCTIONAL REASONS

Personal care products provide prevention and control of skin conditions for:



Aesthetics arising from



PERSONAL APPEARANCE



AROMA

Functionality arising through



GROOMING

HYGIENE



PROTECTION



ODOUR CONTROL

The global personal care market in 2019 \$339BN \$91BN

A GLOBAL INDUSTRY

Proportion of each sector attributable to biofilms:

20% SKINCARE

20% BABY & CHILD

25% HAIR CARE

50% BATH & SOAP

100% DEODORANT

Amount of which was attributable to biofilms



Biofilms have a **significant impact** on human health. This is estimated to be:

\$7.2BN IN THE UK AND \$387BN GLOBALLY

CYSTIC FIBROSIS

UK: \$493M GLOBAL: \$7.5BN

The mucus produced in the lungs of cystic fibrosis patients is colonised by biofilm forming pathogens. In the UK cystic fibrosis accounts for **9,500** hospital admissions and over **100,000** hospital bed-days every year. More than **70,000** people worldwide are living with cystic fibrosis.



CENTRAL VENOUS CATHETER BLOODSTREAM INFECTION

UK: \$38.7M GLOBAL: \$11.5BN

Biofilms colonise catheters and can lead to infection. A European study in 2009 estimated that **210,000 central venous and arterial catheters** were placed annually in the UK leading to **8,940 bloodstream infections**.





PROSTHETIC CARDIAC VALVES AND PACEMAKERS

UK: \$3M GLOBAL: \$220M

The risk of infection is around 1% for a new device and 3% for a replacement device. Over **one million pacemakers** are implanted globally. This infection is typically in the form of a biofilm on the artificial surfaces of the pacemaker. These can only be treated by surgery removal and replacement.



CATHETER—ASSOCIATED URINARY TRACT INFECTION

UK: \$99M GLOBAL: \$IBN

Biofilms colonise catheters and can lead to infection. Around **150 million people** globally experience a urinary tract infection (UTI) every year; it is the most common bacterial infection among women, In England, **17.2%** hospital acquired infections are UTIs; they are the most common type of hospital acquired infection.



In 2019, the global

HOUSEHOLD CLEANING PRODUCT MARKET

reached \$2|2BN with a growth of 5% PER YEAR



RAPID GROWTH DUE TO:

- Consumer shift towards natural and clean-labelled, eco-friendly products (away from perceptions of harsh chemicals)
 - Reduction in non-biodegradable waste, particularly plastics
 - Less time on domestic housework
 - More time on leisure activities
 - Rising incomes



TECHNOLOGY OF PRODUCT FORMULATIONS

- Detergents & surfactants
- Water softeners
- Bleaches & enzymes
 - Polymers (fillers)
- Foaming agents
- Colour & fluorescence additives
 - Fragrances
 - Antibacterials & preservatives

AIR FRESHENERS

Global \$13.3bn UK £340m

POWDER DETERGENTS

Global \$11.1bn UK £286m

LIQUID DETERGENTS

Global \$26.1bn Global \$3.7bn UK £667m UK £95m

POLISHES

UK £95m

DETERGENT TABLETS

MANUAL DISHWASHING

Global \$9.6bn UK £245m



TOILET CARE

Global \$10.1bn UK £259m

LAUNDRY AIDS

Global \$14.9bn UK £381m

FABRIC CONDITIONERS

Global \$13.8bn UK £354m

HOME INSECTICIDES

Global \$4.8bn UK £122m

SURFACE CARE

Global \$24.5bn UK £626m

AUTOMATIC DISHWASHING

Global \$14.9bn UK £381m

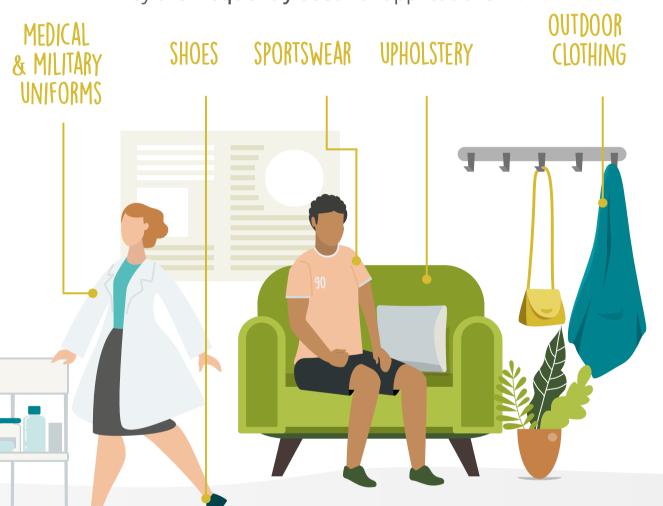


ANTIMICROBIAL TEXTILES are specialist textiles with an ANTIMICROBIAL COMPOUND.



This compound helps **resist contamination** from bacteria, viruses, protozoans and fungi and control odours.

They are **frequently used** for applications in:



CURTAINS MEDICAL BEDDING



THE GLOBAL TEXTILES MARKET reached \$9.5BN in 2019 with a growth of 5.4% PER YEAR

THE MARKET IS

£250M

Key drivers behind market growth in Asia Pacific (region with highest growth rate):

- PREVENTION OF HOSPITAL ACQUIRED INFECTIONS GROWING PER CAPITA INCOMES
 - INCREASED HEALTH AWARENESS
 - RISING POPULATION

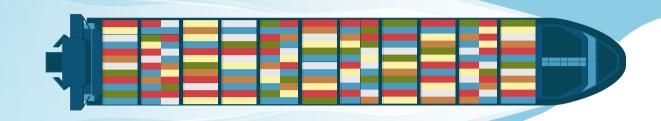








£10,000M



TOTAL VALUE OF MARINE VESSEL ANTIFOULING £28,700M

50,000 REGISTERED MERCHANT SHIPS

are responsible for transporting:

30% of global trade by volume

70% of global trade by value

GLOBAL SHIPPING CAPACITY

is growing by 2.7% PER YEAR

Shipping is reported to account for

2% OF ALL GLOBAL CARBON DIOXIDE EMISSIONS

with the largest emissions from the container ship, bulk carrier and oil tanker fleets

MARINE BIOFOULING can **increase** drag by up to 34%

