



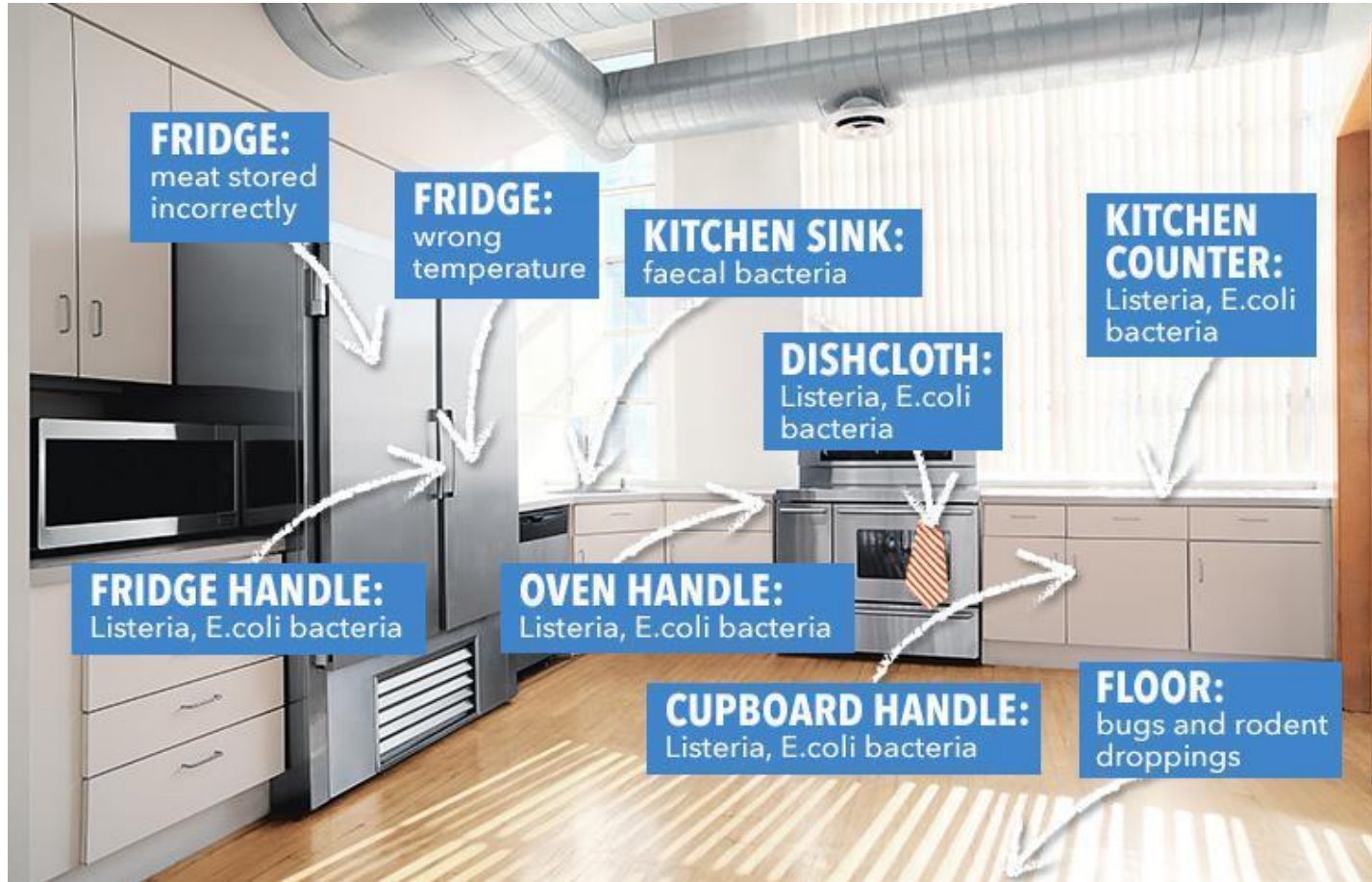
# Germ-Repellent Technology for a Smart Home

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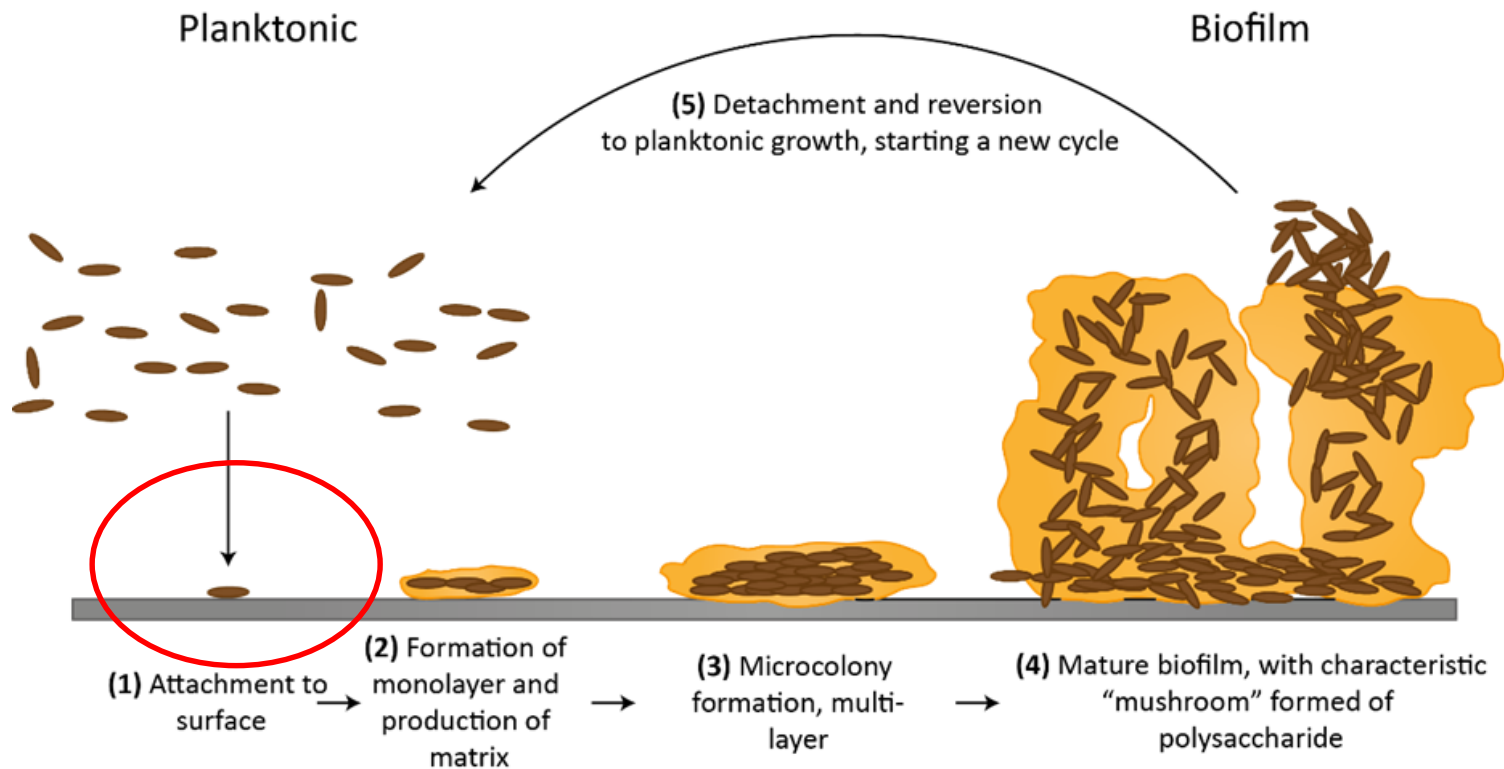
# Bacteria at Home



Bacteria attach to surface of any object and subsequently form biofilm.



# How is Biofilm Formed?



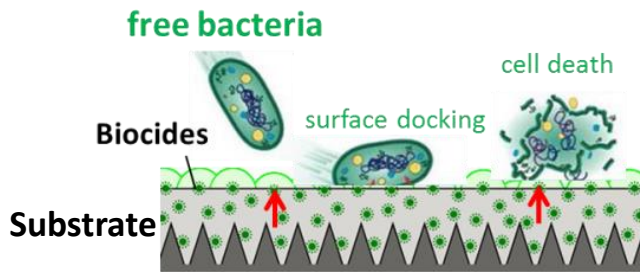
**Biofilm: Cities of bacteria and difficult to be removed**



# Turning “Germ-repellent” Concept into “Antimicrobial” Effect

## Conventional Anti-microbial Products

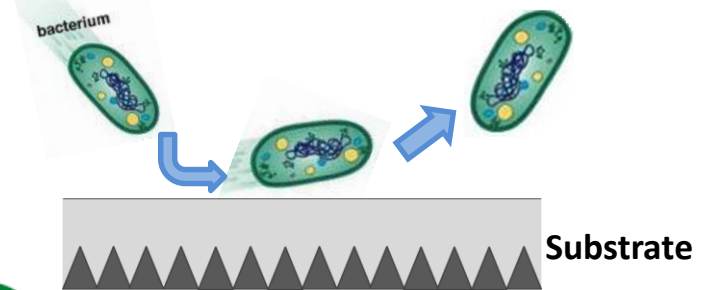
- ❖ Addition of biocides & antimicrobial agents (e.g. silver-based derivatives)



- ⚠ Regulatory incompliance
- ⚠ Appearance change
- ⚠ Skin allergy

## Revolutionized Germ-repellent Plastics

- ❖ Prevention of free bacterium to stay on surface, and hence no biofilm formation

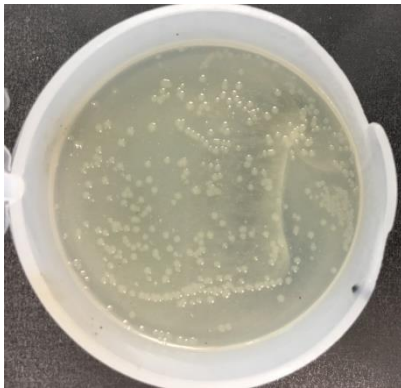


- ✔ GRAS raw materials
- ✔ Minimal change on bulk properties
- ✔ Fit into common manufacturing process

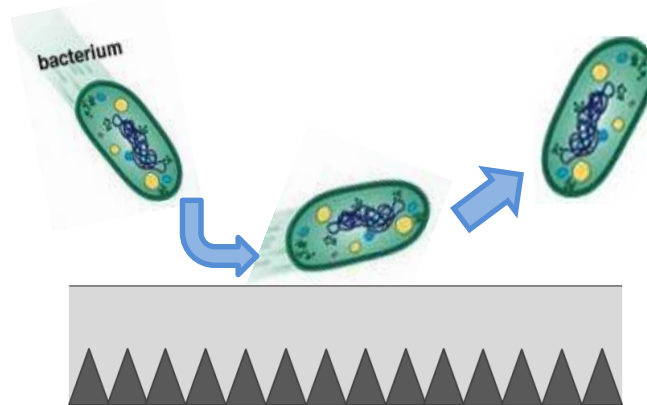


# NAMI Germ-Repellent Plastics

- ❖ Biocide-free, built-in
- ❖ Non leachable
- ❖ No discoloration
- ❖ Award-winning (Inventions Geneva, 2017, 2018 & 2019)



**Traditional** PE after bacterial spike



**NAMI** germ-repellent PE after bacterial spike

Biofilm formation could be prevented by reducing bacterial adsorption.



# *Examples of Outsourced Testing Reports in Previous Research Projects*

## Germ-repellent tests:

NAM's instructed testing protocol  
(with reference to ISO 22196)

## Food-contact safety tests:

EU10/2011

US FDA 21 CFR

LFGB Sensory test

## Biocompatibility tests:

ISO 10993-5 and ISO 10993-10

ISO 18562





# Germ-Repellent Plastic Products



Products under Development



Potential Products



# ***Germ-Repellent Bathroom Fixtures: Collaboration with Kimsion***

- NAMI's germ-repellent technology adds dollar and hygienic values to high-volume bathroom products by Kimsion.







# Biofilm Formed on Bathroom Fixtures



- ❖ The humidity of the bathroom environment is particularly favorable to the proliferation of bacteria like *S. aureus* and *E. coli*.
- ❖ Bacteria adhere onto the surface of bathroom fixtures and eventually form biofilm, which is potentially hazardous for any person comes in contact with the surface.



# A Clean and Biofilm-free Bathroom from Kimsion and NAMI



- ✓ **>90% germ-repellent efficacy** against *E. coli*
- ✓ **>90% germ-repellent efficacy** against *S. aureus*
- ✓ **BS EN 1254** tests passed (toilet seats and cover)
- ✓ **BS EN 274** tests passed (waste traps)



*For R&D Collaboration Opportunities:*

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