



The Science of Cleaning: Research-based insights for food safety

The webinar will begin shortly.
Thank you for attending!



The Science of Cleaning

Research-based insights
for food safety



Webinar housekeeping

- The webinar will run for ~1 hour.
- The presentations will take ~45 mins.
- These will be followed by a panel discussion with our experts. Please submit your questions via the Q&A box.
- We will reach out after the webinar to answer any questions we do not address during the session.
- The webinar will be recorded and we will send you the recording in a few days via email.

Meeting future demands

Global reach & reliable supply chain



326

employees
worldwide



+90

countries with
distributors



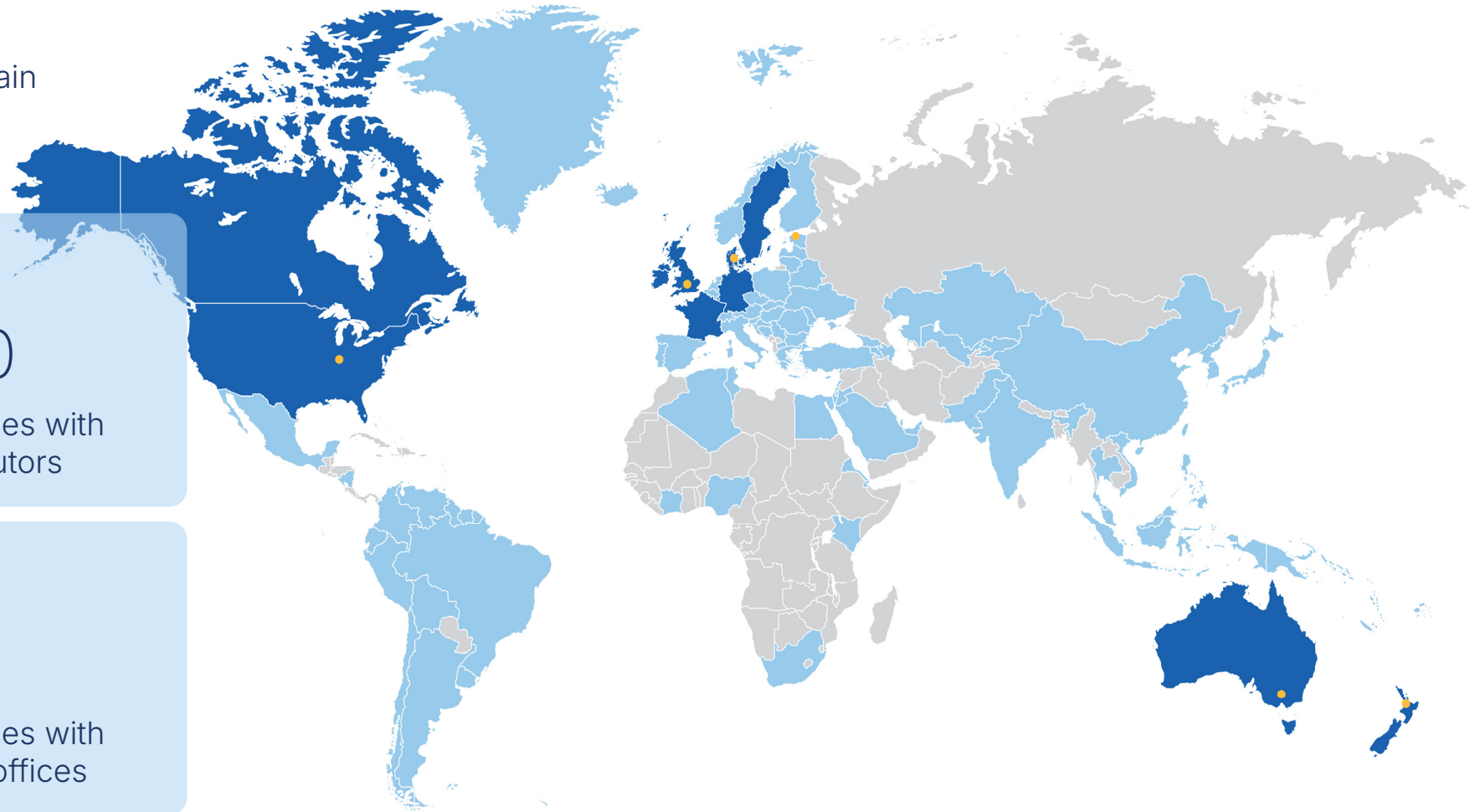
2

factories in
Denmark & Estonia



+9

countries with
Vikan offices





Trond Møretro
Research Scientist and Food
Microbiologist at Nofima



Maria Oliver
Principal Scientist at InBio



Jack Burnett
North American Hygiene
Specialist at Vikan

Cleaning sponges vs. brushes: Usage patterns, food safety, and effective hygiene practices

Trond Møretrø

Senior research scientist

Nofima

Nofima – Norwegian food research institute

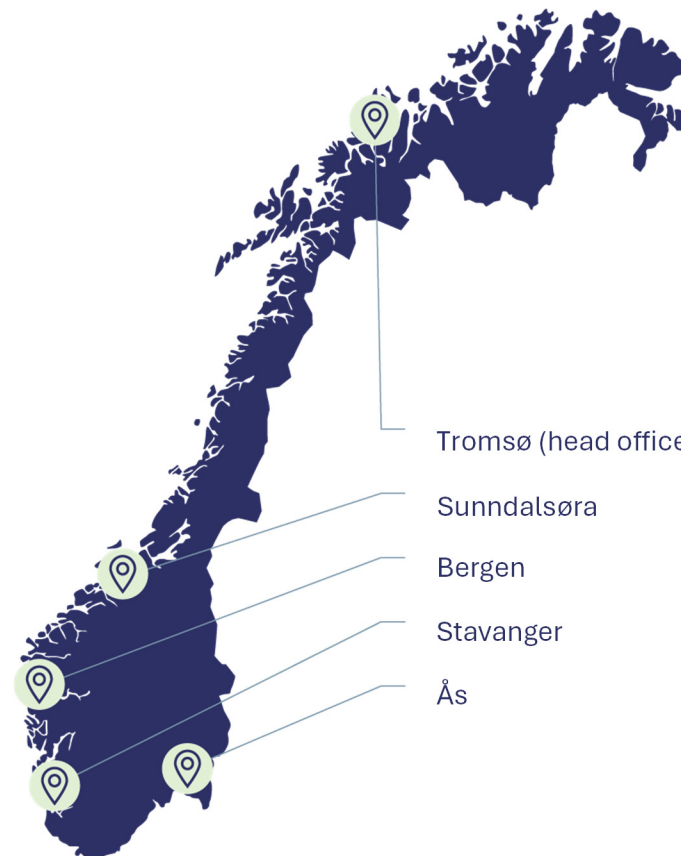
Applied research creating value for the food industry and society



381 Employees



736 Turnover
(mill. NOK)



Sustainable food for all

Kitchen cleaning utensils

- Extremely high number of bacteria in kitchen sponges
- Pathogenic bacteria can be found on sponges
- Cleaning utensils may transfer pathogenic bacteria
- Use of brushes and sponges in Europe
- Growth/survival of bacteria on brushes and sponges
- Influence of humidity
- How to clean cleaning utensils

SAFE CONSUME



Horizon 2020
Research and
Innovation programme

International Journal of Food Microbiology 337 (2021) 108928

Contents lists available at ScienceDirect

ELSEVIER International Journal of Food Microbiology

journal homepage: www.elsevier.com/locate/ijfoodmicro

Dishwashing sponges and brushes: Consumer practices and bacterial growth and survival

Trond Møretro^{a,*}, Birgitte Moen^a, Valérie L. Almli^a, Paula Teixeira^b, Vânia B. Ferreira^b, Anette Wold Åsli^a, Charlotte Nilsen^a, Solveig Langsrud^a

Check for updates

Received: 4 October 2021 | Revised: 29 April 2022 | Accepted: 10 May 2022
DOI: 10.1111/jam.15621

ORIGINAL ARTICLE



Bacterial levels and diversity in kitchen sponges and dishwashing brushes used by consumers

Trond Møretro¹ | Vânia B. Ferreira² | Birgitte Moen¹ | Valérie L. Almli¹ | Paula Teixeira² | Ida M. Kasbo¹ | Solveig Langsrud¹

More bacteria in a kitchen sponge than people on Earth

- Among items/places with most bacteria on Earth, together with intestine, sewage, organic soil
- Often billions of bacteria in a single sponge
 - Dominated by non-harmful bacteria like *Pseudomonas*, *Acinetobacter*...



Kitchen cleaning utensils

- Extremely high number of bacteria in kitchen sponges
- Pathogenic bacteria can be found on sponges
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- Use of brushes and sponges in Europe
- Growth/survival of bacteria on brushes and sponges
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Journal of Applied Microbiology

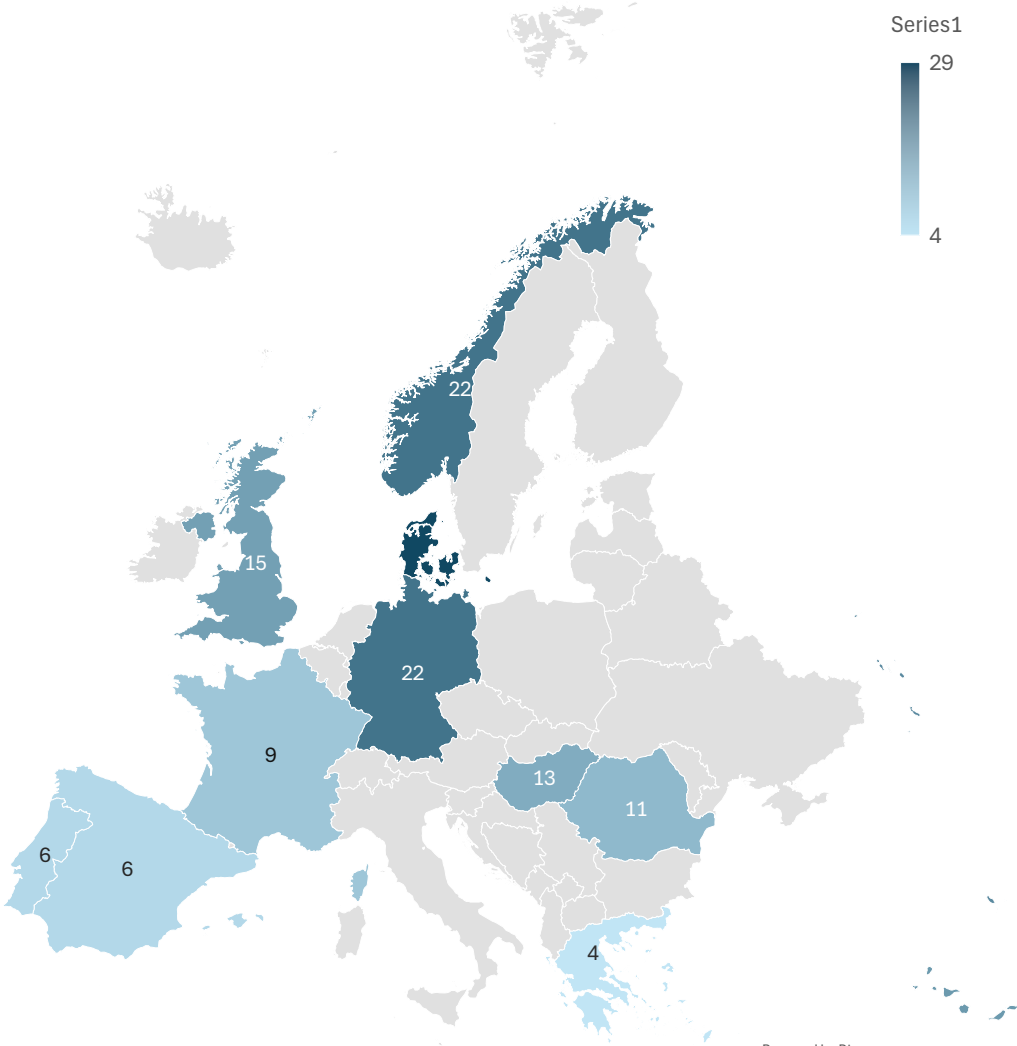
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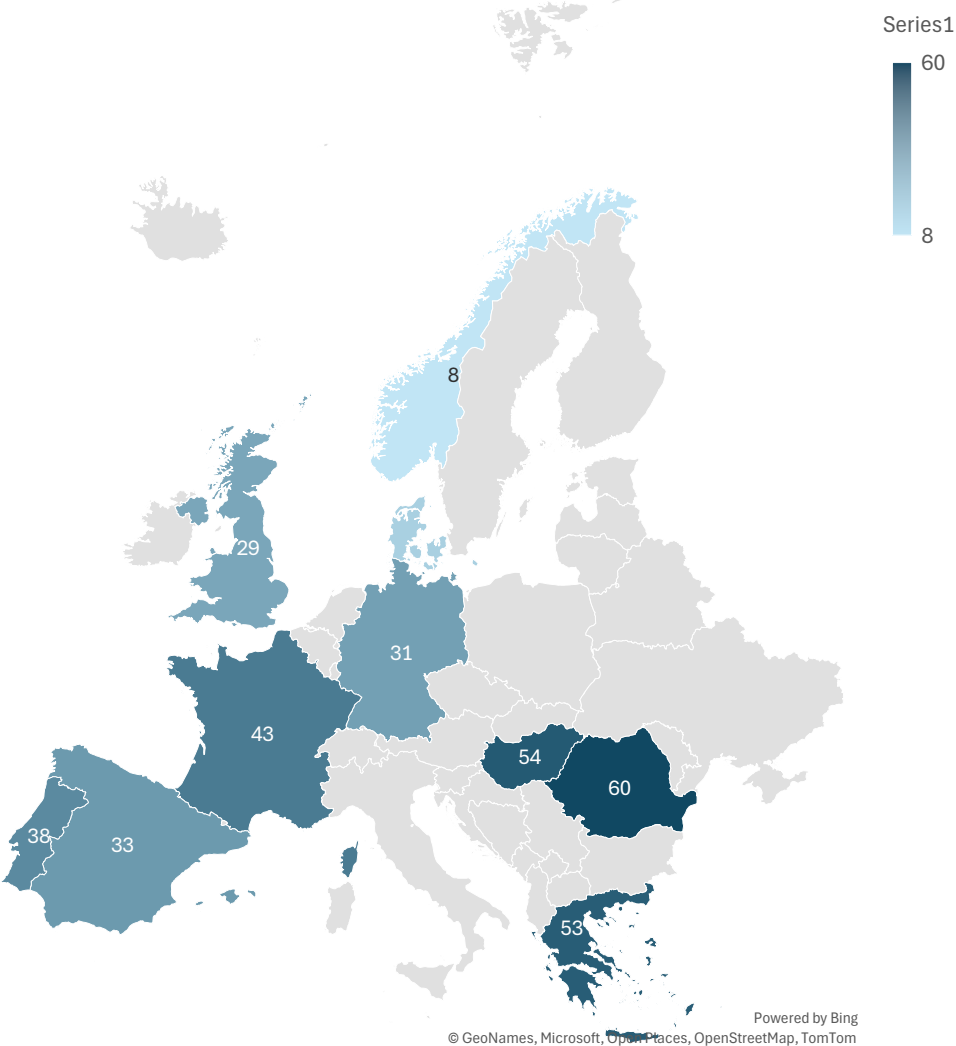
How do you wash up?

Washing up with a BRUSH



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Washing up with a SPONGE (%)



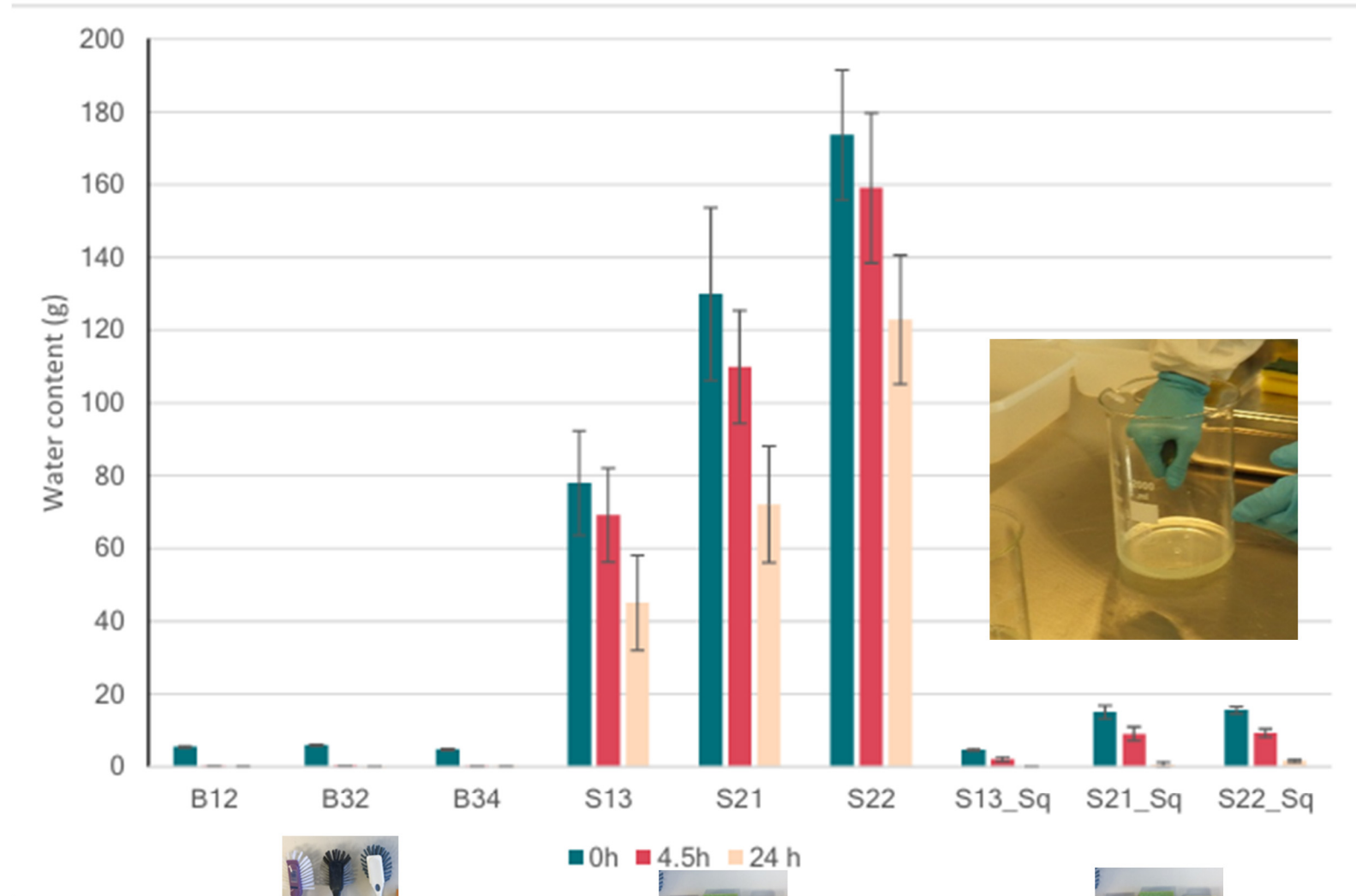
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Brushes and sponges in Norway



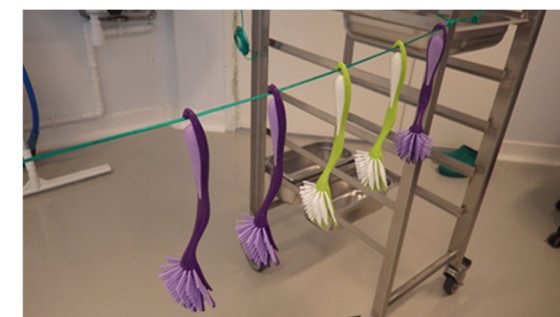
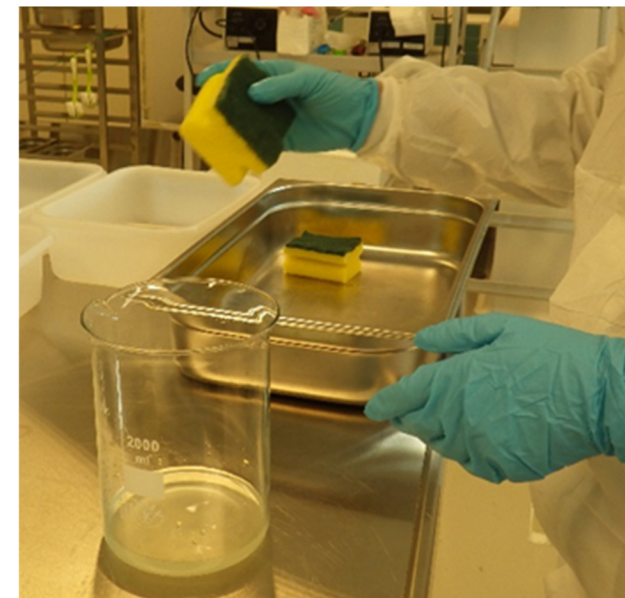
Laboratory studies new brushes and sponges

Brushes dry faster than sponges

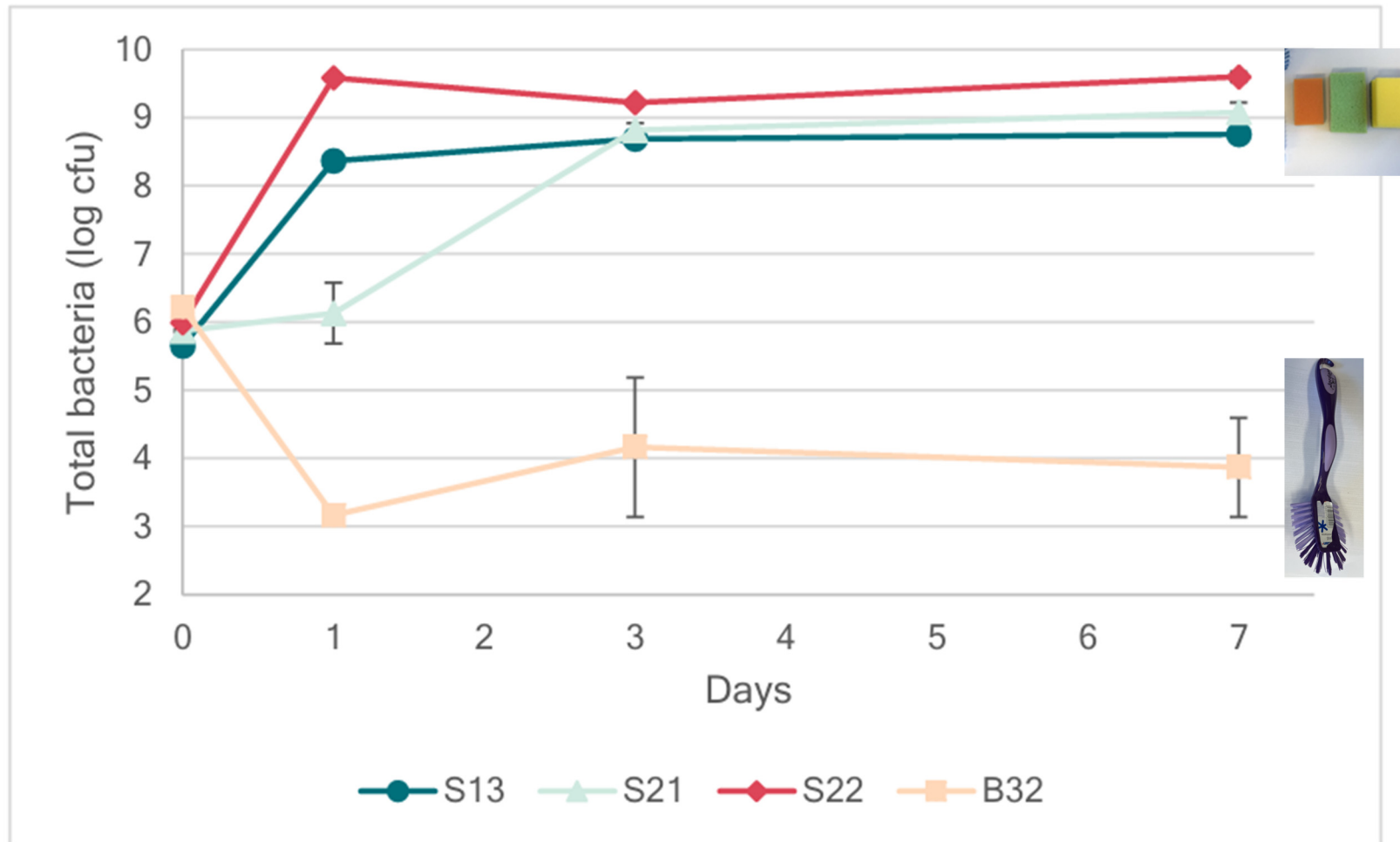


Impact on bacteria

- Inoculated mix of Campylobacter, Salmonella and kitchen bacteria in sponges and brushes
- Nutrients added day 0, 3 and 7 : chicken+salad+waffle mix
- Water added day 1, 2, 6, 8 and 9
- Storage conditions
 - “Left on countertop” – sponges
 - Hang to dry – brush



Total bacteria

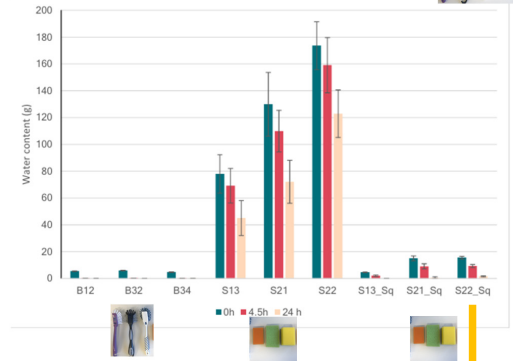
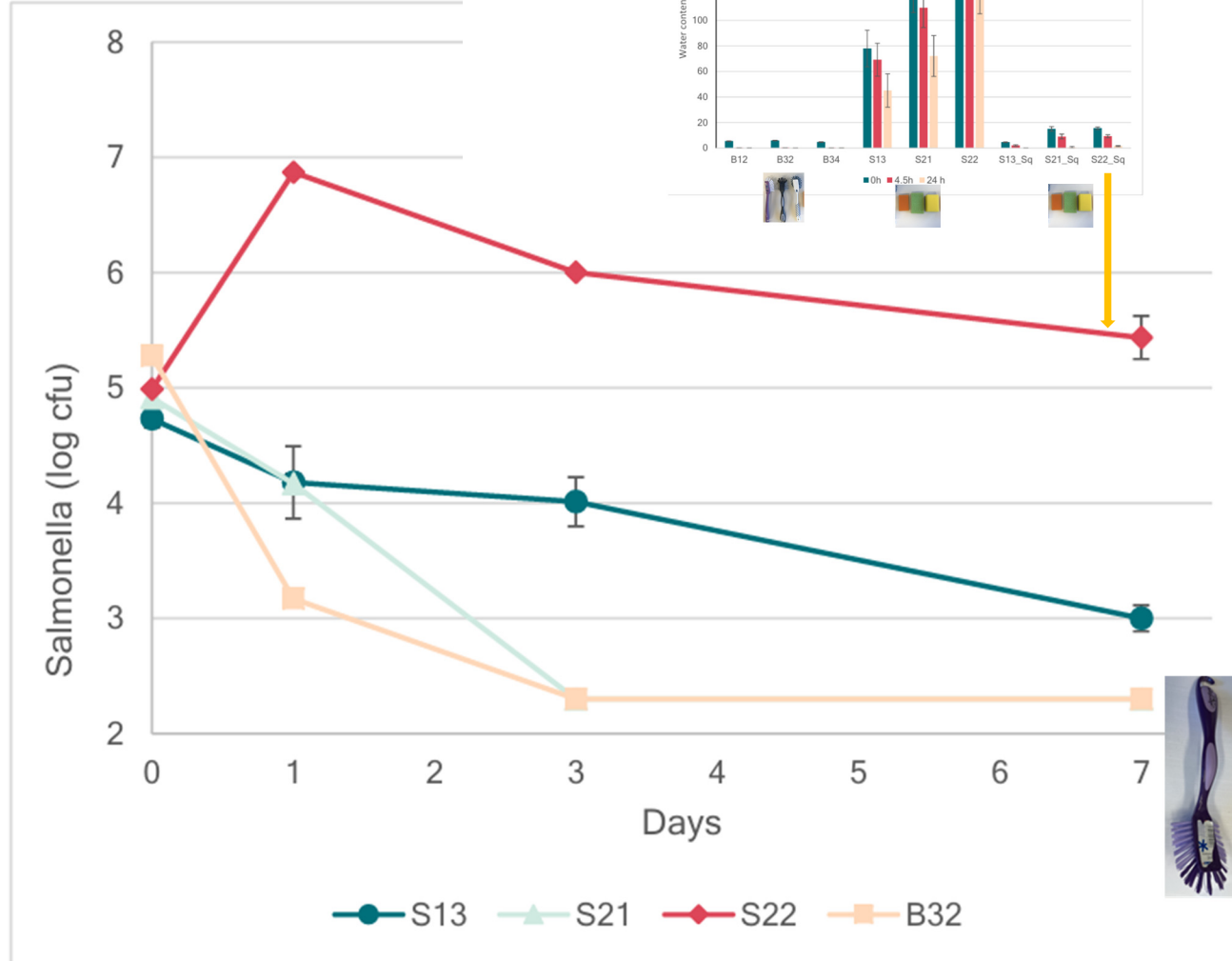


Grow in sponges
Killed in brushes

Salmonella

Brushes dry faster than sponges

SAFE CONSUME



- *Salmonella* dies faster in brushes than sponges



Follow up: Used brushes and sponges



Follow up studies- used items

- Added Salmonella to used sponges and brushes.

- Brush hanging to dry: Salmonella killed



- Brush in a plastic bag: Salmonella grows



- Sponges with or without plastic bags: Salmonella grows in both- humid

How to clean your brush/sponge

- Added Salmonella, kitchen bacteria and food soils to brushes/sponges
- Stored in plastic bags at room temp for 1 week, added water every other day
- Tested different cleaning methods. Removal/kill of bacteria and removal food soil

- 🏆 Gold: 4000 ppm chlorine overnight
- 🥈 Silver: Dishwashing and boiling (5min)
- 🥉 Bronze: Washing in detergent water + drying
 - 4th: Microwave oven and washing in detergent water
 - 5th No washing procedure

Why brushes (and not sponges)?

- Dry fast- bacterial kill, not growth
- Handles- hands not contaminated
- Handles- can wash up in higher temperatures



Lifestyle > Cleaning

Scientist says you should never wash dishes with a sponge - what to use instead

If you wash dishes by hand, you probably use a sponge or scourer to wipe off food residue - but according to one scientist, using a sponge could see you spread more bacteria



Comments 0

By Rom Preston-Ellis Discover Editor and Zahna Eklund Senior News Reporter 29 Jan 2025



TYLE

il News Reporter

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国际 发布于 2025年03月17日 09时25分 · 最后更新 1年前

厨房海绵细菌量惊人！ 专家建议改用刷子更卫生

研究报告

الفرشاة أم الإسفنجة لغسل الأطباق؟.. دراسة تحدد الأفضل صحيا

الأربعاء 2021/1/13 08:49 م بتوقيت أبوظبي

العين الإخبارية - بسمة أبوطالب



فرشاة المطبخ هي الأفضل لغسل الأطباق من الإسفنجة

تم تحديثه الأحد 2021/1/17 06:56 م بتوقيت أبوظبي

نجحت دراسة نرويجية حديثة في الإجابة على السؤال الذي يحير الكثير من النساء في المطبخ: أيهما أفضل لغسل الأطباق: الفرشاة أم الإسفنجة؟.

Take-home message

- Use a BRUSH



Not a Sponge



Thank you for your attention!



- Trond.moretro@nofima.no

**Removal of clinically relevant cow's milk
allergenic proteins from food grade stainless
steel surfaces:**

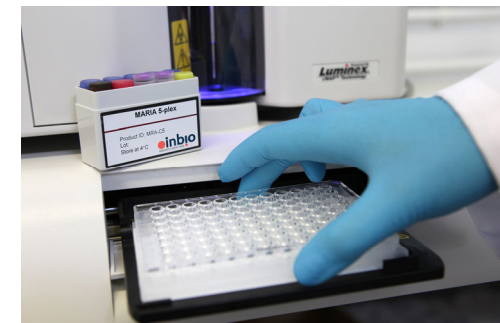
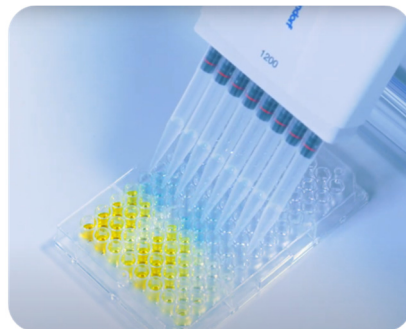
**Ultra Microfibre vs Multi-purpose
Wipes**

Maria Oliver, PhD

Introduction to InBio



- Founded in the 1990s by Martin Chapman PhD, over 30 years of company experience across 2 locations - Charlottesville, VA; Cardiff, UK.
- Manufacture highly purified allergens and immunoassays for research and diagnostics.
- Internationally recognized for research on allergen structure, function, and immune recognition. World leaders in environmental allergen detection.
- Conduct immunoassay analysis services and contract research services:
 - including custom methods for the assessment of allergen control/removal of products, devices and procedures.

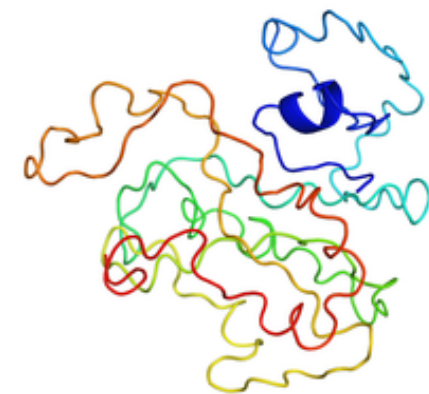


Background to the study

- Cow's milk allergy is one of the most common forms of food allergy, particularly affecting young children.
- Milk allergy is caused by an adverse immune reaction to one or more of the proteins in cow's milk.
- β -lactoglobulin and β -casein are two of the most clinically relevant allergenic proteins.



β -Lactoglobulin



β -Casein

Aim of the study

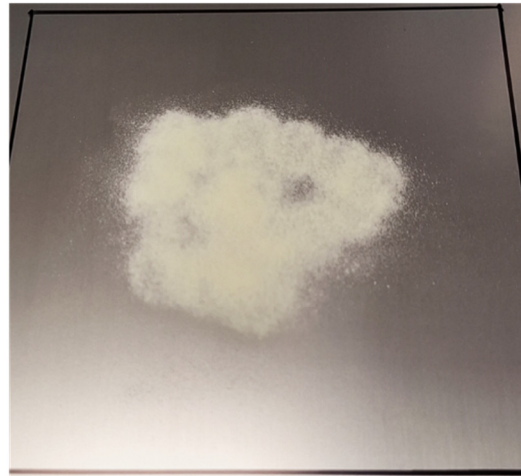
- Ingestion of allergenic proteins by sensitised individuals can result in severe allergic reaction and even death. Ingestion of as little as 2mg of milk protein may trigger an allergic reaction*.
- The food industry must ensure that food contact surfaces are cleaned sufficiently well to minimise the risk of allergenic milk protein cross-contact and consequently reduce the risk of harm to susceptible consumers.
- **AIM: To compare the efficacy of ultra-microfibre cloths with multi-purpose wipes in the removal of allergenic milk proteins from food grade stainless steel surfaces under different scenarios.**

**2mg cow's milk protein corresponds to eliciting dose ED05 - at which 5% of the allergic population is predicted to experience objective allergic symptoms*

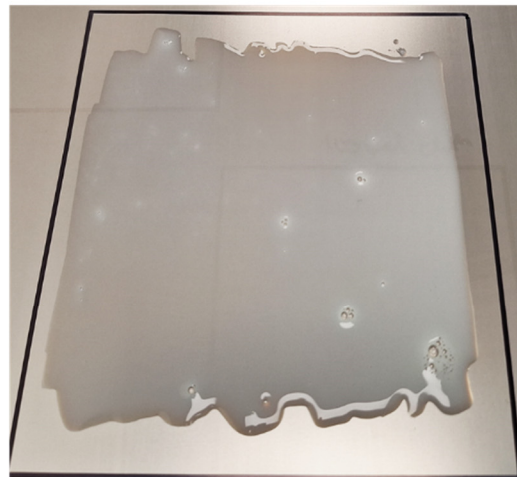
Methods

- Stainless steel food grade (304 grade) trays were thoroughly washed, rinsed with distilled water and left to dry.
- Vikan microfibre cloths were prepared according to manufacturer's instructions.
- Three forms of milk were prepared:
 - A. Dry milk powder (Skim Milk Powder from Merck-Millipore)
 - B. Liquid milk (made by combining 1g skim milk powder and 4mls water)
 - C. Dried-on milk (liquid milk as above was left to dry overnight)
- 15cm x 15cm squares were marked out onto the metal trays. Milk samples in all 3 forms were added to the trays.

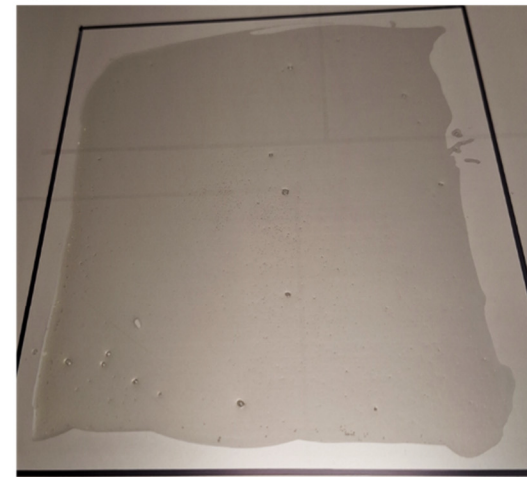
(A) Dry milk powder



(B) Liquid milk

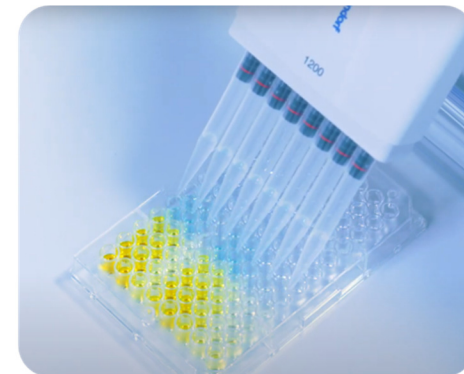


(C) Dried-on liquid milk



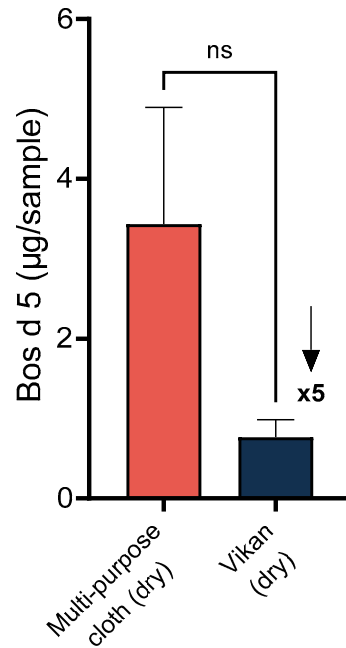
Methods

- Each surface was wiped until visibly clean, using the following testing scenarios:
 - Dry multi-purpose cloths (x3) – For milk powder and liquid milk
 - Dry Vikan microfibre cloths (x3) – For milk powder and liquid milk
 - Damp multi-purpose cloths (x3) – For milk powder, liquid milk and dried-on milk
 - Damp Vikan microfibre cloths (x3) – For milk powder, liquid milk and dried-on milk
- Following test cloth wiping, all surfaces were then wiped a second time with an InBio surface testing wipe to identify any allergens left behind on the surface after the test cloth wipe.
- All InBio surface wipes were extracted according to InBio's SOP and the extracts analysed for Bos d 5 and Bos d 11 using InBio's ELISA immunoassays.

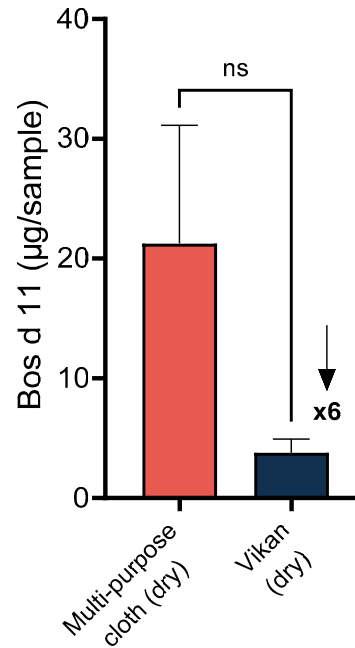


Results – Dry milk powder

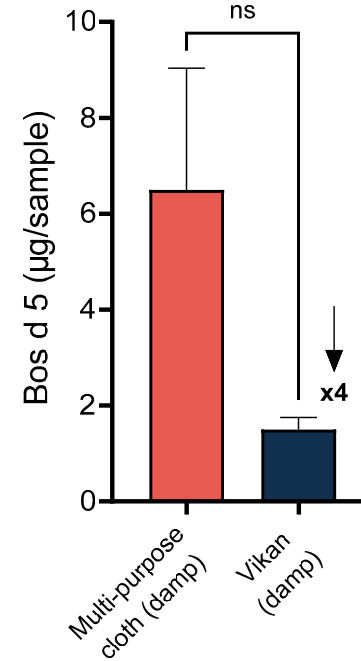
(A) Milk powder - dry cloths



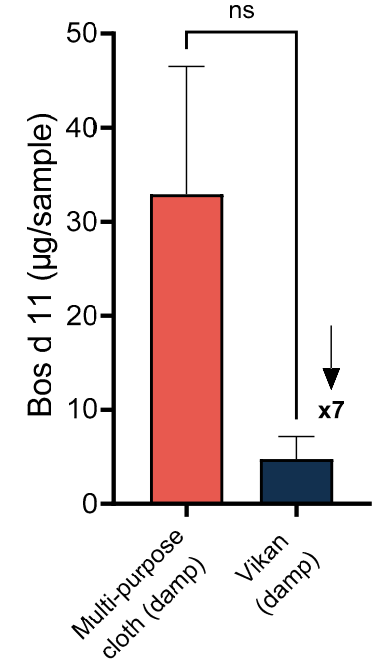
(B) Milk powder - dry cloths



(C) Milk powder - damp cloths

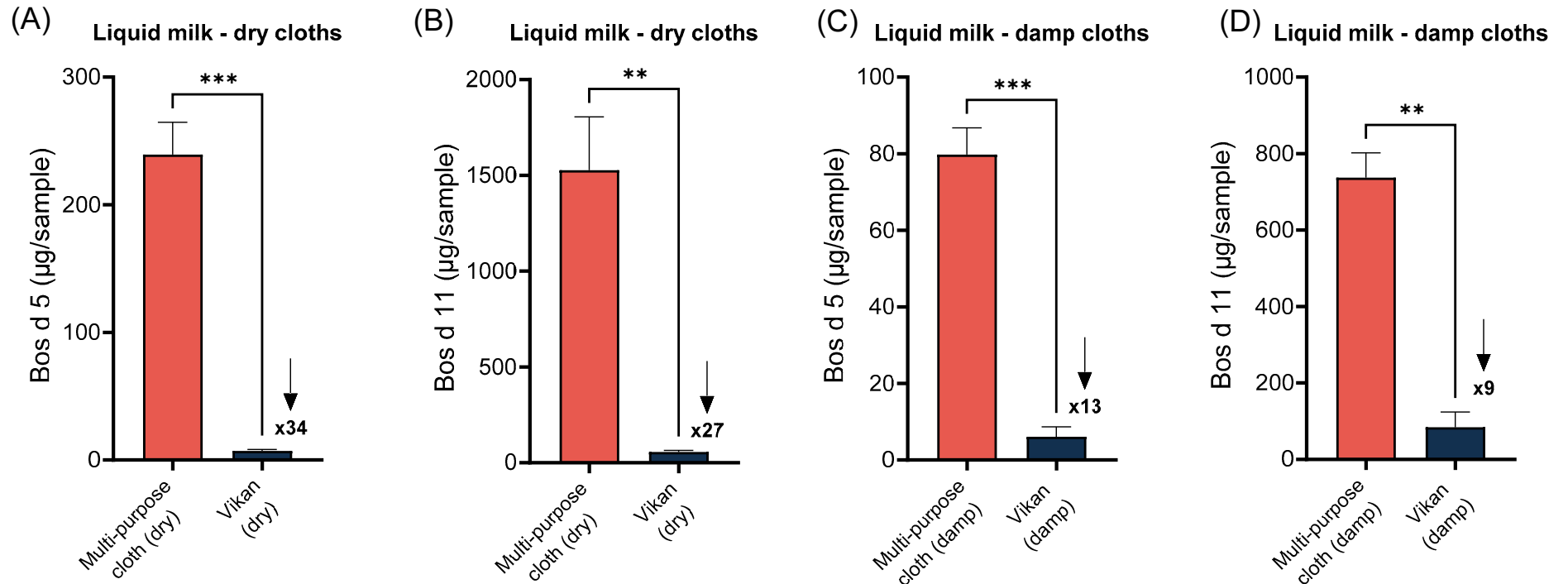


(D) Milk powder - damp cloths



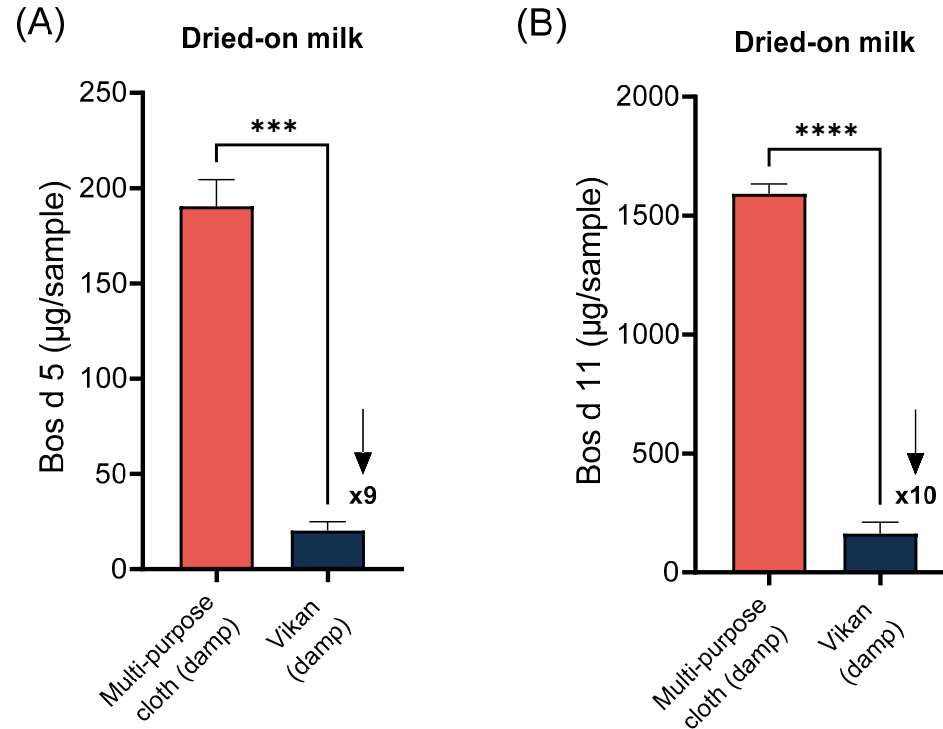
- **More Bos d 5 and Bos d 11 were removed** from the surface of the metal trays after wiping **with a Vikan microfibre cloth** than with a multi-purpose cloth, when used dry or damp.
- Vikan cloths removed between 4-fold and 7-fold more allergen than multi-purpose cloths.

Results – Liquid milk



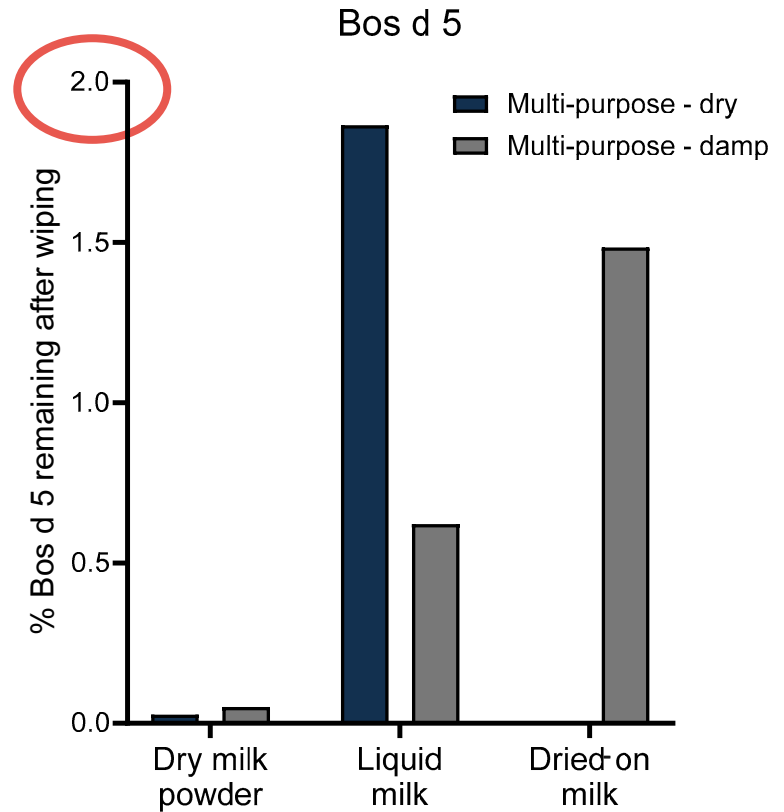
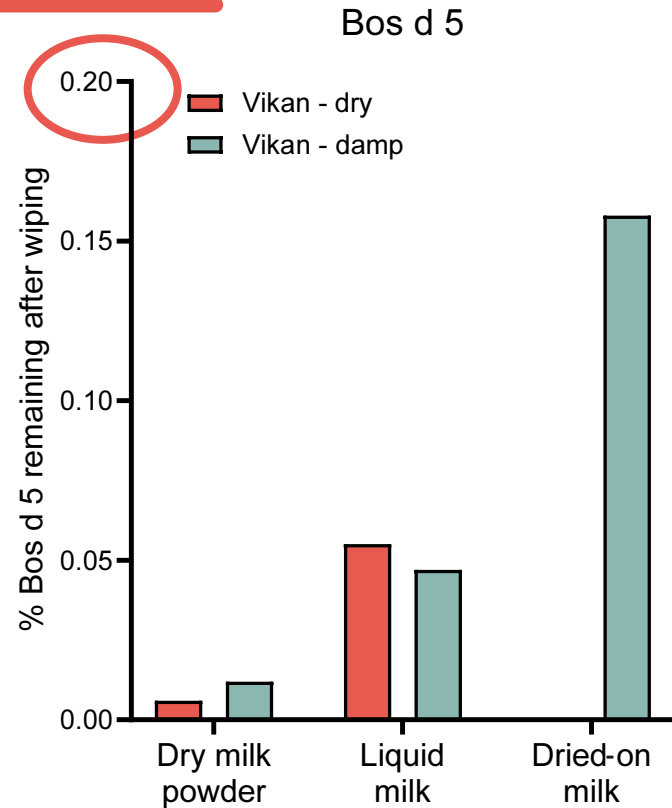
- **More Bos d 5 and Bos d 11 were removed** from the surface of the metal trays after wiping **with a Vikan microfibre cloth** than with a multi-purpose cloth, when used dry or damp.
- Vikan cloths removed ~30-fold more allergen than the multi-purpose cloths when used dry, and ~11-fold more allergen than the multi-purpose cloths when used damp.

Results – Dried-on milk



- **More Bos d 5 and Bos d 11 were removed** from the surface of the metal trays after wiping **with a damp Vikan microfibre cloth** than with a damp multi-purpose cloth.
- Vikan cloths removed ~10-fold more allergen than the multi-purpose cloths.

Results



- Amount of measurable allergen remaining was calculated.
- Wiping with Vikan microfibre cloths resulted in only 0.004 – 0.17% of allergen remaining on surfaces.
- Multi-purpose cloths were less effective in every wiping scenario, with almost 2% allergen remaining on some surfaces after wiping.



Conclusions

- **Vikan microfibre cloths were superior to multi-purpose cloths** at removing the major milk allergens Bos d 5 and Bos d 11 from the surface of food grade metal trays when milk was applied as dry milk powder, liquid milk and dried-on milk.
- **Vikan cloths removed between 4-fold and 34-fold more allergen than the multi-purpose cloths** depending on testing scenario, with differences in allergen removal statistically significant for liquid milk and dried-on milk.
- These data provide useful insight into the **importance of testing cleaning products and procedures** to minimise the risk of harm to susceptible consumers.

Acknowledgements:

- Max Bermingham – InBio
 - Rhys Meredith – InBio
 - Ross Yarham - InBio

 - Deb Smith - Vikan
-

Thank you for your time!



How mechanical brushing alters food contact surfaces: Cleanability, topography, and wear

Dr. Jack Burnett, North American Hygiene Specialist, Vikan



Experiment setup

Surfaces tested:

- Stainless steel (AISI304, 2B) (SS)
- Polypropylene (PP)
- High-Density Polyethylene (HDPE)

Treatment: Continuous rotary brushing at 60 RPM via robotic arm.

Variables:

- Bristle stiffness & constant force
 - Soft (10 N)
 - Medium (15 N)
 - Hard (20N)
- Environment:
 - Wet (demineralized water) vs.
 - Dry brushing

Duration: 90 sequential cleaning cycles (evaluations at 1, 30, 60, and 90 cycles)



A light blue world map is visible in the background of the slide. Three yellow dots are placed on the map: one in North America (USA), one in Europe (Germany), and one in Australia (New South Wales).

Cleanability

- Soiled with *Geobacillus stearothermophilus* spores in 0.3% fat buttermilk
- 20-second wash with 1% universal detergent
- Plate counting

Topography

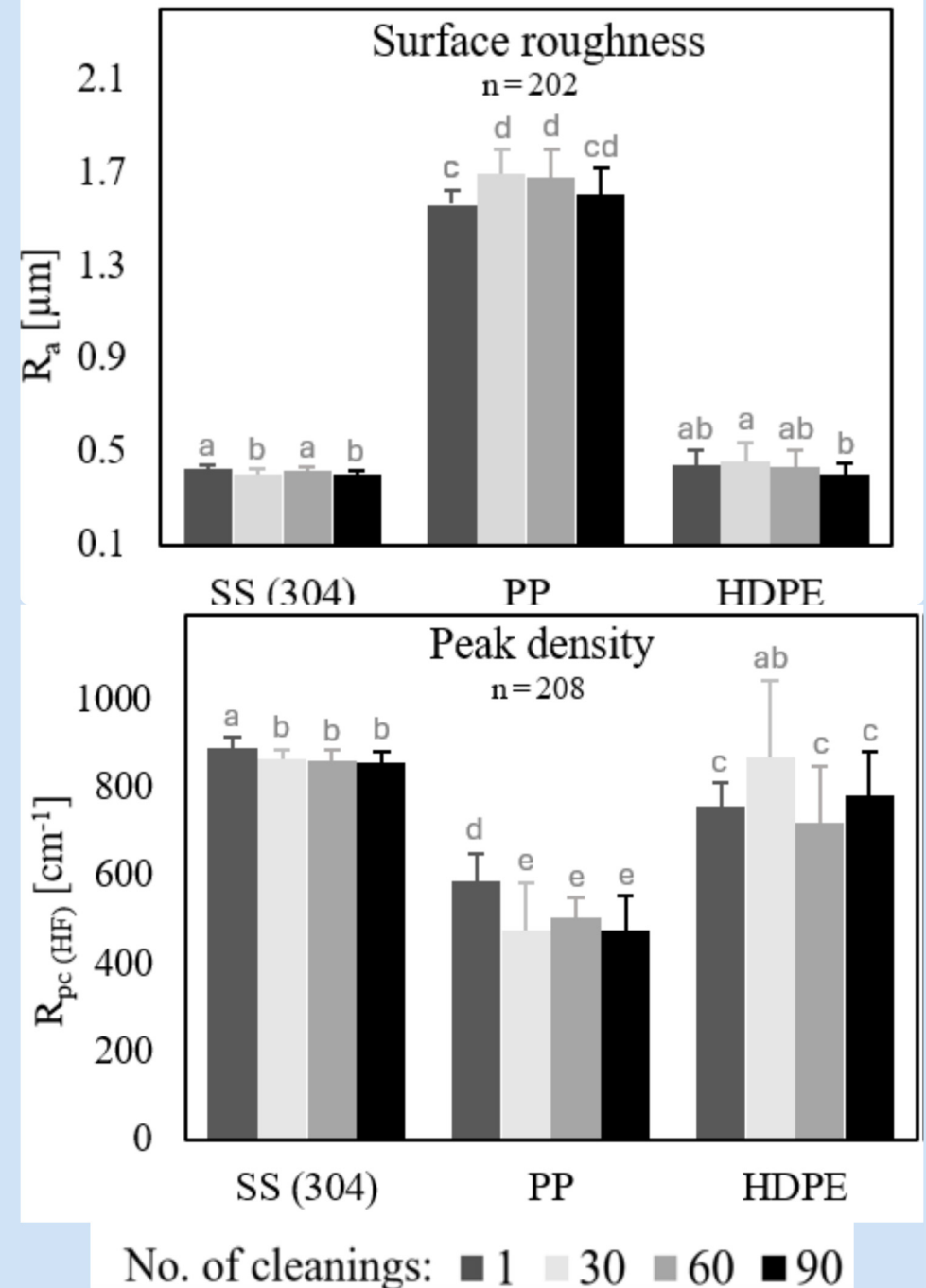
- 3D Optical Confocal Microscopy mapping surface profile roughness
- "Micro-roughness" evaluation using a tighter 25 um filter layer

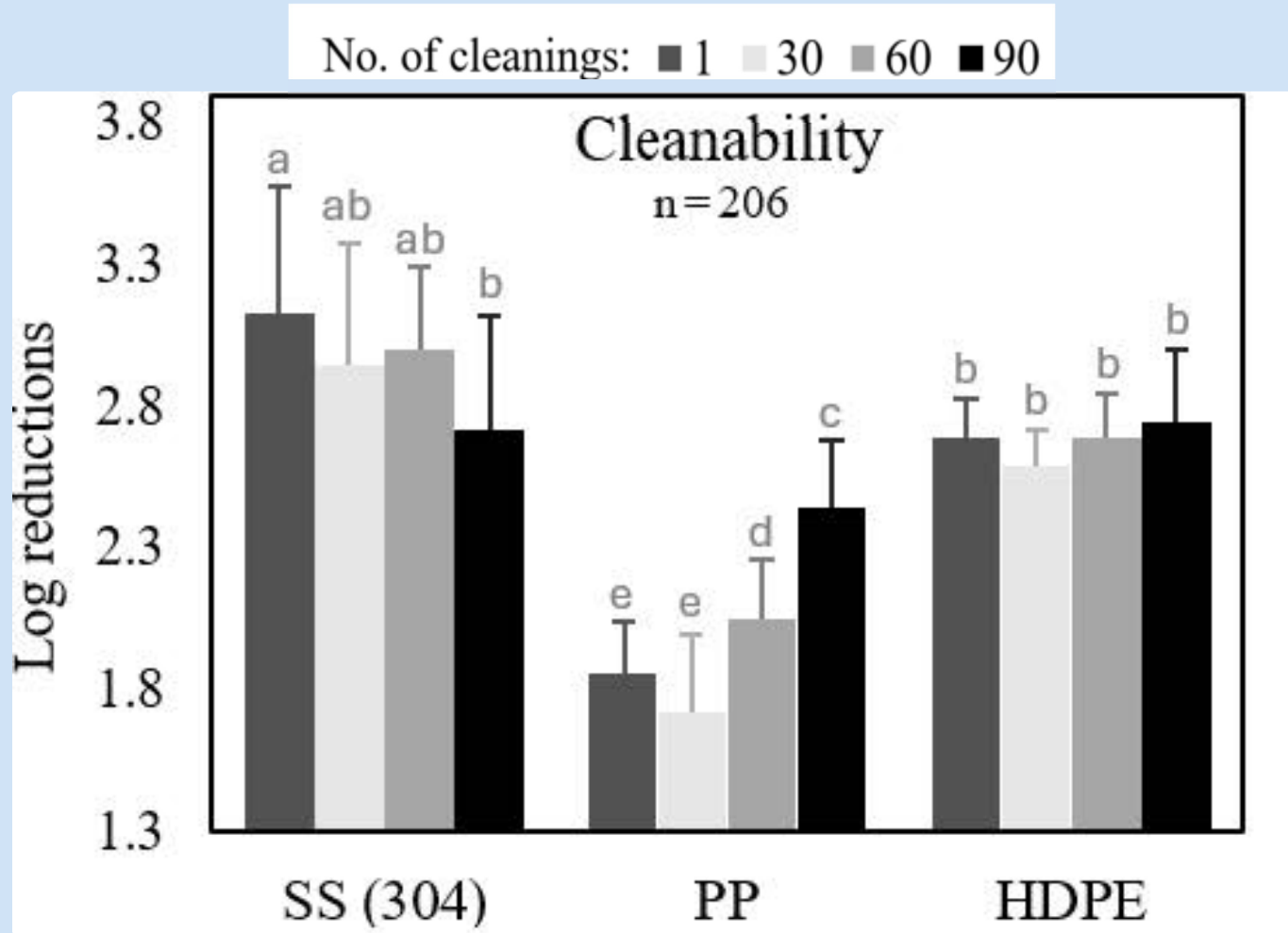
Wettability

- Contact angle profiling using a Kruss Drop Shape Analyzer to assess hydrophobic transitions

Why Standard Surface Roughness (R_a) blindfolded us

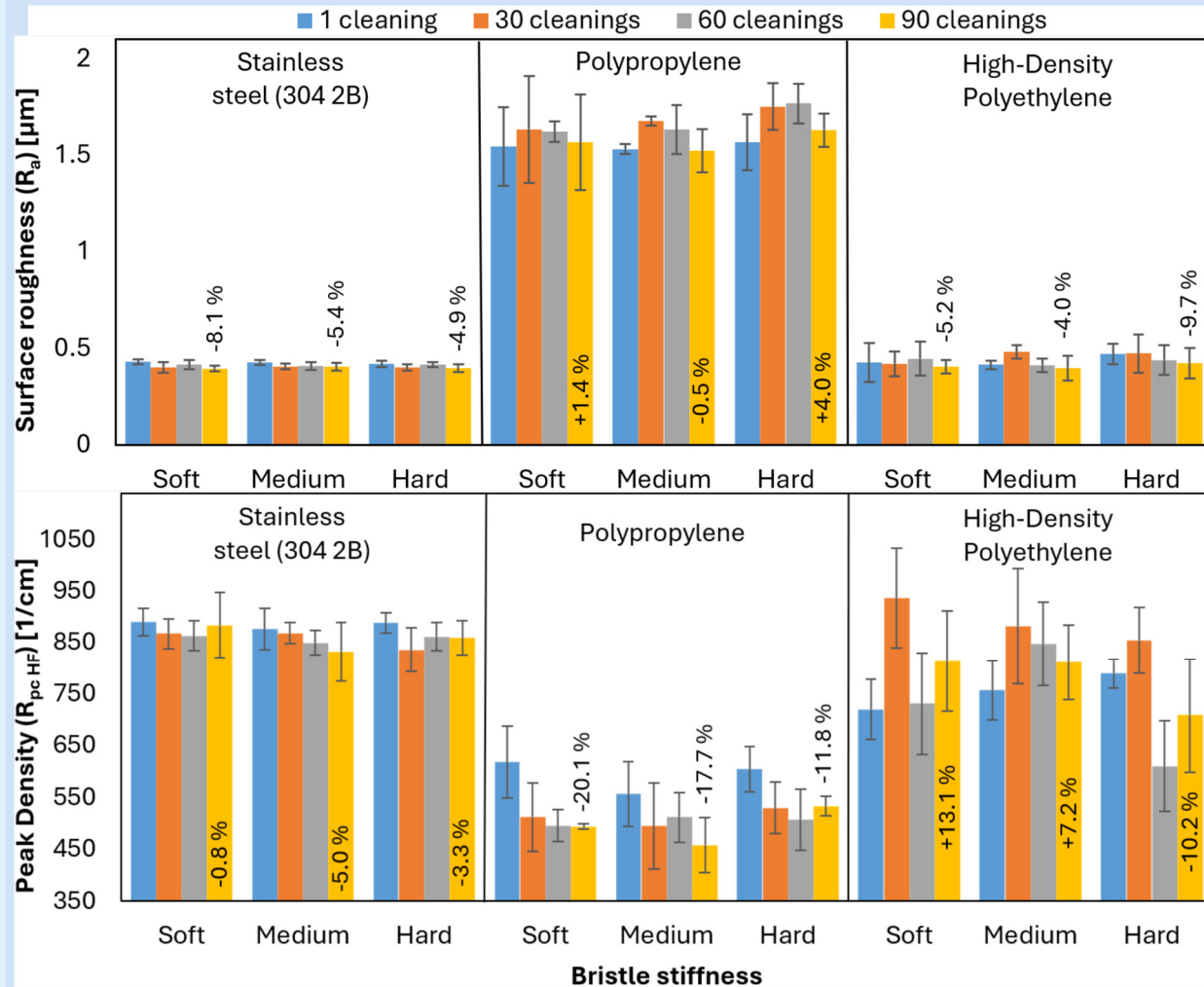
- ISO 21920-2 Standard R_a : Uses an evaluation length filter of 0.8 mm
 - Captures macro-scale valleys
- Hygiene Factor Profile $R_{a\ HF}$: Uses a highly narrowed filter 25 μm
 - Focuses strictly on micro-roughness
- The Disconnect:
 - Standard R_a showed no significant difference for plastic wear
 - Meanwhile, micro-roughness $R_{a\ HF}$ caught massive structural degradation





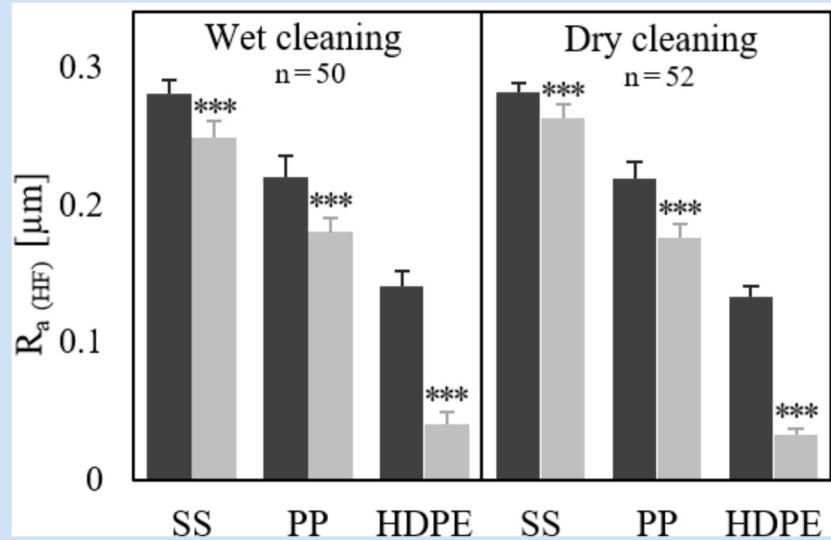
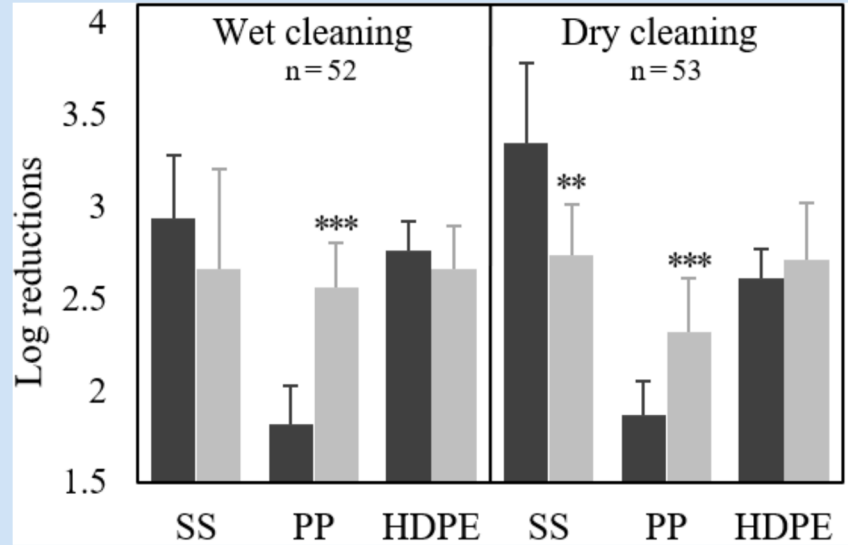
Baseline cleanability vs. long-term trends

- Initial cleanability hierarchy:
 - SS > HDPE > PP
- After 90 cycles
 - SS: Experienced a **significant loss** in cleanability over time
 - PP: Showed a **significant increase** in cleanability (>24%) as it was broken in
 - HDPE: Remained stable with no significant change



Impact of bristle stiffness

- **No evidence** that different bristle stiffnesses impact surfaces differently
- Surface roughness trends and peak densities remained statistically similar across all bristle variants
- **Sanitation takeaway:** You can safely choose the bristle stiffness required for your specific soil type without worrying about accelerating equipment wear-and-tear.



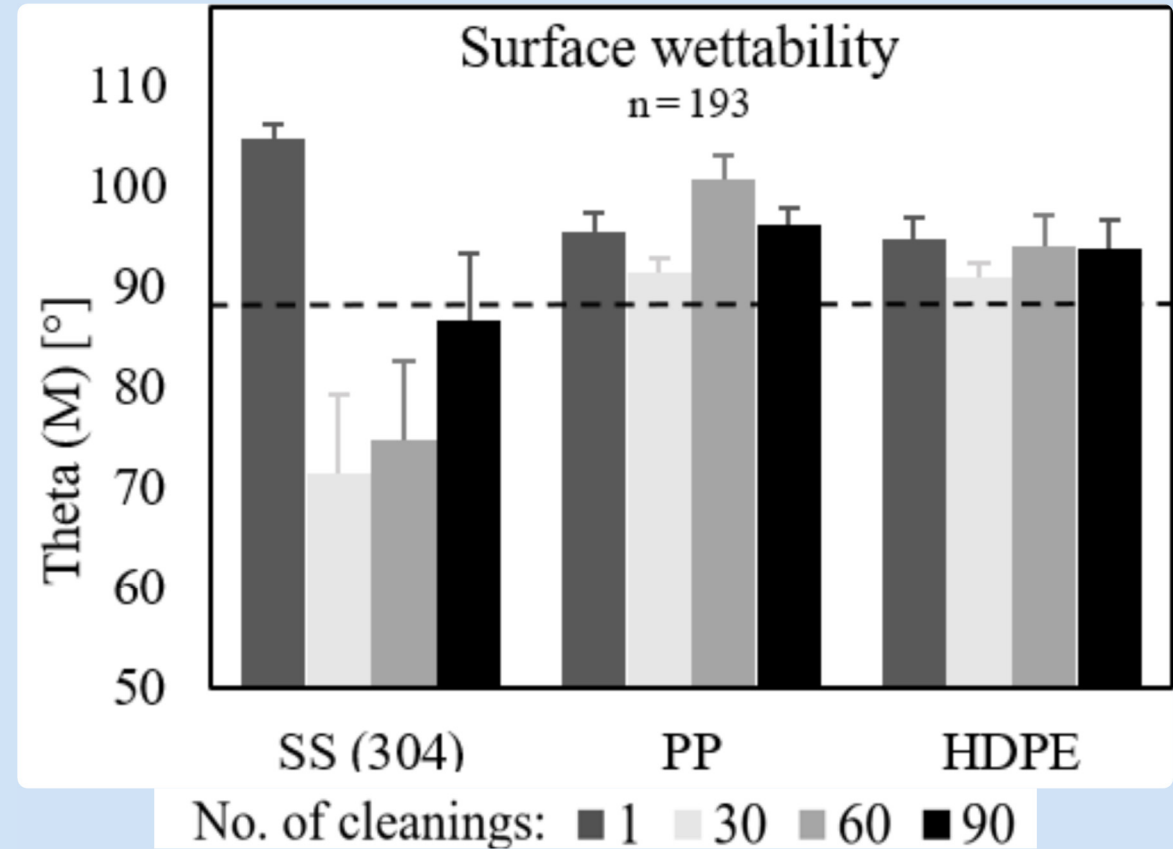
No. of cleanings: ■ 1 ■ 90

Wet vs. dry brushing

- **Wet brushing:** Water acts as a lubricant and a buffer; surfaces showed minimal degradation
- **Dry brushing:** Showed a significantly greater impact across surfaces, most intensely on stainless steel
 - Dry brushing stainless steel uniquely caused a sharp, significant drop in log reductions (cleanability)
 - A subtle but significant 5% to 8% decrease in standard surface roughness occurred on SS

Adhesive residuals on new steel

- Baseline (Cycle 1) contact angle measurements on stainless steel showed an anomalously low, unrealistic level of wettability
- Microscopic chemical glue residue left behind on the brand-new steel after removing its protective manufacturing plastic film
- A single, standardized cleaning session completely removed the adhesive, returning contact angles to true
- Passivating and aggressively cleaning newly installed plant equipment isn't just about chemistry; it's required to clear manufacturing adhesive artifacts that can harbor soil and microorganisms.



Key takeaways for sanitation management

- **Material evolution matters:** Factory-fresh surfaces change rapidly upon operational use; hygiene protocols should be validated against worn surfaces, not just new ones.
- **Stiff bristles are safe:** Deploy soft, medium, or hard bristles based solely on mechanical soil-dislodging needs; bristle stiffness does not dictate surface wear.
- **Minimize dry friction:** Avoid dry mechanical brushing on critical contact zones made of SS, when possible.
- **HDPE and PP resilience:** Both plastics show excellent physical resistance against mechanical brushing, with PP improving in cleanability over time.

Further information and support



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