Hygiene Behaviour in Our Homes and Everyday Lives to Meet 21st Century Needs

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International Scientific Forum on Home Hygiene

Denver Russell Memorial Lecture

Hosted by Prof. Jean-Yves Maillard
Cardiff University, Wales

www.webbertraining.com May 18, 2021

The fall and rise of hygiene

- 1970 US Surgeon General (allegedly) said:

  "**it is time to close the book on infectious diseases, declare the war against pestilence won, and shift national resources to such chronic problems as cancer and heart disease".**

- Heralded declining investment in public hygiene education and increasing complacency during latter half of C20th.
- In the last 50 y - fundamental changes have bought hygiene back up the health agenda
- Never fully regained position on public health agenda?
- To develop hygiene appropriate to current needs, we need to understand the nature of these changes:

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The global pandemic

- From 2000 **emergence of respiratory viruses** - prompting concerns about possible global pandemic (SARS (2003), Avian flu, Swine flu, MERS, COVID-19 (2020)
- Global preparedness plans recognise:
  Hygiene is first line of defence to mitigate infection before other measures e.g vaccines, antivirals
- How well prepared – and willing – were public to take on this role?
- How appropriate is the advice they are being given?"
  "Wash your hands frequently" – when?

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Global problem of Antibiotic resistance

Infection prevention seen as one of 5 key strategies for tackling AMR

- **Prevention of infection through hygiene in HEDL:**
  - reduces the need for antibiotic prescribing
  - Reduces "silent" community spread of AR strains such as MRSA, NDM-1
- **WHO, US, EU action** plans emphasize need for community engagement – ***"Health care providers can only do so much; when it comes to infections in the community, the public have a huge part to play".***
- In reality, these plans **mostly focus on healthcare facilities.**

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GI infections in the community

- **Foodborne infections exert a huge toll on health & prosperity**
  - WHO estimate: unsafe food causes 600 million cases of foodborne diseases and 420,000 deaths each year worldwide
  - Norovirus (winter vomiting) virus , Campylobacter, Salmonella
- **Data 18 European countries - 31% of outbreaks occur in private homes**
- **Norovirus is most significant cause of GI in developed world**
  - Most infections are person to person via surfaces & airborne
  - Not treatable by antibiotics, prevention through hygiene is key

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ID risk in the community is increasing

- Increasing "vulnerable" groups needing special care
  - Up to 1 in 5 people in the European community
  - Include - otherwise healthy - elderly, very young, pregnant
  - underlying disease: HIV/AIDS, diabetes
- Increasing healthcare at home /in community
  - shorter hospital stays, home-based chemotherapy, dialysis etc

- Different from 1970s – "normal healthy people" in community - little risk
- Much healthcare is by family members who thus need good hygiene knowledge
- COVID-19 shows this issue can drive health strategy
  - UK lockdowns largely driven by need to sustain hospital bed/ intensive care capacity?

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The cycle of infection

- Different aspects of HEDL hygiene are dealt with by different agencies
- Without integration/leadership - no authoritative voice to advocate for HEDL hygiene against competing health issues

- Need recognition from policy makers that infection prevention in healthcare settings cannot be achieved without reducing circulation in the community.
- Need hygiene to be recognised as an equal partner in controlling IDs & tackling AMR.

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These changes suggest the need for a fundamental rethink to develop hygiene which is appropriate to the issues we currently face

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The International Scientific Forum on Home Hygiene (IFH) www.ifh-homehygiene.org

- Established 1997 - not-for profit, non-government organisation.

Primary objectives:

- Developing and promoting hygiene in home and everyday life settings based on scientific principles

Target audience:

- scientists, opinion formers, health professionals, media, private sector

IFH Website offers:

- Scientific reviews, guidelines, training resources, fact/advice sheets

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Developing home and everyday life hygiene to meet C21st needs

- **Hygiene for the 21st century**
  - **Targeted Hygiene** – based on risk management approaches developed since 1950s to prevent contamination of foods, pharmaceuticals etc during manufacture
  - Focusing hygiene practices <u>at the times/moments and in the places that matter</u> to break the chain of infection transmission.

- **Hygiene in the 20th century**
  - Largely concerned keeping our homes clean – "dirt" regarded as a/the main source of harmful microbes.
  - "Keeping the home clean protects my family against infections"
  - If COVID has taught us anything, it's that public perceptions still rooted in the 20th century

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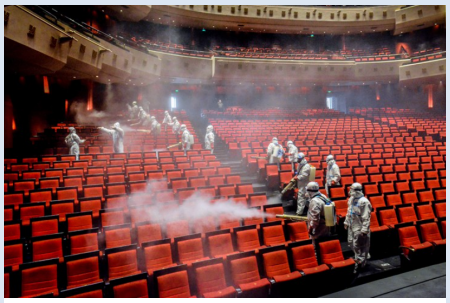
"Hygiene theatre" – a barrier to change

- Rituals that make us *feel* safer - but don't do much to reduce risk
- Power scrubbing & fogging:
  - New York subways seats, walls, poles –
  - Streets in Korea,
  - Theatres in Wuhan etc
  - Gyms, restaurants etc saying: "there's no surface we won't sanitize, no machine we won't scrub".



A team disinfecting the Qintai Grand Theatre in Wuhan, China, in January. Credit: Xia Junjun/V

- Lack of understanding that public hygiene behaviour is the most important factor
- Tends to foster false sense of security

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What is Targeted Hygiene?

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The chain of infection - "the journey of the germ"

Main sources of infection	Main routes of transmission – critical surfaces	Portals of entry – mouth, nose, eyes, wounds
People Foods Domestic animals	• Hands • Hand contact surfaces, • Food contact surfaces • Clothing, towels, bedlinens • Toilets, baths, etc • Airborne	

If we are not exposed to harmful microbes we cannot become infected!

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The 9 key moments when hygiene really matters

These are not the only moments - but - getting the public to visualize hygiene as "acting at risk moments" provides sound basis for prompting action when & where needed.

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Moment 3: "when handling raw foods"

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Moment 5: surfaces frequently (and recently) touched by other people

- Micro data strongly suggest contact surfaces do contribute – but by how much?
- Different for different species:
  - More risk for norovirus and rhinovirus (robust, low ID)
  - Less risk for influenza and SARS-Cov-2 (less stable, higher ID)
  - COVID-19 – droplets 35%; aerosol 57%; contact surfaces 8%
- Different for different settings
  - More risk in home setting, hospitality, where several people share a relatively confined space?
- We cannot disinfect contact surfaces every time we touch them

But

- "Knowing" acts as a prompt to
  - decontaminate hands after touching surfaces
  - focus on contact surfaces as part of routine cleaning

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What is risky and what is not?

Risk of infection = hazard x exposure

- Hands, contact surfaces cleaning cloths are highest risk
  - Associated with some or all 9 moments
- General environmental surfaces lower risk:
  - rarely a hazard x low risk of exposure
- "rule of thumb" ranking

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Targeted Hygiene – breaking the chain of transmission

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Breaking the chain of infection using hygiene procedures which are effective

- Purpose - to reduce organisms on critical surfaces/key moments to acceptable safety target level (<infectious dose)

Process	Resources used
Physical removal from surface or air	**Mechanical detachment, soap or detergent, rinsing with running water, Facemasks,**
Killing the microbes in situ	**Microbiocides, heat, UV etc**

- Hands, environmental surfaces, fabrics
- Used singly, sequentially, in combination
- Both processes have the potential to reduce contamination to a safe level e.g handwashing with soap
- In some situations removal processes are enough – in some cases a microbiocidal product is needed

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The case for microbiocides

- In the past, recommendations for domestic use were based on health status of family
- Still argued - disinfectants should only be used in situations where people are infected or at increased risk of infection

- This limited vision is no longer acceptable -
- Ignores evidence showing that, in some risk situations, wiping/ detergent-based cleaning insufficient to reduce contamination to a safe level.

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Preparing a meal with a chicken contaminated with Salmonella or Campylobacter

	Percentage of sites contaminated with Salmonella and/or Campylobacter		
No of participants in each group = 20	**After Meal Preparation**	**After Cleaning with Soap and Water**	**After Cleaning with soap and water + hypochlorite disinfectant**
Hands, Chopping board, Utensils Dishcloth Sink ,taps, Fridge, door handles etc	**17.3%**	**15.3%**	**2.3%**

33% contaminated sites had >1000 cfu/sample area

Infectious dose 500cfu

Cogan, Bloomfield & Humphries, Letts Appl. Microbiology 1999, 29,354-358

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Targeted risk situations where disinfectants/ hand sanitizers may be needed

- Surfaces which cannot be rinsed under running water
- Hands - where there is no access to soap and running water
- For cloths/sponge/pads after use to clean surfaces
  - Bacteria become more strongly attached.
- Where there is need to set a lower “safety target level” (higher LR) for hands and contact surfaces
  - Immunocompromised person susceptible to lower ID
  - Controlling risk from pathogens e.g nv with low ID (1-10 particles)

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Sustainability of hygiene procedures

- Purpose - to reduce organisms on critical surfaces/key moments to acceptable safety target level (<infectious dose)

Breaking the chain of infection cannot be achieved without using one or more of these resources

Process	Resources used
Physical removal from surface or air	Mechanical detachment, soap or detergent, rinsing with water . masks
Killing the microbes in situ	Microbiocides, heat, UV etc

- Hands, environmental surfaces, fabrics

How can we use them in the most effective & sustainable way?

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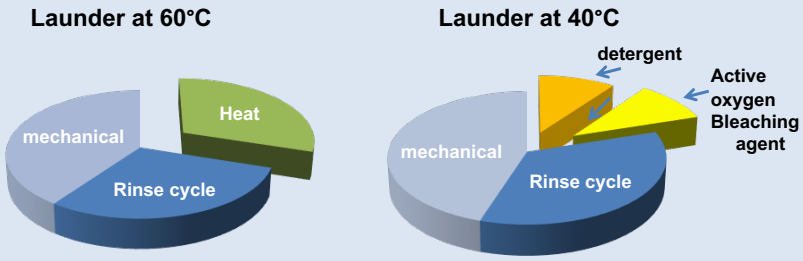
A concept for effective & sustainable hygiene – the Sinner circle



- Applicable to hands, surfaces and fabrics
- To apply this principle, "microbiocidal action" must be seen as part of a combination of resources which act together to deliver "hygiene"

Brands, B., Brinkmann, A., Bloomfield, S.F, Bockmühl, D.P. 2016 Microbicidal action of heat, detergents and active oxygen bleach as components of laundry hygiene. *Tenside Surf. Det. 53, 495-501.*

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Estimating impact on infection rates

- **Quantitative Microbial Risk Assessment (QMRA)**
  - Scientifically validated approach
  - Increasingly being used to develop infection prevention/hygiene strategies
- Developing **models simulating use conditions** – to quantify
  - how organisms spread
  - how resources work independently/together to reduce contamination
  - Estimate infectious doses
- Efficacy currently assessed by standard lab tests:
  - Measure performance criteria (3,4,5 Log Reduction) have no clinical significance
- QMRA modeling estimates: **health outcomes i.e. reduction in infection rates** associated with hygiene procedures

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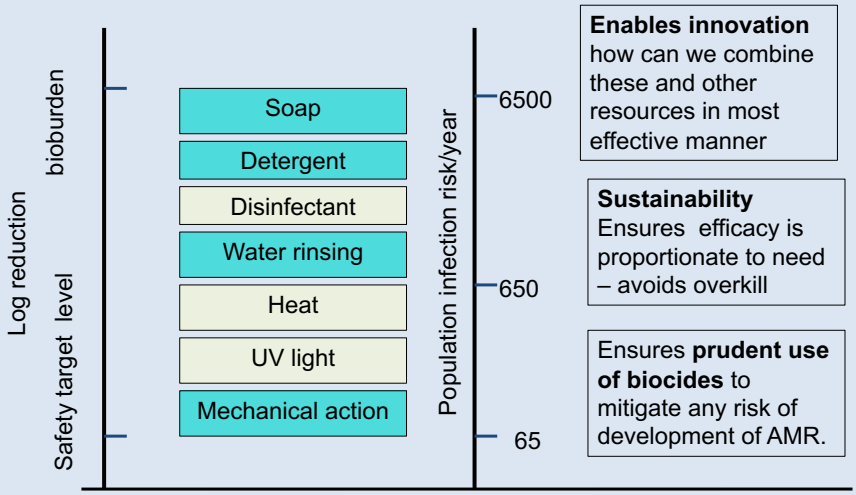
Bloomfield SF, Carling PC, Exner M .Unified framework for developing hygiene procedures for hands, surfaces & laundry in domestic, food & other settings. GMS Hyg Infect Control. 2017;12

Handling raw poultry – what is risk of infection by hand to mouth transfer from contaminated surface?



Enables innovation how can we combine these and other resources in most effective manner

Sustainability Ensures efficacy is proportionate to need – avoids overkill

Ensures **prudent use of biocides** to mitigate any risk of development of AMR.

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Safety target level: e.g not more that 1 in 10^6 risk of infection

Targeted hygiene: an effective and sustainable approach

Targeted hygiene provides the framework for maximizing protection against infection whilst:

- minimizing environmental impacts
- maximizing safety margins against any hazards
- ensuring prudent use of microbiocides to mitigate any risk of development of AMR.

In recent years, these issues have taken precedence over hygiene?

- Need to argue for a balanced approach where importance of hygiene is balanced against other issues
- Need to generate support data using new approaches to demonstrate that health benefits of hygiene procedures (product + process) outweigh potential risks

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Realising the health benefits of Targeted Hygiene depends on getting the public to adopt this approach

- overcoming barriers to change

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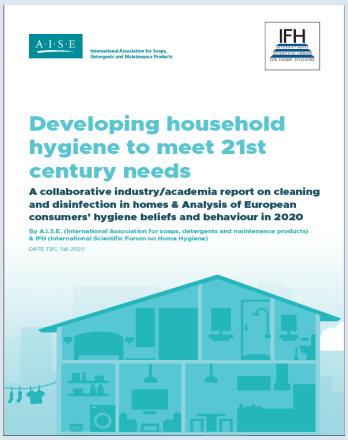
Consumer understanding of hygiene

- Feb 2020 - A.I.S.E. Poll – in collaboration with IFH
- Online Poll carried out in 23 European countries representing 5 regions
  - **Western Europe:** Belgium, Netherlands, France, Germany, Austria, Switzerland
  - **Eastern Europe**: Hungary, Poland, Romania, Slovakia, Czech Republic, Bulgaria
  - **Southern Europe:** Greece, Italy, Portugal, Spain, Turkey
  - **UK / Ireland**
  - **The Nordics**: Denmark, Finland, Norway, Sweden
- Total 4583 panellists
- Report in published April 7th 2021



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Public perception of the importance of hygiene

	Agree
Cleaning and Hygiene in my home is important because it helps my family avoid getting an infectious disease.	87%

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European citizens have different interpretations of meaning of "clean" and "hygienic"

Q: What does term "hygienic" mean & how does it differ from cleanliness?

Cleaning means keeping my home dirt free; **Hygiene** means keeping my family healthy

Cleaning and **hygiene** are the same thing – if a surface is clean it's also hygienic

Cleaning means using a cleaning product, **hygiene** means using a disinfectant

Lack of understanding suggests consumers will react to messaging/ on pack claims based on what THEY believe these terms mean?

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Do people's behaviours correlate with their perception of risk ? (12 questions asked)

	How often do you do the following ?	Always /Often	High/ medium risk	To what extent do you think the following pose a risk of infection
Highest risk	Wash hands after using the toilet	90%	89%	Not washing hands after going to the toilet
	Wash hands immediately after preparing raw meat	83%	86%	Handling raw meat without washing hands afterwards
	Wash and dry cleaning cloths after each use	47%	65%	Reusing cleaning cloths without washing & drying after each use
	Wash pet feeding utensils separately from family cups/plates etc	45%	76%	Washing pet feeding utensils in same bowl as family feeding utensils
Some risk	Have different hand/bath towels for family members	67%	63%	Sharing hand and bath towels with other family members
Low risk	Use antibacterial to clean kitchen & bathroom floors	62%	64%	Not using antibacterial to clean kitchen & bathroom floors

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Improving public communication

- Public perceptions of hygiene are still rooted in C20th beliefs?
- Limited understanding of concept of infection risks in their HEDL

- **Public behaviour change strategies will not be effective in delivering health benefits unless we also take steps to change their understanding of hygiene?**

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Are we too clean for our own good?

a further barrier to change?

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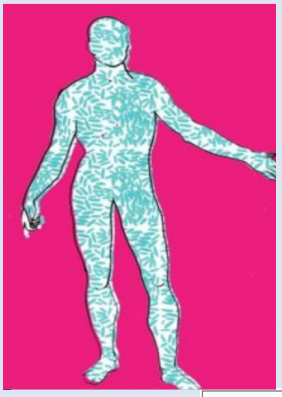
Blowing the "are we too clean?" myth

- Since 2000 explosion of research
  - Exposure to diverse range of "friendly" microbes essential to health
  - Required to build human microbiome (diverse range of microbes which inhabit gut, respiratory, skin etc)
  - Dysbiosis linked to significant range of diseases

The human microbiome



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	For disease states linked to dysbiosis of the microbiome:	Dysbiosis related to lack of exposure to:	In turn due to:
Old Friends Hypothesis 2003	Allergies, Autoimmune diseases e.g MS, IBD Diabetes, Obesity, Depression	"old friends" microbes from: • other humans, • animals, • natural outdoor environment,	**Lifestyle changes:** Fewer siblings, less outdoor activity, C-section & bottle feeding, antibiotics, diet

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	Diseases linked to dysbiosis of the microbiome	due to lack of exposure to	Due to
Hygiene hypothesis 1989	Rapid rise in childhood allergies	Childhood infections	- Smaller families, - Higher standards of home & personal cleanliness
Old Friends Hypothesis 2003	Allergies, Autoimmune diseases e.g MS Diabetes, IBD, Obesity, Depression	"old friends" microbes from: • other humans, • animals, • natural environment,	**Lifestyle changes:** Fewer siblings, less outdoor activity, C-section & bottle feeding, antibiotics, diet

37 If it's not infection exposure we need – it can't be hygiene?

Is home "cleanliness" a causative factor?

- No good evidence to support this – but keep an open mind
- If routine home and personal cleanliness contribute at all, likely to be small, because
  - Even "cleanest" homes are full of bacteria, viruses, fungi, etc.

But – because it is still referred to as the hygiene hypothesis - many people (inc many experts) still believe the problem is "being too "clean"

Hygiene hypothesis has become "received wisdom"

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RSPH public online poll 2018 - 2000 people

Which of the following factors do you believe is preventing children coming into contact with enough good bacteria?

Taking too many antibiotics	59%
Spending less time outdoors	56%
Keeping our homes too clean	**55%**
Using too many antibacterial cleaners	**52%**
Reduced contact with other children	49%
Bottle rather than breast feeding	22%
Having lots of baths/ showers	**21%**
Eating processed foods	18%
C-section rather than natural childbirth	9%
None of the above	3%

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What do microbiome experts tell us?

The Times: health supplement Nov 3rd 2015

"The idea that children should wash their hands before eating. I don't think we should be washing our hands before a meal now.

Food poisoning infections in the home are incredibly rare

we are over-cleaning enough, our sterility is causing us problems"

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Targeted Hygiene and the human microbiome

- Targeted Hygiene works to ensure normal interaction with essential microbes
- Provides a means to argue against those who continue to believe "being too clean" is the cause of rising levels of childhood allergies

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Key points

Objectives	Stakeholder groups
Targeted Hygiene provides the framework for an effective and sustainable approach to preventing spread of infection in our homes and everyday lives.	Policy makers, health professionals etc
Use new approaches to ensure that hygiene procedures are effective and proportionate to needs	Academia + house-holdcare industry, regulators
Realising the benefits of Targeted Hygiene depends on getting **the public to adopt this approach**.	All stakeholders + media + HHC industry
To achieve this, hygiene promotion must be accompanied by **strategies to improve consumers' hygiene understanding**	All stakeholders + media + HHC industry +allergists and microbiomists

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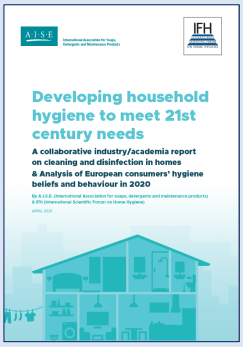
IFH White paper 2018

RSPH policy paper 2019



AISE/IFH report 2021

Available from www.ifh-homehygiene.org

- These reports calls on hygiene stakeholders to **work together** to achieve these objectives.
- Only by working together will we achieve health benefits which HEDL offer

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Thank you for listening!

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www.webbertraining.com/schedulep1.php	
May 20, 2021	COMPLACENCY ABOUT DISEASES, ANXIETY ABOUT VACCINES: THE MENINGITIS PERSPECTIVE Speaker: **Elizabeth Rodgers**, Meningitis Research Foundation, UK
May 27, 2021	EMERGING PATHOGENS - HAVE WE LEARNED ANY LESSONS? Speaker: **Prof. Rodney Rohde**, Texas State University
June 8, 2021	*(European Teleclass)* ASSESSING PERSONAL PROTECTION EQUIPMENT Speaker: **Linda Kilsdonk-Bode**, Amphea Hospital, The Netherlands
June 16, 2021	*(FREE South Pacific Teleclass)* FROM POLICY TO PRACTICE – IMPLEMENTING GOVERNMENT DIRECTED POLICY & IMPLICATIONS FOR INFECTION CONTROL PRACTICE Speaker: **Sally Havers**, Queensland University of Technology, Australia
June 24, 2021	CONTINUOUS ACTIVE ANTI-VIRAL COATINGS Speaker: **Prof. Charles Gerba**, University of Arizona
July 15, 2021	PANDEMIC IMPACT ON HEALTHCARE LAUNDRY IN ACUTE CARE AND LONG TERM CARE FACILITIES Speaker: **Dr. Lynne Sehulster**, American Reusable Textile Association
July 27, 2021	*(FREE European Teleclass)* THE CHANGING PERCEPTIONS OF INFECTION PREVENTION AND CONTROL

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