Topic Exploration Report [1]

Topic explorations are designed to provide a high-level briefing on new topics submitted for consideration by Health Technology Wales. The main objectives of this report are to:

- Determine the quantity of evidence available for a technology of interest.
- Identify any gaps in the evidence.
- Inform decisions on topics that warrant fuller assessment by Health Technology Wales (HTW).

Topic exploration report number	TER583
Topic	Probiotic cleaning products in hospital settings
Summary of findings	Healthcare-associated infections (HCAIs) affect approximately 4% of patients in acute and community hospitals in Wales. HCAIs can exacerbate existing or underlying conditions, prevent or delay recovery and negatively impact a patient's quality of life. Treatment of HCAIs also results in significant financial cost to the NHS in Wales. Probiotic cleaning products may be an effective alternative to traditional chemical-based sanitation practices and may reduce the number of HCAIs acquired in the hospital setting. HTW identified one randomised controlled trial, one budget impact analysis and one multi-centre prospective intervention study. The evidence is mixed and suggests that probiotic cleaning products may be either non-inferior to or more effective than soap and chemical-based cleaning. A budget impact analysis from Italy suggests that probiotic cleaning products may avert over 31,000 HCAIs per year and save €11.6 million in direct costs associated with treating HCAIs. There are uncertainties regarding the cost of implementing probiotic cleaning products, how and whether probiotic cleaning products comply with antimicrobial stewardship principles, and whether their effectiveness may vary depending on the healthcare setting.

[1] Cyfieithu dogfennau HTW wedi'u cyhoeddi o'r Saesneg i'r Gymraeg
Translation of published technical HTW documents from English into Welsh

Introduction and aims

Healthcare-associated infections (HCAIs) can develop as a result of direct contact with a healthcare setting or following medical or surgical treatment. The term refers to a wide range of infections such as respiratory, urinary tract and surgical site infections cause by microorganisms such as meticillin-resistant *staphylococcus aureus* (MRSA), *Clostridiodes difficile (C. difficile)* and *Escherichia coli (E. Coli).*

HCAIs are a key patient safety concern, occurring in approximately 4% of patients in acute and community hospitals in Wales. For patients, HCAIs can exacerbate existing or underlying conditions, prevent or delay recovery and negatively impact quality of life. Treatment of HCAIs also results in significant financial cost to the NHS in Wales, estimated to be £50m per year.

Current practice in infection control and surface cleansing in the hospital setting is to use chemical-based sanitation. Probiotic-based cleaning systems may be an effective alternative to traditional chemical-based sanitation, leading to a decrease in HCAIs in the hospital setting.

Health Technology Wales researchers searched for evidence on the clinical and cost-effectiveness of probiotic cleaning systems to reduce the number of HCAIs in the hospital setting.

Evidence overview

Randomised controlled trials

A single-centre, cluster randomised crossover trial by Leistner, et al (2023) was identified comparing soap-based, disinfection and probiotic cleaning in 18 non-ICU wards in a university hospital in Germany. Each intervention was tested for a consecutive 4 month period, with a one month wash-in period between interventions. 13, 896 patients were randomised: 4,708 in the soap (reference) group; 4,535 in the disinfectant group; and 4,653 in the probiotic group. HCAI incidence in the soap (reference) group was 2.31 per 1000 exposure days. Incidence was similar in the disinfectant (2.21 per 1000 exposure days, p=0.95) and probiotic (2.21 per 1000 exposure days, p=0.95) groups. The study concluded that in non-ICU wards, neither probiotic nor disinfectant strategies were superior to soap-based cleaning in terms of HCAI incidence.

Health economic evidence

A budget impact analysis by Tarricone, et al (2020) was identified. The study compares The Probiotic Cleaning Hygiene System (PCHS) to conventional chemical-based sanitation. Incidence rates were estimates from a previously conducted pre-post intervention study in a hospital setting (Caselli, 2018). The cumulative incidence of HCAIs was 4.6% (n=4,160) for conventional chemical-based sanitation and 2.4% for PCHS (n=4,160, p=<0.0001). The study also identified a decrease in antibiotic resistances, with 1.13% for conventional chemical-based sanitation and 0.53% for PCHS. The study estimated that use of PCHS over conventional chemical-based sanitation across a 5 year horizon averts approximately 31,000 HCAIs and 8,500 antibiotic resistances. The study claims this will save approximately €14 million, €11.6 million of which is directly related to the treatment of HCAIs.

Prospective studies

A multi-centre prospective intervention study by Caselli, et al (2018) was identified. The study compared the effectiveness of The Probiotic Cleaning Hygiene System (PCHS) to conventional

Evidence overview

chemical-based sanitation in six Italian public hospitals over an 18-month period. The study found that use of PCHS was associated with a significant decrease in cumulative HCAI incidence from a global 4.8% to 2.3% (p=<0.001). The study also found a decrease in surface pathogens (mean decrease 88%) and a drop in microbiota drug resistance (p<0.001). The authors conclude that use of PCHS can be associated with a significantly decreased risk of HCAIs in the hospital setting.

Areas of uncertainty

Areas of uncertainty include:

- Cost of implementing probiotic cleaning products.
- How, and whether, probiotic cleaning products are compatible with NHS Wales antimicrobial stewardship principles.
- Whether effectiveness of probiotic cleaning products may vary depending on ward type.

Literature search results

Health technology assessments and guidance
None identified.
Evidence reviews and economic evaluations
None identified.
Individual studies
Caselli E, Brusaferro S, Coccagna M, et al. (2018). Reducing healthcare-associated infections incidence by a probiotic-based sanitation system: A multicentre, prospective, intervention study. PLoS One. 13(7): e0199616. doi: 10.1371/journal.pone.0199616
Ongoing research
None identified.
Evidence supplied by topic proposer
Leistner R, Kohlmorgen B, Brodzinski A, et al. (2023). Environmental cleaning to prevent hospital-acquired infections on non-intensive care units: a pragmatic, single-centre, cluster randomized controlled, crossover trial comparing soap-based, disinfection and probiotic cleaning. EClinicalMedicine. 59: 101958. doi: 10.1016/j.eclinm.2023.101958 Tarricone R, Rognoni C, Arnoldo L, et al. (2020). A Probiotic-Based Sanitation System for the Reduction of Healthcare Associated Infections and Antimicrobial Resistances: A Budget Impact Analysis. Pathogens. 9(6). doi: 10.3390/pathogens9060502

Date of search	04/02/2025
Concepts used	Probiotic cleaning, HCAIs, Hospital, Healthcare infections, PCHS

Proposed research question and evidence selection criteria (if selected)

Proposed Research question	**What is the clinical and cost-effectiveness of probiotic cleaning products to reduce the number of HCAIs in the hospital setting?**

	Inclusion criteria	Exclusion criteria
Population	Adults and children in the hospital setting	
Intervention	Probiotic cleaning products	
Comparison/ Comparators	Soap-based cleaning Chemical-based cleaning	
Outcome measures	Incidence of HCAIs Severity of HCAIs Rates of microbiota drug resistance Health related QoL Resource use Economic outcomes Patient-related outcomes	

Proposed speciality	
Proposed specialities	Health service organisation and delivery, Infectious disease, Public health, Patient experience