

Blood and body fluid spill kit in use: a staff and patient evaluation – Final report

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Abstract

Background

The COVID-19 pandemic has highlighted the importance of cleaning and disinfection, as part of a range of infection control interventions, with the aim of preventing the spread of infection. Standard precautions apply for the safe practice and handling of blood, and other bodily fluids such as urine, faecal matter, vomit, and sputum in a healthcare environment. Disinfecting and dealing with biological spills is integral to reducing the risk of exposure to patients and health care workers. Management of these spills should adhere to national guidance and policy and instructions should be clear within each area/care setting. Decontamination of the spill depends on the nature and size of the spill, the pathogens, the type of surface and the location of the spill. ^[1] It is important, therefore, to have the right spill management measures in place to protect those individuals at risk. ^[2] In the UK, biological spill kits generally include polyacrylate granules (which absorb water but not any form of solids or fats often found in bodily fluids), with a chlorine releasing agent and/or biocidal wipes and single use plastic scoops and scrapers. ^[4] There is currently no incumbent spill kit which is recommended for all biological spills. Instead, healthcare professionals must choose the correct spill kit for different spills. It is against this backdrop that we undertook a comparative analysis of two standard biological spill kit systems currently used in NHS and healthcare environments against BIOPERL+ (a new to market, wide-spectrum absorbent based on a natural mineral with disposable cardboard dustpan and scraper).

Aim

The aim of the study was to investigate the useability of the kits in scenarios that matched real clinical settings as much as possible. Simulated spills such as faeces, urine, blood, and vomit were used.

Method

Videos and semi-structured interviews were conducted using a purposive sample of 12 healthcare professionals/students with 'observing' patients. Participants were asked to clean up various simulated body fluid spills using the spill kits provided (including following the

manufacturers' instructions for use). The kits differed in their component parts, assembly, and their use. Data analysis followed the Framework Method of Analysis (Gale et al. 2013)

Kits

- Incumbent Kit 1 (Polyacrylate based, recommended for urine and vomit)
- Incumbent Kit 2 (Polyacrylate based, recommended for biological spills except urine and vomit)
- BIOPERL+ (Natural mineral based, recommended for all biological spills)

Further details of the kits and their usage instructions can be found in the methodology overview.

Main Findings

Respondents found the instructions for BIOPERL+ were easier to follow with clear, identifiable diagrams. Respondents felt it was helpful that BIOPERL+ is a 'one size fits all' kit suitable for all biological spills. Conversely, the incumbent kits' instructions were more detailed and lengthier meaning that, in some instances, respondents were less clear about which incumbent kit to use for which type of spill. Other respondents found the multiple components in the incumbent kits to be confusing. These challenges were observed and appeared to contribute to hesitancy and potentially impacted on the decision-making process; for example, one participant used the wrong incumbent kit for the presented spill.

BIOPERL+ was perceived by both observing patients and healthcare professionals to have increased absorption compared to the incumbent kits and healthcare professionals felt it allowed them to deal with spillages more quickly leading to perceived less psychological discomfort for the patient. Measurement of the total time taken to clear up the spill verified BIOPERL+ as the quickest of the options. The incumbent spill kits were considered to be less efficient, but opinions varied regarding how well the polyacrylate powder absorbed the spill – possibly because polyacrylate absorbs only the H₂O element. It was felt that BIOPERL+ left less residual powder while excess polyacrylate granules from the incumbent kit were harder to remove from the floor. None of the participants noted that BIOPERL+ left a dry floor at the end of the process, while the incumbent kits left a damp surface which may have needed to be dried to avoid potential slip hazard. Nonetheless, this could be an important factor in a healthcare setting.

The plastic scoop and scraper provided with the incumbent spill kits came pre-formed, ready for use which was seen as simpler. However, the scoop was too small to clear up the spills effectively. The larger, cardboard dustpan and scraper provided with BIOPERL+ was felt to work well and cleared the spill more effectively. Some respondents did find constructing the BIOPERL+ cardboard dustpan challenging, but these respondents had built the scoop outside the scope of the manufacturer's instructions, which still appeared to be fit for purpose.

On the whole respondents reported little or no odour when using the spill kits but a bleach odour was perceived from all three kits by a minority.

Conclusions

The aim of this study was to compare the useability of a new approach to the clearing up of biological spills in a healthcare environment with current practice to see if there were any additional benefits relevant to infection control. BIOPERL+ potentially represents a simpler, quicker and more effective method of cleaning up biological spills in a healthcare setting. For current incumbent spill kits, the user first has to make a decision about which kit is the correct one for the spill, then utilise multiple components and processes to complete the task. The BIOPERL+ kit can be used on all biological spills and is a more straightforward process with fewer components in the kit. BIOPERL+ was found to be quicker and more effective than the incumbent kits based on polyacrylate granules.

Results summary

The following excerpts from the report narrative have been provided to highlight the general trends in the data. Please read the full narrative as this provides the fullest account of the data collected so far.

Instructions of incumbent and BIOPERL+ products

Incumbent

- Instructions were detailed in terms of their step -by- step guidance, yet the detail could be confusing
- The instructions did not extend to information about all types of spillages or how much product/s to use
- Instructions included too many steps

BIOPERL+

- The instructions were smoother in method and process with clear identifiable instructions and diagrams
- Assumption that the whole pack was to be used

Components and of the incumbent and BIOPERL+ products

Incumbent

- Positive aspects related to its multiple re-use
- Negative aspects related to having to rummage around the boxes to obtain all the necessary components to commence cleaning
- It was felt that components were missing, specifically overshoes and face masks, and gloves were too small and that more larger paper towels were needed

BIOPERL+

- Contained all the required components necessary to clean a spillage
- The packaging serrated edge was not entirely effective
- Health professionals considered that the clinical waste bag needs to be bigger and at times this made it difficult to secure the spillage contents easily.

Odour of the incumbent and BIOPERL+ products

Incumbent

- Variable responses about perceived odour
- Most perceived little or no odour
- Remnants from the aerosol spray may have the potential to cause and exacerbation of asthma
- In some instances, health professionals considered that a strong smell emitted during development of the solution, likened to a chlorine hit

BIOPERL+

- Variable responses about perceived odour
- Most respondents considered that there was less odour from the BIOPERL+ product
- A minority of patients reported a strong overpowering chlorine smell
- A minority of healthcare professional reported a strong bleach smell, which caught in the throat, particularly noticeable when the packet was opened

Powder absorption using the incumbent and BIOPERL+ products

Incumbent

- Responses varied
- Some patients perceived the incumbent less efficient and health professionals used many attempts to clean up granules
- Other patients, however, felt that the powder solidified with the spillage quickly
- One respondent identified that the powder did not gel in the middle

BIOPERL+

- Perceived by patients and healthcare professionals to have increased absorption properties compared to the incumbent with overall improved management of the spill highlighting its rapid cleaning process
- Overall, the BIOPERL+ product facilitated health professionals to deal with spillages quickly most likely related to the clear instructions and ease of use of the powder resulting in less psychological discomfort for the patient
- It was felt that part of the product, specifically the powder was lighter and softer to use

Ease of use of the incumbent and BIOPERL+ kits and the shovel/scoop

Incumbent

- Effectiveness of the incumbent shovel/scoop related to the fact that it was premade with no assembly required and it was effective in cleaning spillages
- Health professionals acknowledged that the plastic shovel/scoop was simpler to use because of the plastic material
- However, health professionals generally found the scoop to be too small to clean the spillage effectively

BIOPERL+

- Health professionals, although initially dubious about the effectiveness of the cardboard shovel scoop, found it worked well
- Reported benefits around the BIOPERL+ shovel/scoop were in terms of its shape and size, which required less scoops to clean the spill

- It was highlighted that if the BIOPERL+ scoop/shovel had been easier to assemble, this method would have been the preferred choice

Cleanliness of the floor, collection, and disposal

Incumbent

- Residual staining and colour reported
- Health professionals considered that remnants of residual staining were limited although this was mostly satisfactory
- It was also felt that it would take considerable effort to clean the floor of excess granules

BIOPERL+

- Overall, had fewer residual remnants and was considered optimally clean
- However, some felt that there was some residual powder staining on the floor
- In some instances, it was felt that the floor was unclean

Methodology (brief overview)

This final report is primarily based on qualitative data drawn from the following sources.

- Interviews with 12 patients taken in May and August 2021 these included: adult nurses and laboratory technicians (the patients).
- Interviews with 12 healthcare professionals taken in 2021 these included: adult and mental health nurses, an operating department practitioner, an adult health practice manager; and student Operating Department Practitioners.

The BIOPERL+ spill kit consisted of a single kit for all the bodily fluids used in this study. The contents of the kit were:

- BIOPERL+ granules, PPE (nitrile gloves, aprons) scoop and scraper, clinical waste bag, instruction poster.

The instructions consisted of:

- Donning PPE
- Coverage of the spill with application of the granules (time delay 1-5 minutes)
- Containment of spill
- Safety disposal

The incumbent spill kits (commercially-available products used in healthcare and other settings) consisted of two – one for urine and vomit – “Urine and Vomit Spill Kit” and the other for a range of biological spills (except urine and vomit) – “Biohazard Spill Kit”. The contents of these kits were:

Urine and vomit spill kit

- High Absorbency Granules, Biocide Spray, PPE (nitrile gloves, aprons), clinical waste bags, disinfectant surface wipes, scoops and scrapers, instruction poster.

The instructions consisted of:

- Donning PPE
- Coverage of the spill with application of the granules (time delay 0.5 to 1 minute)
- Containment of the spill
- Safety disposal
- Wipe with disinfectant wipe
- Spray with biocide spray

Biohazard spill kit

- Chlorine tablets, NaDCC Granules, dilution solution, PPE (Nitrile gloves, Aprons), clinical waste bags, scoops and scrapers, instructions and poster, a recording card.

The instructions consisted of:

Donning PPE

- Coverage of the spill with application of the granules (time delay 2 minutes)
- Prepare disinfection solution

Containment of the spill

- Safety disposal
- Wipe with towelling and disinfection solution

Interpreting the findings

The qualitative findings are based on interviews from respondents who as part of their practice are likely to have been involved in infection control procedures and the management of spills of blood and body fluids. Qualitative data analysis was informed by the Framework Method of Analysis as it is systematic and flexible in its approach while being applicable to varied health professionals within the clinical setting¹.

The timings for the procedures were recorded as follows. The start time was from the moment the participant encountered the spill and the end time was when the participant announced that they were finished. In some cases when using the incumbent kit, the floor remained slightly wet after this time, therefore some additional drying time may be required when using the incumbent kit.

Findings: Coding

Transcript 1- 12 (T1- T12)	Patient (P) OR Health professional (H)	Incumbent (C) OR BIOPERL+(F)	Blood (B), Faeces (F), Urine (U), Vomit (V)
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¹ Ritchie J, Lewis, J. (2003) Qualitative research practice: a guide for social science students and researchers. London: Sage Publications.

2. Results

Each of the scenarios was recorded and an analysis of the timings of the spill removal were analysed with the following results (Table 1). In each of the four scenarios spill removal with the BIOPERL+ product was on average faster than the incumbent.

Table 1: Average times for spill removal

	BIOPERL+	Incumbent
Blood	05:26:40	08:15:40
Faeces	07:34:20	08:44:00
Urine	08:42:40	11:03:20
Vomit*	05:00:30	05:44:00

Key: Values were an average of three replicates and based on the video recording timings. The urine averages for BIOPERL+ were based on two observations as the video was not available for one of the replicates.

2.1 Patients and health professionals' perceptions and instructions of the incumbent and BIOPERL+ products

Patient respondents from the interviews observed the following factors in relation to how health professionals used the instructions for both the incumbent and BIOPERL+ products. Overall, it was felt that the instructions for the incumbent products were detailed in terms of their step-by-step guidance (T1PCB; T4PCB; T6PCV; T12PCV) although some respondents felt that there were too many steps (T7PCV). Other challenges related to the incumbent having less clear information about types of spillages or how much product/s to use (T2PCF; T5PCF; T7PCV). Some patients considered that the length of the instructions caused health professionals to use the incumbent spill kits in different ways or required consistent confirming about each step, which impacted on the time to clean the spill (T4PCB). Patients also considered that the BIOPERL+ instructions were a helpful 'one size fits all' (T5PFF) process, which was brief and to the point with no confirmability needed (T4PFB; T5PFF; T9HFB).

Some patients were of the viewpoint that all components in the BIOPERL+ kit was to be used (T7PFV) highlighting preconceived assumptions. One respondent offered an intervention such as instruction on the BIOPERL+ shovel to facilitate assembly (T7PFV).

Similarly, health professionals found the instructions on the incumbent kit straightforward with clear steps and guidance (T1HCB; T2HCF; T3HCU; T7HCF; T9HFB; T12HCV), yet there were less instructions on aspects such as Personal Protective Equipment (PPE) (T2HCF) and guidance on how to use the powder and expected distribution (T4HCB; T10HCF). It was suggested that some health professionals were familiar with using the incumbent spill kit, so had some understanding of the process (T5HCF), while others used process of elimination for guidance (T5HCF) or used the displayed diagrams to work out the necessary steps (T5HCF; T6HCV). Using different learning methods explains how individuals internalise their learning² within a social constructivist setting³ underpinned by the Visual, Aural, Reading Kinaesthetic (VARK) model to encapsulate sensory preferences.^{4 5} One respondent noted that the incumbent product had extra steps compared to the BIOPERL+ product (T8HCU). One respondent suggested that the instructions impeded scoop construction (T9HCB). In some instances, health professionals found the incumbent instructions irritating (T10HCF) in terms of understanding granule application and how to dispose of unwanted solution (T10HCF).

Health professionals felt that the BIOPERL+ instructions were smoother in method and process (T1HFB; T4HFB; T9HFB) with clear identifiable instructions and diagrams (T2HFF; T4HFB, T5HFF; T6HFV; T7HFV; T8HFU) including good organisation of components (T7HFV). These instructions, therefore, allowed health professionals to multi-task in terms of learning new knowledge, while at the same time prepare components of the kit (T4HFB). In contrast, some health professionals were unable to find the instructions (T6HFV; T12HFV) and perceived that there was limited guidance on type of spillage (T5HFF), powder application (T4HFB; T10HFF), instructions after the spill (T10HFF) and instructions around scoop assembly (T4HFB; T5HFF; T6HFV; T7PFV; T12HFV). Other health professionals suggested that it was not obvious as to the whereabouts of the PPE equipment (T10HFF). Some patients also suggested that it may be helpful to have instructions on both sides of the BIOPERL+ packet (T11HFU)

² Kolb, D. A. (1984) *Experiential learning: Experience as the source of learning and development* (Vol. 1). Englewood Cliffs, NJ: Prentice-Hall.

³ Vygotsky, L. S. (1978) *Mind in society: The development of higher psychological processes*. Cambridge: MA: Harvard University Press.

⁴ Fleming N. (2006) 'VARK: A guide to learning styles: VARKING up the right tree', 7(4), *Educational Developments*, pp. 4-7.

⁵ Prithishkumar, I. J. and Michael, S. A. (2014) 'Understanding your student: Using the VARK model', *J Postgrad Med*. 60, pp.183-186.

2.2 Patients and health professionals' perceptions of the ease of use of the incumbent and BIOPERL+ products (ease of use of components)

A minority of respondents suggested that the number of components in the incumbent spill kit was complicated (T9HCB; T11HCU). However, patients also clearly highlighted that the effectiveness of the incumbent shovel/scoop related to the fact that it was premade with no assembly required (T5PCF; T12PCV). Responses regarding the size of the scoop were varied with some highlighting that it was too small (T1PCB; T4PCB; T10PCF) and others suggesting it was effective in cleaning spillages (T5PCF) or difficult to assemble because of the extra part (T9PCB). In contrast other patients felt that the incumbent kit was less ambiguous in terms of the relationship between the components, for example, the shovel and sweeper (T7PCV) which facilitated the spillage clean up. Patients also highlighted that there were not enough wipes to adequately clean the spill (T5PCF). When patients discussed health professionals use of the BIOPERL+ kit it was found that there were benefits to using the whole product (T2PFF) facilitating a comprehensive clean (T4PFB) particularly in a timely manner most relevant to infection control/safety and patient psychological concern/embarrassment (T4PFB; T5PFB) and for environmental reasons (T10PCF). Some patients highlighted that some professionals had challenges with assembling the shovel and (T1PCB; T5PCF; T6PFV; T7PFV; T9PFB; T12PFV) and it may be helpful to include instructions on the paddle (T6PFV) although others found it easier to use because it was larger (T9PFB). One respondent considered that the scoop was noisy when cleaning the spill (T10PCF).

Health professionals were clear about the components of both the incumbent and FORSPILLS products. Some respondents found that the incumbent kit was slightly confusing because of the need to rummage around the box/es to obtain all the necessary components to commence cleaning (T5HCF; T9HCB; T10HCF; T11HCU; T12HCV), which impacted on the timeliness of cleaning (T7PCV) and infection risk (T8HCU), asepsis and box contamination (T10HCF) including the required order (T8HCU). In some instances, it was felt that components were missing, specifically overshoes and face masks (T3HCU), gloves were too small (T1HCB) and that more larger paper towels were needed (T5HCF). Respondents presented some concern in relation to the reusable components of the incumbent kit, particularly as health professionals had to rely on the conscience and knowledge of other health professionals to ensure correct administration of the tablets to the solution (T5HCF).

One respondent highlighted the issue of Actichlor wastage (T8HCU) whilst another mentioned economic cost (T12HCV). Health professionals considered the shovel/scoop of the incumbent product, simpler to use because of the plastic material (T3HCU; T4HCB; T12HCV) yet the scoop was too small to clean the spillage effectively (T2HCF; T4HCB; T4PCB; T8HCU; T9HCB). Some respondents considered the wipe too small (T8HCU; T10HCF). It was suggested that numerous trips were required to dispose of the spill (T5HFF). One respondent highlighted that the scoop was too narrow and demonstrated how they adapted the scoop to ensure that more spillages could be gathered (T3HCU). On the other hand, it was perceived that the incumbent kit was efficient because of its multiple reuse functions (T1HCB; T3HCU; T6HCU; T10HCF) reflecting health professionals' concerns about the environment (T6HCV; T9HCB).

Health professionals felt that the BIOPERL+ kit contained all the required components necessary to clean a spillage (T3HFU; T5HFF; T7PCV; T7HFV; T11HFU). Some barriers in relation to BIOPERL+ components were discussed in relation to gaining access to the BIOPERL+ kit itself (T1HFB; T3HFU), largely because the serrated edge was not entirely effective (T3HFU; T5HFF; T6HFV). One respondent suggested that they were worried about application of the product prior to use (T8HFU; T11HFU) suggesting unfamiliarity with the product. One respondent felt that that the granules in the BIOPERL+ product was messy and sprayed when cleaning (T12HFV). Health professionals also considered that the disposable bag needs to be bigger and at times this made it difficult to secure the spillage contents to the disposable bag (T1HFB; T3HFU; T4HFB; T9HFB). Other barriers related to the shovel/scoop being too flimsy (T1HFB; T7HFV) and too long for the bag (T4HFB) Professionals purported that it may be useful to consider additional components to the kit, for example, eye protection (T1HFB) gloves, bags, and wipes (T7HFFV; T11HFU). Whilst health professionals were initially dubious about the effectiveness of the BIOPERL+ cardboard shovel scoop, it was found to work well (T4HFB). Other health professionals cited benefits around the BIOPERL+ shovel/scoop in terms of its shape (T2HFF) and size (T2HFF; T4HFB; T6HFV; T8HFU), which required less scoops to clean the spill (T6HFV; T10HFF). Indeed, it was highlighted that if the BIOPERL+ scoop/shovel had been easier to assemble this method would have been the preferred choice (T6HFV; T7HFV; T8HFU; T12HFV). Respondents also discussed the BIOPERL+ product in relation to it being environmentally friendly (T8HFU).

2.3 Patients and health professionals' perceptions of the odour of the incumbent and BIOPERL+ products

Patients considered the smell of both the incumbent and BIOPERL+ powder products. It was perceived that the incumbent had no odour with no apparent harm to the potential patient (T1PCB; T2PCF; T2PCB; T8PCU; T9PCB). Some patients considered a slight to no smell (T3PCU; T4PCB; T7PCV; T11PCU) although it was recognised that the odour could be related to proximity (T5PCF). Some patients considered a strong smell (T6PCV; T9PCB; T10PCF) from the incumbent powder. Some health professionals informed that the incumbent odour was minimal (T1HCB; T2HCF; T3HCU), yet remnants from the aerosol spray may have the potential to cause and exacerbation of asthma (T3PCU) yet others found the neutraliser smell nice (T12PCV). In some instances, however, health professionals considered that a strong smell emitted during development of the solution (T4HCB; T5HCF; T9HCB), likened to a chlorine hit (T5HCF; T6PFV; T10HCF). When patients discussed the odour from the BIOPERL+ kit, it was felt that there was no apparent smell (T1PFB; T3PFU; T9PFB), or less smell (T6PFV), yet others described an overpowering chlorine smell (T4PFB) or bleach smell (T7PFV), with one respondent describing it as an offensive/choking smell, which would be difficult for the patient (T8PFU). One respondent highlighted that the bleach smell made them clean the spill quickly (T8HFU).

Health professionals' responses to the incumbent odour were varied. For example, it was felt that the incumbent product had less smell (T1HCB; T2HCF; T3HCU; T6HCV; T8HCU; T11HFU). Whilst other professionals felt a strong chlorinated smell emitted from the solution (T4HCB; T5HCF) and the tablets (T9HCB; T10HCF). In relation to the BIOPERL+ odour, it was perceived that there was no smell (T2HFF; T3HFU; T4HFB; T5HFF; T9HFB; T10HFF) to a strong throat catching bleach smell when the package was opened (T1HFB; T6HFV; T8HFU) with the potential to cause patient discomfort (T1HFB; T7HFV).

2.4 Patients and health professionals' perceptions of powder absorption of the incumbent and BIOPERL+ products

Some patients discussed their observations around the incumbent kits and powder absorption of the spillages, which seemed less efficient in terms of timeliness, messiness, and granules not being absorbent enough (T4PCB; T5PCF; T10HCF; T11PCU). Other patients,

however, felt that the powder solidified with the spillage quickly (T1PCB; T7PCV) with the spill contained well (T7PCV; T8PCU). When discussing the BIOPERL+ product, patients felt that there in some instances there was slow absorption (T1PFB) and more packets were used (T3PFU; T8PFU) to cover the spill. Yet it appeared that rapid cleaning took place and that the spill was contained well (T3PFU; T4PFB; T5PFF; T6PFV; T7PFV; T9PFB; T10PFF; T11PFU; T12PFV) which contributed to potential psychological experience and comfort (T4PFB; T5PFF).

Health professionals felt that application of the powder in the incumbent kit was simple with faster absorption (T1HCB; T2HCF; T3HCU; T12HCV), and solidification (T12HCV) although there were some challenges with the gel not absorbing in the middle (T4HCB) and overall absorption (T5HCF; T6HCV; T10HCF) and more powder required to clean the spill (T7HCV) contributing to patient embarrassment (T8HCU). Overall, health professionals felt that the BIOPERL+ product facilitated quick containment of the spillages (T2HFF; T3PFU; T4PFB; T5PFF; T6PFV; T7PFV; T8HFU; T11HFU; T12HFV) and less patient embarrassment (T7HFV). It was felt that the powder was lighter, softer, and easier to use (T1HFB; T2HFF; T4HFB; T6HFV), a one step process (T4HFB; T9HFB). It was considered that the BIOPERL+ product had better absorption (T10HFF) and may be more beneficial for smaller spills compared to larger spills (T5HFF). In contrast, there were some perceptions about around longer absorption time (T1HFB; T3HFU) and that an additional powder packet was required to contain the spill (T1PFB; T1HFB; T3PFU; T5HFF).

2.5 Patients and health professionals' perceptions of the cleanliness of the floor, collection and disposal

Much discussion was held regarding cleanliness of the floor in relation to granule and residual staining after spillages were cleaned. Patients observing health professionals felt that the incumbent had residual staining and colour (T1PCB; T2PCF; T3PCU; T4PCB; T5PFF; T6PCV; T7PCV; T8PCU; T9PCB; T10PFF; T12PCV) with some respondents feeling uncomfortable that the stain remained *in situ* (T2PCF; T7PCV; T11PCU) with a potential slip hazard (T11PCU). Patients felt that the BIOPERL+ product had fewer residual remnants (T3PFU; T5PFF; T9PFB) and was considered optimally clean (T2PFF; T3PFU; T4PFB; T4PFB; T5PFF; T11PFU; T12PFV). Other patients felt that there was some residual powder staining on the floor (T1PFB; T2PFF; T4PFB; T8PFU). Health professionals considered that the incumbent cleaned the floor

satisfactorily (T1HCB; T2HCF; T7HCV; T8HCU) with some suggesting that effort was required to clean the floor of excess granules (T3HCU; T4HCB; T5HFF; T10HCF) with several paper towels needed and sanitiser (T7HFV; T12HCV). One respondent who was cleaning urine felt that the floor was 'mushy and wet' demonstrating lack of absorbency (T11HCU), which could be demoralising or embarrassing for the patient (T11HCU). Similarly, health professionals felt that the BIOPERL+ powder also created some material residue (T2HFF; T3HFU; T8HFU; T10HFF; T11HFU), which was eventually cleaned well (T4HFB). Others felt that it was unlikely that the stain would be removed completely (T1HFB). In some instances, it was felt that the floor was unclean (T6HFV). One respondent suggested an extra wipe to be included in the BIOPERL+ packaging (T8HFU).

3. References

[1] NIPCM (2021) National Infection Prevention and Control Manual Available from: <https://www.nss.nhs.scot/nhs-scotland-assure/guidance/scottish-national-infection-prevention-and-control-manual-nipcm/>(Accessed December 2021).

[2] Wilson, J. (2019) -Infection Control in Clinical Practice Updated Edition, 3e. London: Bailliere Tindall.

[3] NHS (2017) Standard infection control precautions Literature review: Routine cleaning of the care environment, Available from: <https://www.nipcm.hps.scot.nhs.uk/media/1656/2017-04-sicp-lr-cleaning-v31.pdf> (Accessed December 2021).

[4] Goel, V., Luthra, P., Kapur, G.S. and Ramakumar, S.S. (2021) Biodegradable/bio-plastics: myths and realities. *Journal of Polymers and the Environment*. 6, pp.1-26.

[5] Gale, N.K., Heath, G., Cameron, E., Rashid, S., Redwood, S. (2013) Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med Res Methodol*. doi: 10.1186/1471-2288-13-117. PMID: 24047204; PMCID: PMC3848812.