Summary of: A quantitative assessment of residual protein levels on dental instruments reprocessed by manual, ultrasonic and automated cleaning methods

M. Vassey,[1] C. Budge,[2] T. Poolman,[3] P. Jones,[4] D. Perrett,[5] N. Nayuni,[6] P. Bennett,[7] P. Groves,[8] A. Smith,[9] M. Fulford,[10] P. D. Marsh,[11] J. T. Walker,[12] J. M. Sutton[13] and N. D. H. Raven[14]

FULL PAPER DETAILS

[1,3]Project Team Leader, [2,4]Assay Scientist, [11]Programme Leader, TB & Public Health Microbiology Programme, [12]Senior Project Team Leader, [13*]Scientific Leader - Healthcare Biotechnology, [14]General Project Manager, Centre for Emergency Preparedness and Response, Health Protection Agency, Porton Down, Salisbury, SP4 0JG; [5]Professor of Bioanalytical Science, [6]Project Scientist, William Harvey Research Institute, Barts & The London School of Medicine and Dentistry, Queen Mary, University of London, John Vane Building, Charterhouse Square, London, EC1M 6BQ; [7]Head of Analysis, Health Protection, [8]Senior Principal Analyst, Department of Health, Wellington House, London; [9]Professor & Consultant Microbiologist, College of Medical, Veterinary & Life Sciences, Glasgow Dental Hospital & School, 378 Sauchiehall Street, Glasgow G2 3JZ; [10]General Dental Practitioner (retired), Shepton Mallet, [11]Professor of Oral Microbiology, School of Dentistry, Leeds Dental Institute, University of Leeds, Clarendon Way, Leeds, LS2 9LU
*Correspondence to: Dr Mark Sutton
Email: mark.sutton@hpa.org.uk
Tel: +44 (0) 1980 612 643

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Objective To assess residual protein on dental instruments cleaned in general dental practice by manual, manual plus ultrasonic and automated washer disinfector (AWD) processes. **Design and setting** Instruments submitted by 30 dental surgeries in the South West of England. **Subjects (materials) and methods** Instruments analysed were matrix bands, associated retaining clips, diamond and stainless steel burs, extraction forceps and hand scalers. Each instrument was visually assessed under magnification for residual debris. Residual protein was extracted by immersion in detergent and sonication. A collection of used but uncleaned instruments of each type (n = 177) was also analysed for adherent protein using ophthalaldehyde/N–acetylcysteine reagent. **Main outcome measures** Residual protein levels allowed comparisons to be made on the effectiveness of different cleaning processes. **Results** One thousand, three hundred and four instruments were analysed. Observational data demonstrated several shortcomings in cleaning chemistries and operation of the AWD. For uncleaned instruments, median residual protein levels ranged from 0.4 μg (stainless steel burs) to 462 μg (extraction forceps). Following manual washing, median protein levels ranged from 0.3-78 μg; for manual plus ultrasonic washing, levels ranged from 9-39 μg and AWD levels ranged from 0.3-27 μg. Manual washing combined with ultrasonic cleaning was significantly less effective than the other two processes ($p < 0.008$). AWDs reduced the variability in the cleaning process. No correlation was found between visual scoring and residual protein determination. **Conclusion(s)** There was a wide variation in residual protein levels both within and between different methods and instruments and this underlines the complexity of this process.

EDITOR'S SUMMARY

What I find interesting about this Department of Health funded paper is that it begins, 'A number of concerns have been raised over the efficacy of instrument decontamination in ... general dental practice.' The initial question that I think should be asked is, 'why are there concerns?' And the reason that I ask this is because we are supposed to be living in an evidence-based culture.

The paper describes how there was indeed a wide variation in residual protein levels on instruments, by whatever method they were cleaned and then put through a process of sterilisation. In terms of the efficacy of decontamination then this does raise valuable points about the robustness of current cleaning practices and indeed the authors highlight where changes and improvements can be made. All of this is very laudable and entirely what research and science should be about. While not a single one of us would condone 'unclean' instruments, or knowingly use them on patients, what do the terms 'clean' and 'unclean' actually mean?

I return to my initial query, what has prompted the 'number of concerns' about this? If it is the much quoted but (to my knowledge) undefined theoretical risk of disease transmission then where is the evidence for this? The research was carried out in the South West of England between December 2005 and October 2007 and I am unaware of any reported outbreaks of disease, major or minor, from this part of the world before, during or since then which have been traced to dental practices.

To make it crystal clear, I am absolutely not advocating complacency or denigrating useful research findings such as reported here. I am asking for realistic real-world assessment of the driving forces behind the seemingly relentless and futile pursuit of unrealistic sterility in the face of a lack of evidence that it is either achievable or, from evidence, even desirable.

The full paper can be accessed from the *BDJ* website (www.bdj.co.uk), under 'Research' in the table of contents for Volume 210 issue 9.

Stephen Hancocks
Editor-in-Chief

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IN BRIEF

- Informs the reader about the efficacy of different types of dental instrument cleaning process.
- Defines for the first time the relative efficacy of these cleaning processes as used in real-life dental practice settings.
- Highlights differences between the cleanability of different types of dental instruments.
- Aids in understanding the potential risk of transmitting variant CJD between patients.

RESEARCH

COMMENTARY

In recent years, instrument decontamination has become a controversial issue in dentistry. It is, therefore, very valuable to have access to published data on the effectiveness of processes used in one of the key stages of the decontamination cycle. Whilst the heat stability of prion proteins has been the trigger for a focus on the effectiveness of instrument cleaning in all branches of healthcare, it must be remembered that effective cleaning is also a prerequisite for sterilisation of items contaminated with conventional microorganisms.

This study assessed the amount of residual protein on 1,304 specified reusable dental instruments that had been retained following decontamination in 30 dental practices. Ten each of these practices utilised manual cleaning only, manual cleaning plus ultrasonic cleaning, or an automated washer disinfector (AWD) respectively.

The results throw up a number of apparent idiosyncrasies. Regardless of the cleaning process used, 72% of the instruments had detectable residual protein contamination. Surprisingly, those instruments subjected to combined manual and ultrasonic cleaning demonstrated higher protein recovery than those cleaned manually. However, some of the surgeries did not use appropriate detergents, some did not change the cleaning fluid sufficiently regularly and none of the surgeries undertook any testing of the ultrasonic baths. Under these conditions, there is the potential to increase rather than decrease protein contamination.

The use of AWDs was also not statistically better overall than manual cleaning alone. Manual cleaning proved more effective than an AWD for cleaning extraction forceps. However, it would appear that none of the surgeries with AWDs were operating them according to best practice. AWDs are highly engineered pieces of equipment performing complex processes dependent on many parameters, and adherence to validation and testing protocols is essential for reliability.

In summary, this study has generated some surprising findings which nevertheless give a useful indication of key areas for ongoing development and revealed some of the ongoing challenges in dental instrument decontamination. The installation of AWDs does not guarantee perfect cleaning. Factors such as the mode of use are critical and the availability of enhanced technical support for those operating washer disinfectors is a priority. The data also emphasise the importance of visual examination of instruments after cleaning and, ultimately, of the development of more effective methods to detect residual contamination.

J. Bagg
Professor of Clinical Microbiology,
University of Glasgow Dental School

AUTHOR QUESTIONS AND ANSWERS

1. Why did you undertake this research?
The research was commissioned by the Department of Health to provide evidence to assess the effectiveness of dental instrument cleaning within general dental practice. This data forms part of the risk assessment to address the possibility of transmission of variant Creutzfeldt-Jakob disease (vCJD) between patients in a dental setting. Given ongoing uncertainties about the carriage of this disease within the population, such evidence is important in supporting policy decisions about changes to decontamination of dental instruments and the implementation of single-use instruments.

2. What would you like to do next in this area to follow on from this work?
Significant changes are being proposed to the way in which dental instruments may be processed for GDP in the future. The study methodology would be well suited to evaluate whether such approaches had been successful in reducing the levels of residual protein on dental instruments and, as such, their potential to reduce the risks of vCJD transmission.