In Small Animal Surgery Are Alcoholic Hand Rubs Superior to Scrubbing Brushes and Antimicrobial Soap at Reducing Bacterial Counts?

A Knowledge Summary by

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KNOWLEDGE SUMMARY

Clinical bottom line

The current literature suggests that the use of alcohol hand rubs provide similar, if not better, reductions in bacteria colony forming units, both immediately after hand antisepsis and in the immediate postoperative period.

Question

In small animal surgery are alcoholic hand rubs superior to scrubbing brushes and antimicrobial soap at reducing bacterial counts?

The evidence

The majority of the literature found was author narrative or looking at the current attitudes and habits that veterinary surgeons have regarding surgical hand preparation. Two relevant papers were found comparing alcohol hand rubs (AHRs) to traditional methods of hand preparation. They differed slightly in that the first paper did not use an abrasive brush in any of the regimes; it only looked at alcohol in different formulations against antimicrobial soap. The second paper did look at the traditional hand scrub with a brush and antimicrobial soap as one of the comparisons.

Many human studies were found, with a number of them having relevance in all areas of the PICO question apart from the population, so these were excluded.

Summary of the evidence

Chou (2016)	
Population:	3rd year veterinary students
Sample size:	45
Intervention details:	The participants were randomly assigned to carry out 4 of the 12 possible combinations: • Non-abrasive hand scrub with 4% Chlorhexidine gluconate (CHG) antimicrobial soap • AHR with 30% 1-propanol and 45% 2 –propanol • AHR with 70% 2 –propanol • AHR with 61% ethanol solution with 1% CHG • All the above products could have had any one of the below contact times thus making 12 possible combinations 1.5, 3 or 5 minutes. Using shuffled cards the participants were assigned 4 of the possible 12 combinations
Study design:	Prospective randomised controlled
Outcome studied:	• To compare the antibacterial efficacy of different surgical

	hand antisepsis protocols used by veterinary students both at the recommended and at extended contact times • Antibacterial efficacy was assessed before surgical hand preparation, after surgical hand preparation and at the end of surgery. • Reductions in bacterial colony forming units and positive aerobic culture rates were compared using multivariable analysis or variance and multivariable logistic regression.
Main findings: (relevant to PICO question):	• After hand preparation the AHR with 61% ethanol/1% CHG and the CHG non abrasive antimicrobial soap scrubs were more effective at reducing log colony forming units (CFUs) when used at the manufacturer recommended contact time. Increasing contact time for any of the products did not have an effect on bacterial reduction immediately after hand preparation • At the end of surgery, the product used, the contact time and the product/ contact time interaction all had effects on CFU reductions • At the end of surgery, the AHR with 61% ethanol/ 1% CHG and the AHR with 30% 1-propanol and 45% 2- propanol had significantly increased bacterial reductions with increasing contact time • At the end of surgery, at the manufacturer recommended contact time the AHR with 61% ethanol/ 1% CHG had significantly higher CFU reduction compared to the AHR with 70% 2-propanol
Limitations:	• Authors and participants not blinded to the products used or the contact time. • Veterinary students may not be as experienced in the methods of pre-surgical hand preparation. There were guidelines, however there was likely to be some variability between participants. • There was some variability between surgical times (57-255 mins) which may have affected the final samples taken. However, in the discussion it is stated that the average surgery time was relatively short • There was no comparison with an abrasive scrubbing brush; the scrubbing method used a sponge as opposed to a brush.

Verwilghen (2011)	
Population:	Small animal and equine surgeons
Sample size:	3 equine and 2 small animal surgeons. A total of 64 samples were obtained for AHRs (Sterilium) (50 equine, 14 small animal) and 30 obtained for antimicrobial soap (CHG) (20 equine, 10 small animal).
Intervention details:	A preliminary study was carried out comparing Povidone Iodine

	(PVP), CHG and Sterilium. Following this preliminary study it was found that the actions of the PVP were not comparable to the others and so the clinical in use study was carried out only using CHG and Sterilium. Sample sizes are discussed above. The CHG was used in a 5 minute scrubbing technique and the Sterilium was used according to manufacturer's instructions at 1.5 minutes after a 1 minute's hand wash with neutral soap. Fingertips were pressed for 10 seconds onto a blood agar plate (separate for each hand) and bacterial growth was quantified by counting the CFUs grown after 24 hours of incubation. This was performed prior to hand antisepsis, immediately after hand antisepsis and after surgery during which the surgeon was double gloved (the first pair discarded after draping the patient). Mean surgery time was 1.5 hours.
Study design:	Clinical trial
Outcome studied:	To compare AHRs to CHG in a surgical setting
Main findings: (relevant to PICO question):	• A preliminary study was carried out comparing PVP, CHG and Sterilium and found that PVP was not comparable to the other 2 products and so this was not taken forward into the further study. • 4 Sterilium samples were excluded due to contamination during surgery, 1 was excluded due to an infected wound by the nail of one of the surgeons creating an extreme growth of staphylococcus aureus. • Prior to hand antisepsis samples were significantly different to after hand antisepsis and after surgery samples for both products. • No difference was found in CFUs between after hand antisepsis and after surgery samples for Sterilium. • The clinical in use trial found that there was a significantly greater reduction factor for the Sterilium compared to CHG. • The results of this study agreed with previous studies carried out in this area (Parienti et al 2002; Kampf and Osteomeyer, 2005; Loffler and Kampf, 2008 and Tanner et al 2008).
Limitations:	Residual activity of CHG is difficult to assess without the use of a neutralising agent as bacteriostatic concentrations of the CHG will remain. The decision was made to not use a neutralising agent as it wasn't used in similar studies. More than double the amount of samples were gained for the Sterilium group, although some of these did have to be discarded.

Appraisal, application and reflection

Two relevant studies were found for this particular PICO question, which both conclude that alcohol is as effective, if not more, than antimicrobial soap for pre surgical hand preparation when used according to the manufacturer guidelines. The AHRs used in the 2 studies, however, was of different formulations. In the first study (Chou et al, 2016) there were 2 formulations of alcohol used: propanol (of different strengths) and alcohol with CHG, of which the alcohol with CHG was found to be the most effective. In the second study (Verwilghen et al 2011) the only alcohol formulation used was propanol (Sterilium). The PICO question only specifies AHRs rather than particular formulations so both studies are relevant.

Another difference between the studies was that Chou et al (2016) did not use an abrasive method of hand scrubbing as one of the comparisons; their non-abrasive scrub method was with the use of a sponge rather than bristles. As the PICO question in this instance was asking for a comparison between scrubbing brushes and AHRs there are some discrepancies between this and the PICO question, but the decision was made to include it. Verwilghen et al (2011) did use the more traditional surgical scrub with a brush as one of their variables, making it very suited to the PICO question.

On reflection, whether in human or veterinary surgery, the end point of pre-surgical hand antisepsis is the same; to have reduced bacterial colony forming units on the hands. The author therefore feels that a future Knowledge Summary with a slight change to the PICO to include human surgery would still be relevant to veterinary professionals to draw evidence from.

Methodology Section

Search Strategy	
Databases searched and dates covered:	PubMed and CAB Abstracts 1973-2016 week 29
Search terms:	Small animal or veterinary surgery or companion animal or (cats or cats or feline or felis or dogs or dog or canis or canine) or small animal surgery and (chlorhexidine gluconate or povidone iodine or antimicrobial soap) or scrubbing brush or (hand and scrub*) or scrub and (alcohol rub or alcoholic rub or ethanol or propanol) or (hand and rub) or rub*
Dates searches performed:	6/8/2016 CAB abstracts 5/10/16 Pubmed

Exclusion / Inclusion Criteria	
Exclusion:	Large/farm animal studies, human studies, narrative reviews, any studies on skin preparation of patients as opposed to the surgeon, any studies that are not relevant to the PICO question
Inclusion:	Small animal/companion animal studies comparing the 2 hand preparation techniques

Search Outcome							
Database	Number of results	Excluded – Narrative	Excluded – Not relevant to the PICO	Excluded – Human study	Excluded – Duplicate	Excluded – Large animal study	Total relevant papers
CAB Direct	19	1	18	0	0	0	1
NCBI PubMed	554	0	542	11	1	1	1
Total relevant papers when duplicates removed							2

CONFLICT OF INTEREST

The author declares no conflict of interest.

REFERENCES

1. Chou, P. et al (2016) Antibacterial Efficacy of Several Surgical Hand Preparation Products Used by Veterinary Students. *Veterinary Surgery,* 45 (4) pp. 515-522 http://dx.doi.org/10.1111/vsu.12473
2. Kampf, G. and Osteomeyer, C. (2005) Efficacy of Two Distinct Ethanol Based Hand Rubs for Surgical Hand Disinfection- a Controlled Trial According to prEN 12791. *BMC infectious diseases,* Vol 5 (19). http://dx.doi.org/10.1186/1471-2334-5-17
3. Loffler, H. and Kampf, G. (2008) Hand Disinfection: How Irritant Are Alcohols? *Journal of hospital infection,* 70 (S1) PP. 44-48 http://dx.doi.org/10.1016/S0195-6701(08)60010-9
4. Parienti, J. J. et al (2002) Hand Rubbing with an Aqueous Solution vs Traditional Surgical Hand Scrubbing and 30 Day Surgical Site Infection Rates: A Randomised Equivalence Study. *Journal of the American Medical Association,* 288 (6) pp. 722-727 http://dx.doi.org/10.1001/jama.288.6.722
5. Tanner, J., Swarbrook, S. and Stuart, J. (2008) Surgical Hand Antisepsis to Reduce Surgical Site Infection. [Cochrane Database Systematic Review] [online]. Available from: http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD004288.pub2/full DOI http://dx.doi.org/10.1002/14651858.CD004288.pub2 [Accessed 1 October 2016]
6. Verwilghen, D. R. et al (2011) Surgical Hand Antisepsis in Veterinary Practice: Evaluation of Soap Scrubs and Alcohol Based Rub Techniques. *The Veterinary Journal,* 190 (3) pp. 372-377 http://dx.doi.org/10.1016/j.tvjl.2010.12.020

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