The probability that a pathogen lingered on the probe after cleaning and disinfection was derived from data on bacterial agents in 2 single-center studies,[2,3] whereas most infections simulated by Leroy et al were viral. The probability of probe contamination from an infected patient was extracted from observational data on sexual intercourse. However, the probability of transmission differed according to type of sexual intercourse, inoculum or viral load.[4] Sexual exposure was most probably very dissimilar from endocavitary ultrasound exposure. With hepatitis C virus, the rate of transmission differed strongly between infection observed among drug users[5] and patients after nosocomial exposure, such as hemodialysis.[6] Similarly, with human immunodeficiency virus, the probability of infection after accidental blood[7] and male-to-female sexual exposures[4] is distinct with 0.003 and 0.0019 probability densities, respectively. Sensitivity analyses should have been conducted to properly interpret the results.

In a hypothetical cohort of 4 million exposed patients in France,[1] the authors ascertained that a mean (SD) of 40 (20) would be infected by human immunodeficiency virus and 151 (63) by hepatitis C virus annually. Recently, our group studied a French prospective, observational, hospital-based cohort of 16,474 individuals[8] and found that the incidence of human immunodeficiency virus seroconversion was 0 (n = 0) per 10,000 patient-years in patients with endocavitary probe exposure within 12 months before testing and 6.7 (n = 13) in nonexposed patients (log-rank test: $P = .64$). The incidence of hepatitis C virus seroconversion was 16.1 (n = 1) per 10,000 patient-years in patients exposed to endocavitary probes and 23.4 in nonexposed patients (log-rank test: $P = .69$).

In a letter published elsewhere,[9] our group underlined that statistical analysis of a previous meta-analysis by Leroy,[10] based on 2 published studies, would be questionable owing to lack of weighting according to study size. However, similar data were analyzed, again with a dearth of details regarding the calculation of pooled prevalence.[7] We agree with Leroy et al[1] that the issue of probe contamination is important and could be a public health concern, particularly with human papillomavirus infection related to endocavitary ultrasound exposure. Additional sensitivity analysis would have improved the accuracy of estimations in the present study.[1] Appropriate prospective investigations are needed with a view to proposing the best preventive measures for patient safety regarding these exposures.

ACKNOWLEDGMENTS

Financial support. None reported.

Potential conflicts of interest. All authors report no conflicts of interest relevant to this article.

Thomas Bénet, MD, MPH;[1,2]
René Ecochard, MD, PhD;[2,3]
Philippe Vanhems, MD, PhD[1,2]

Affiliations: 1. Infection Control and Epidemiology Unit, Hospices Civils de Lyon, Lyon, France; 2. Biometry and Evolutive Biology Laboratory, Biostatistics and Health Unit, Lyon 1 University, and National Center for Scientific Research, Mixed Research Unit 5558, Villeurbanne, and Lyon 1 University, Lyon, France; 3. Department of Biostatistics, Lyon University Hospitals, Lyon, France.

Address correspondence to Philippe Vanhems, MD, PhD, Service d'Hygiène, Epidémiologie et Prévention, Hôpital Edouard Herriot, Hospices Civils de Lyon, 5 place d'Arsonval, 69437 Lyon CEDEX 03, France (philippe.vanhems@chu-lyon.fr).

Infect Control Hosp Epidemiol 2015;36(7):851–852

 0899-823X/2015/3607-0020. DOI: 10.1017/ice.2015.87

REFERENCES

1. Leroy S, M'Zali F, Kann M, Weber DJ, Smith DD. Impact of vaginal-rectal ultrasound examinations with covered and low-level disinfected transducers on infectious transmissions in France. *Infect Control Hosp Epidemiol* 2014;35:1497–1504.
2. Kac G, Podglajen I, Si-Mohamed A, Rodi A, Grataloup C, Meyer G. Evaluation of ultraviolet C for disinfection of endocavitary ultrasound transducers persistently contaminated despite probe covers. *Infect Control Hosp Epidemiol* 2010;31:165–170.
3. Kac G, Gueneret M, Rodi A, et al. Evaluation of a new disinfection procedure for ultrasound probes using ultraviolet light. *J Hosp Infect* 2007;65:163–168.
4. Hughes JP, Baeten JM, Lingappa JR, et al; Partners in Prevention HSV/HIV Transmission Study Team. Determinants of per-coital-act HIV-1 infectivity among African HIV-1-serodiscordant couples. *J Infect Dis* 2012;205:358–365.
5. Thorpe LE, Ouellet LJ, Hershow R, et al. Risk of hepatitis C virus infection among young adult injection drug users who share injection equipment. *Am J Epidemiol* 2002;155:645–653.
6. Petrosillo N, Gilli P, Serraino D, et al. Prevalence of infected patients and understaffing have a role in hepatitis C virus transmission in dialysis. *Am J Kidney Dis* 2001;37:1004–1010.
7. Henderson DK, Fahey BJ, Willy M, et al. Risk for occupational transmission of human immunodeficiency virus type 1 (HIV-1) associated with clinical exposures: a prospective evaluation. *Ann Intern Med* 1990;113:740–746.
8. Bénet T, Ritter J, Vanhems P. Risk of human immunodeficiency virus and hepatitis C virus infection related to endocavitary ultrasound probe exposure in France. *Infect Control Hosp Epidemiol* 2014;35:1429–1431.
9. Bénet T, Vanhems P. Methodological issues concerning the meta-analysis by Leroy on the risk of infectious complications after endovaginal and transrectal ultrasonography. *J Hosp Infect* 2014;88:52–53.
10. Leroy S. Infectious risk of endovaginal and transrectal ultrasonography: systematic review and meta-analysis. *J Hosp Infect* 2013;83:99–106.

Reply to Bénet et al

To the Editor—We thank Bénet et al.[1] for their letter discussing the difficulties in evaluating the infectious risk linked to

performing low-level disinfection (LLD) of endovaginal and transrectal ultrasonography (US) probes used with disposable probe covers. As indicated in our article, we used a modeling approach to approximate this infectious risk for some pathogens, and agreed that our modeling had limitations, closely related to the assumptions we used as inputs.[2]

However, we do not completely agree with all the concerns raised by Bénet et al.[1] The probability (Pr2b, in our article) that the probe might remained contaminated after cleaning and LLD was estimated from a meta-analysis of 2 cohort studies that quantified the efficacy of LLD on bacterial agents: the studies of Buffet-Bataillon et al.[3] and Kac et al. (2007),[4] and not the Kac et al. article published in 2010.[5] We agreed that assuming LLD efficacy is similar for bacterial and viral agents is arguable, as discussed in our paper, but we made the assumption because of the lack of data available on viruses.[6] Moreover, if human immunodeficiency virus (HIV) is a fragile virus as discussed in our paper, other non-enveloped viruses such as human papillomavirus are relatively resistant to commonly used clinical disinfectants.[7] We also agreed that the probability of probe transmission from an HIV-infected patient varies with viral load and the mucosal breach, and choosing sexual transmission as a proxy for both probabilities of transmission from an infected patient to the probe as well as of transmission from the infected probe to the next patient could be arguable. However, given the lack of specific data, it appears to us to be the more realistic assumption to make, better than data from drug users that supposes percutaneous injections, or accidental contaminated blood exposures. Sensitivity analysis would have provided an estimation of the impact of the parameters' variability on the modeling results. This is problematic as well, since we would have had to make compounding assumptions on these parameters' variability, especially to numerically approximate how far our proxy was from the reality of probe-to-patient and patient-to-probe transmission. Interestingly, our modeling was checked by an "empirical modeling" performed for human papillomavirus, in which Casalegno et al.[8] empirically estimated Pr1a to Pr2b. The results of the empirical and baseline modeling were similar with a slight underestimation from the baseline modelling, indicating that our assumptions for Pr1a to Pr2b were likely realistic. Of note, pooled prevalences were calculated by using a random effects model with inverse variance weighting using the Der Simonian and Laird method, referencing to our previous work in which pooled estimates were clearly calculated taking into account both sample size and data dispersion.[9]

Beyond these technical points, the question raised is how can we estimate the infectious risk related to LLD performed on endovaginal and transrectal US probes used with disposable covers, and how can we provide quantitative estimates to guide public health decision-making using relevant and robust scientific evidence. One approach is modeling given the lack of comprehensive data, with the limitations due to the model assumptions. Bénet et al.[10] proposed another approach based on a secondary analysis of a large hospital-based cohort study and compared their results with ours to conclude on the safety of endocavitary US regarding HIV and hepatitis C virus. However, their results appeared to us to have some limitations as well. Patients were initially part of a cohort study designed for another purpose and selected for that secondary analysis on having 2 HIV and hepatitis C virus serologies, but no complementary information on the other transmission risk factors was collected even though it might be of interest for adjustment in the analysis. Then patients who underwent endocavitary US were identified by searching in the French procedures classification (Classification Commune des Actes Médicaux). Therefore, since patients were selected on the basis of 2 repeated serologies, they could present with a particular status regarding the risk of viral transmission that could limit the external validity of their results beyond this particular cohort study.

One can ask whether for some pathogens, such as HIV, hepatitis B virus, and hepatitis C virus, that lead to rare or very rare transmission but with dramatic consequences, a simple case report but with a very well-documented causality relationship would be enough to alert public health services, as it happened in the United Kingdom.[11] Another observation reported hepatitis C virus transmission to patients in the in vivo fecundation process, likely through healthcare workers during routine procedures such as daily US.[12] For more common viruses such as human papillomavirus related to an increased risk of cervical cancer, quantitative studies may be valuable. Lastly, we agreed with the conclusions of Bénet et al.[1] that appropriate investigations are warranted in order to guarantee patients' safety regarding these semicritical devices. We find ourselves wondering why LLD is still recommended for routine vaginal/rectal US in France whereas high-level disinfection is encouraged in its European neighbors, Australia, North America, and Japan. If waiting for more convincing evidence is required by public health services, a precautionary principle can be applied as an easy and efficient start point and patients may be asked for their serologic HIV/hepatitis C virus/hepatitis B virus status before endovaginal/transrectal US. In case of positivity, disinfection procedures can be switched to high-level disinfection.

ACKNOWLEDGMENTS

Potential conflicts of interest. All authors report no conflicts of interest relevant to this article.

Sandrine Leroy, MD, PhD;[1]
David J. Weber, MD;[2]
David D. Smith, PhD[3]

Affiliations: 1. Unité Mixte Internationale 233, Institut de Recherche pour le Développement, INSERM U1175, and University of Montpellier, 34394 Montpellier, France; 2. Division of Infectious Diseases, University of North

https://doi.org/10.1017/ice.2015.88 Published online by Cambridge University Press

Carolina School of Medicine, Chapel Hill, North Carolina; 3. Department of Biostatistics, City of Hope, Duarte, California.

Address correspondence to Sandrine Leroy, MD, PhD, Institut de Recherche pour le Développement, Unité Mixte Internationale 233, INSERM U1175, Université de Montpellier, 911 avenue Agropolis, BP 64501, F-34394 Montpellier CEDEX 5, France (sandrin.leroy@gmail.com).
Infect Control Hosp Epidemiol 2015;36(7):852–854
 0899-823X/2015/3607-0021. DOI: 10.1017/ice.2015.88

REFERENCES

1. Bénet T, Ecochard R, Vanhems P. Letter to the editor regarding "Impact of vaginal-rectal ultrasound examinations with covered and low-level disinfected transducers on infectious transmissions in France" by Leroy et al. *Infect Control Hosp Epidemiol* 2015; DOI: 10.1017/ice.2015.87.
2. Leroy S, M'Zali F, Kann M, Weber DJ, Smith DD. Impact of vaginal-rectal ultrasound examinations with covered and low-level disinfected transducers on infectious transmissions in France. *Infect Control Hosp Epidemiol* 2014;35:1497–1504.
3. Buffet-Bataillon S, Vallee A, Lebrun B, Cormier M, Poulian P, Jolivet-Gougeon A. Contrôle microbiologique de la désinfection de sondes endovaginales et d'e´chographie transoesophagienne au CHU de Rennes. In: Program and Abstracts of the 20th Congress of the Société Française d'Hygiène Hospitalière (SFHH) and Société des Infirmiers et Infirmières en Hygiène Hospitalière de France (SIIHH). Nice, France: SFHH and SIIHH, 2009. Abstract 312009.
4. Kac G, Gueneret M, Rodi A, et al. Evaluation of a new disinfection procedure for ultrasound probes using ultraviolet light. *J Hosp Infect* 2007;65:163–168.
5. Kac G, Podglajen I, Si-Mohamed A, Rodi A, Grataloup C, Meyer G. Evaluation of ultraviolet C for disinfection of endocavitary ultrasound transducers persistently contaminated despite probe covers. *Infect Control Hosp Epidemiol* 2010;31:165–170.
6. Thorpe LE, Ouellet LJ, Hershow R, et al. Risk of hepatitis C virus infection among young adult injection drug users who share injection equipment. *Am J Epidemiol* 2002;155:645–653.
7. Meyers J, Ryndock E, Conway MJ, Meyers C, Robison R. Susceptibility of high-risk human papillomavirus type 16 to clinical disinfectants. *J Antimicrob Chemother* 2014;69:1546–1550.
8. Casalegno JS, Le Bail Carval K, Eibach D, et al. High risk HPV contamination of endocavity vaginal ultrasound probes: an underestimated route of nosocomial infection? *PLOS ONE* 2012;7:e48137.
9. Leroy S. Infectious risk of endovaginal and transrectal ultrasonography: systematic review and meta-analysis. *J Hosp Infect* 2013;83:99–106.
10. Bénet T, Ritter J, Vanhems P. Risk of human immunodeficiency virus and hepatitis C virus infection related to endocavitary ultrasound probe exposure in France. *Infect Control Hosp Epidemiol* 2014;35:1429–1431.
11. Department of Health, Social Services and Public Safety, UK (DHSSPS). MDA/2012/037. DHSSPS website. Available at: http://www.dhsspsni.gov.uk/mda-2012-037.pdf.
12. Lesourd F, Izopet J, Mervan C, et al. Transmissions of hepatitis C virus during the ancillary procedures for assisted conception. *Hum Reprod* 2000;15:1083–1085.

Letter to the Editor Regarding "Efficacy of Alcohol Gel for Removal of Methicillin-Resistant *Staphylococcus Aureus* from Hands of Colonized Patients"

To the Editor—We have read with great interest the article by Sunkesula et al[1] on the effectiveness of alcohol 70% v/v against methicillin-resistant *Staphylococcus aureus* in a clinical study. Surprisingly, 2 mL of a commonly used, registered handrub product failed in 27 (40%) of 67 instances to completely eradicate MRSA. This result might be explained by several issues that were not discussed in detail in the article: (1) the hand hygiene product used has been previously shown to have a lower mean microbial reduction factor compared with reference alcohol—therefore not meeting the European Standards (EN 1500) requirements within 30 seconds of application,[2] (2) the volume of 2 mL might not have been sufficient, and (3) it is unclear whether the hand hygiene technique as outlined by the World Health Organization was strictly adhered to in this study. We recently found compliance with all 6 steps of the technique among healthcare workers at our institution to be as low as 8.5%, despite high compliance with hand hygiene indications.[3] Several studies showed that training in hand hygiene significantly improves antimicrobial effectiveness.[4] By any means, this study is important and might explain why many studies failed to decrease the spread of methicillin-resistant *Staphylococcus aureus* despite high compliance with hand hygiene.

ACKNOWLEDGMENTS

Financial support. None reported.

Potential conflicts of interest. Both authors report no conflicts of interest relevant to this article.

Andreas F. Widmer, MD, MSc; Sarah Tschudin-Sutter, MD, MSc

Affiliations: Division of Infectious Diseases and Hospital Epidemiology, University Hospital Basel, Basel, Switzerland.

Address correspondence to Andreas F. Widmer, MD, MSc, Division of Infectious Diseases and Hospital Epidemiology, University Hospital Basel, Petersgraben 4, CH-4031 Basel, Switzerland (andreas.widmer@usb.ch).
Infect Control Hosp Epidemiol 2015;36(7):854–855
 0899-823X/2015/3607-0022. DOI: 10.1017/ice.2015.94

REFERENCES

1. Sunkesula V, Kundrapu S, Macinga DR, Donskey CJ. Efficacy of alcohol gel for removal of methicillin-resistant *Staphylococcus*