

Micro News

July 2007

1. Importance of environmental contamination – HIS review

Several articles in the conference proceedings from the Hospital Infection Society (HIS) meeting last year, published in this month's *Journal of Hospital Infection*, discuss the role of environmental contamination in the transmission of nosocomial pathogens. An article by Dr John Boyce, from a Yale University-affiliated US hospital presents convincing evidence that environmental contamination makes an important contribution to the transmission of MRSA and VRE (Boyce 2007). The article discusses studies demonstrating that MRSA and VRE can survive for extended periods on surfaces, persist despite terminal cleaning, and be transferred directly to patients and to the hands of healthcare workers from environmental surfaces. The article reviews evidence that environmental decontamination can be effective for preventing the transmission of MRSA and VRE in outbreak settings and goes on to describe encouraging results of a study investigating the efficacy of hydrogen peroxide vapour (HPV) for the control of *Clostridium difficile*.

An article by Dr Adam Fraise from the Hospital Infection Research Laboratory in Birmingham, UK, begins by discussing the public perception that dirty hospitals are unsafe and questions whether there is scientific evidence to support this point of view (Fraise 2007). The article questions whether contamination identified during outbreaks of MRSA or VRE is cause or effect of transmission and goes on to discuss several studies which showed comparable rates of infection before and after a switch from a detergent to a disinfectant, though the studies were concerned with general disinfection policies rather than policies focussed on hand-touch sites. The article goes on to discuss studies in which environmental decontamination does appear to have been effective in reducing transmission including one published successful outbreak intervention that involved the use of HPV (Bates and Pearse 2005). The article concludes that decontamination can help halt outbreaks of nosocomial infection, in particular *C. difficile*.

A third related article by Drs Dettenkofer from a German hospital and Spencer from the UK Health Protection Agency (HPA) calls for targeted surface disinfection policies, rather than widespread surface disinfection (Dettenkofer and Spencer 2007). The article also calls for further evaluation of promising new technologies, including HPV.

To reconcile these varied and, on certain points, contradictory viewpoints is difficult, but there is increasing interest and evidence surrounding the role of environmental contamination in the transmission of nosocomial pathogens and the use of HPV in hospitals.

2. *Acinetobacter* infections in US soldiers – searching for the source

Three possible sources for *Acinetobacter baumannii-calcoaceticus* (ABC) infections in the US military healthcare system associated with military operations in Iraq have been proposed: inoculation of the wound site with ABC-containing soil at the time of injury, skin colonisation amongst soldiers and subsequent endogenous infection or nosocomial acquisition and transmission. An article published this month in *Clinical*

Infectious Diseases provides compelling evidence that the bulk of ABC infections amongst US soldiers occurs through nosocomial acquisition (Scott et al. 2007). Only 1 of 160 US soldiers had ABC skin colonisation and only 1 of 49 soils samples yielded ABC. By contrast, ABC was sampled from inanimate surfaces in patient care areas in all seven field hospitals sampled, including hand-touch sites in the near patient environment. Although the environmental isolates were genetically related to the patient isolates, they tended to be less antimicrobial resistant, which could be evidence that susceptible environmental isolates were the source of infections and acquired antimicrobial resistance in response to therapy. These data fit with the findings of Griffith et al. (2007), who found that none of 102 healthy US soldiers were colonised with ABC (Griffith et al. 2007).

3. Updates on *Acinetobacter* – outbreaks, clinical significance and cost

Zanetti et al. (2007) describe a biphasic outbreak of *A. baumannii* on a Swiss intensive care unit (ICU) characterised by widespread environmental contamination (Zanetti et al. 2007). The index case was injured in the 2002 Bali bombing and caused an outbreak affecting two other patients. No *A. baumannii* was identified in the environment at this stage. Six months later, 6 of 9 consecutive burns patients acquired the outbreak strain of *A. baumannii*. A switch to a different culture methodology using minimal media identified environmental contamination on 10% of 161 sites during the second phase of the outbreak. The patient and environmental isolates in the second phase of the outbreak were indistinguishable from the patient isolates in the first phase of the outbreak by PFGE. The authors comment that 'the known propensity of *A. baumannii* to persistently contaminate surfaces is a likely explanation for the resurgence of the outbreak.' The outbreak was only terminated by closure and intensive cleaning of the burns ICU.

A case-control study published this month has provided further evidence that multi-drug resistance in *Acinetobacter baumannii* infection is bad news (Lee et al. 2007)! The study showed that patients with MDR-*A. baumannii* bacteraemia had increased mortality, length of stay and cost (an additional US\$3,758) compared with multi-drug susceptible *A. baumannii*. However, only differences in the length of stay and cost of hospitalisation were statistically significant.

4. *C. difficile* environmental contamination: prevalence and molecular types

A multi-facility study identified *C. difficile* environmental contamination on 13 (27%) of 48 sites across six healthcare facilities (Dubberke et al. 2007). *C. difficile* was recovered from 33% of the rooms where the patients did not have apparent *C. difficile*-associated disease; this contamination may have been imported into the room, survived from previous patients or the occupant may have been asymptotically colonised with *C. difficile*. 67% of the environmental isolates were the NAP1 toxinotype III strain, which was recovered from all but one of the six healthcare facilities included, indicating that the NAP1 outbreak strain is now endemic within the healthcare district investigated.

5. Prevalence of paediatric CA-MRSA nasal colonisation: Taiwan vs. Switzerland

Two articles published this month report dramatically divergent prevalence of nasal colonisation with MRSA in their respective paediatric populations. A point-prevalence survey of 68 kindergarten children in Taipei, Taiwan, found nasal colonisation in 9

(13.2%) of the children, all of which were resistant to both erythromycin and clindamycin (Lo et al. 2007). By contrast, a larger multi-centre Swiss study found only 1 (0.2%) of 1363 patients screened on admission to hospital to be colonised with MRSA (Heininger et al. 2007). Whilst the point-prevalence survey in the Taiwanese kindergarten should not be used as a measure of national prevalence, there may be real geographical difference in the prevalence of CA-MRSA colonisation and infection.

6. Hypertoxigenicity of *C. difficile* is not due to the 18-bp deletion in TcdC gene

A detailed molecular study published this month has demonstrated definitively that *tcdC* is a negative regulator gene for the expression of *C. difficile* toxins (Matamouros et al. 2007). The paper goes on to demonstrate that the hypertoxigenicity of the epidemic NAP1/027 strain is not due to the 18-bp deletion in the *tcdC* gene, as was initially suspected.

7. And finally...voluntary ingestion of alcohol hand rub

A patient in France drunk a whole bottle of alcohol hand rub and lived to tell the tale after suffering serious health effects (Tavolacci et al. 2007). The concentration of alcohol in her blood was 2.28 g/L, three times the drink-driving blood alcohol limit in the UK!

References

- Bates,C.J. and Pearse,R. (2005) Use of hydrogen peroxide vapour for environmental control during a *Serratia* outbreak in a neonatal intensive care unit. *J Hosp Infect* **61**, 364-366.
- Boyce,J.M. (2007) Environmental contamination makes an important contribution to hospital infection. *J Hosp Infect* **65**, 50-54.
- Dettenkofer,M. and Spencer,R.C. (2007) Importance of environmental decontamination - a critical view. *J Hosp Infect* **65**, 55-57.
- Dubberke,E.R., Reske,K.A., Noble-Wang,J., Thompson,A., Killgore,G., Mayfield,J., Camins,B., Woeltje,K., McDonald,J.R., McDonald,L.C. and Fraser,V.J. (2007) Prevalence of *Clostridium difficile* environmental contamination and strain variability in multiple health care facilities. *Am J Infect Cont* **35**, 315-318.
- Fraise,A.P. (2007) Decontamination of the environment. *J Hosp Infect* **65**, 58-59.
- Griffith,M.E., Lazarus,D.R., Mann,P.B., Boger,J.A., Hospenthal,D.R. and Murray,C.K. (2007) *Acinetobacter* skin carriage among US army soldiers deployed in Iraq. *Infect Cont Hosp Epidemiol* **28**, 720-722.
- Heininger,U., Datta,F., Gervais,A., Schaad,U.B., Berger,C., Vaudaux,B., Aebi,C., Hitzler,M., Kind,C., Gnehm,H.E. and Frei,R. (2007) Prevalence of nasal colonization with methicillin-resistant *Staphylococcus aureus* (MRSA) in children a multicenter cross-sectional study. *Pediatr Infect Dis J* **26**, 544-546.
- Lee,N.Y., Lee,H.C., Ko,N.Y., Chang,C.M., Shih,H.I., Wu,C.J. and Ko,W.C. (2007) Clinical and economic impact of multidrug resistance in nosocomial *Acinetobacter baumannii* bacteremia. *Infect Cont Hosp Epidemiol* **28**, 713-719.
- Lo,W.T., Lin,W.J., Tseng,M.H., Lu,J.J., Lee,S.Y., Chu,M.L. and Wang,C.C. (2007) Nasal carriage of a single clone of community-acquired methicillin-resistant *Staphylococcus aureus* among kindergarten attendees in northern Taiwan. *BMC Infect Dis* **7**, 51.
- Matamouros,S., England,P. and Dupuy,B. (2007) *Clostridium difficile* toxin expression is inhibited by the novel regulator TcdC. *Mol Microbiol* **64**, 1274-1288.
- Scott,P., Deye,G., Srinivasan,A., Murray,C., Moran,K., Hulten,E., Fishbain,J., Craft,D., Riddell,S., Lindler,L., Mancuso,J., Milstrey,E., Bautista,C.T., Patel,J., Ewell,A., Hamilton,T., Gaddy,C., Tenney,M., Christopher,G., Petersen,K., Endy,T. and Petruccielli,B. (2007) An outbreak of multidrug-resistant *Acinetobacter baumannii*-calcoaceticus complex infection in the US military health care system associated with military operations in Iraq. *Clin Infect Dis* **44**, 1577-1584.
- Tavolacci,M.P., Marini,H., Vanhese,S., Merle,V., Coulon,A.M., Micaud,G. and Czernichow,P. (2007) A voluntary ingestion of alcohol-based hand rub. *J Hosp Infect* **66**, 86-87.