ordering society and rationalising environment. Douglas,[27] in her studies of taboo, which she describes as a "spontaneous device for protecting the distinctive categories of the universe", and her observation that ambiguity (of any substance) leads to discomfort, notes holiness and impurity to be at opposite poles of the spectrum.

Of the five basic tenets of Islam, observing regular prayer five times daily is one of the most important. Personal cleanliness is paramount to worship in Islam. Muslims must complete methodical ablutions before praying, and explicit instruction is given in the Qur'an as to precisely how Muslims should wash. Ablutions must be made in freely running (not stagnant) water and involve washing of the hands, face, forearm, ears, nose, mouth, and feet, three times each. Additionally, hair must be dampened with water. Thus, every observant Muslim is required to maintain scrupulous personal hygiene five times a day, aside from his or her usual routine of bathing. These habits are observed by Muslims of all races, cultures, and ages.

Apart from the Qur'an, other references exist to guide Muslims. The ways in which the prophet Mohammed lived are documented in the *Hadith* and the *Sunna*, and provide additional observations on the emphasis given to personal hygiene in Islam and the specific prominence on hand hygiene. The prophet Mohammed always urged Muslims to wash hands frequently[28] and after clearly delineated tasks: before and after meals; after visiting the lavatory; after touching a dog, a cadaver, or one's shoes; and after handling anything soiled or in some way suspect. Hence, from the dawn of Islam, strict observation of hand hygiene with freely running water has been advocated for all Muslims. Nevertheless, a small minority of Muslim health-care workers have expressed reluctance or, in a small number of cases, refusal[7] to adhere to the current strategies for hand hygiene that are based on use of alcohol-based handrubs.[2,6,8] We believe this reluctance arises because of the specific interpretation of alcohol as a *haram* (forbidden) substance.

Alcohol use and Islam

Alcohol is clearly designated as *haram* in Islam because it is a substance leading to *Sukr* (intoxication). For Muslims, any agent or process leading to a disconnection from a state of awareness or consciousness (a state in which he or she may forget the creator) is called *Sukr*, which is *haram*. Consequently, an enormous taboo has become attached to consumption of alcohol for all Muslims. Although most understand that abstinence from alcohol can have substantial benefits on health, many overlook that alcohol as a medicinal agent is permitted within Islam. Indeed, any substance that man can manufacture or develop in order to alleviate illness or aid health is permitted. In this capacity, the substance is not used as an agent of *Sukr*. For example, cocaine is permitted as a local anaesthetic (*halal*, allowed), but inadmissible as a recreational drug (*haram*). This distinction enables the Muslim health-care worker to engage in evolving technology and emerging science, including acceptance of new applications of substances clearly deemed *haram*.

The topic of medicines containing alcohol and narcotics was discussed during the 16th meeting of the Muslim Scholars' Board of the World Muslim League in Mecca, Saudi Arabia, in January, 2002. Several recommendations were made, and medicines that contain alcohol in any concentration have since been deemed permissible by the World Muslim League if no substitute exists.

Furthermore, alcohol has long been a component present in household cleaning agents and other materials for public use such as perfume, without legislated restriction for Muslims. In these instances, the alcohol content is permitted because it is not for ingestion.

Concerns have been expressed about the potential systemic diffusion of alcohol or its metabolites after dermal absorption or airborne inhalation related to the use of alcohol-based handrub.[8] This issue was also discussed within the framework of the preparatory phase of the NPSA "*clean*your*hands*" campaign in the UK. Available scientific data are limited at present, although some published[29] and unpublished data (Kramer A, Institute of Hygiene and Environmental Medicine, Greifswald, Germany, personal communication) show that the amount of alcohol absorbed is negligible. Further studies need to be done to provide a definitive answer to this question.

Islamic theology and health-care interface

Parallels of religious belief and clinical practice interface in Saudi Arabia on a daily basis. The health-care system thrives within the governance of Islamic Law and provides a useful indicator of current Islamic attitudes, as shown by the following two examples.

At the Saudi Arabian National Guard Health Affairs (SANG-HA) hospitals, use of alcohol-based handrub has been permitted since 2003, and is now mandatory for all staff. No difficulties or reluctance to adopt these formulations have been encountered. Even though Saudi Arabia is the accepted Custodian of the Two Holy Mosques (at Mecca and Medina) and is considered to be the spiritual epicentre of Islam, no state policy or permission was sought in implementing alcohol-based rubs for hand cleansing in this major, government-funded, military hospital.

However, at SANG-HA hospitals, most health-care workers are expatriates, often either non-Muslim or, if Muslim, highly selected professionals with "western" training and sensibilities. Therefore, their attitude to alcohol-based handrub agents may be different to that of Muslim health-care workers in facilities elsewhere. However, no other hospitals in Saudi Arabia, or indeed in the Gulf states, have reported any inability to comply because of religious beliefs. Alcohol-based handrub has been installed recently in more than 200 public hospitals

in Saudi Arabia (Ishag AH, personal communication). We find this regional acceptance encouraging, and believe that it demonstrates that alcohol-based handrub solutions are indeed tolerable to most Muslim health-care workers.

All health-care workers should be aware of the cultural preferences of colleagues. We must seek these insights as adamantly as we seek to understand our patients' belief systems. Although we have mainly discussed experiences in Saudi Arabia and the UK, these issues might also be relevant to other religious and cultural contexts. Unfortunately, no systematic review of this topic is currently available, and further investigations are needed to delineate the extent to which religious beliefs might affect health-care practices, if at all.[7,8,15] In the UK, issues encountered in relation to religion and culture seem to be surmountable, and alcohol-based handrubs have been successfully introduced in all acute care hospitals. Challenges relating to use of alcohol-containing formulations are likely to be more frequently encountered,[7] since such formulations are now seen as the gold standard for hand hygiene during care of patients, as reflected in guidelines currently under development within the scope of the Global Patient Safety Challenge 2005–06 of the WHO World Alliance for Patient Safety.[19,30]

Increased awareness of Muslim health-care workers' beliefs and anxieties could improve compliance with accepted hand-hygiene practices.

As medicine advances faster than we can assimilate required changes in attitudes and ethical beliefs, we will see an increasing number of interfaces between science and belief—interfaces that may take time to resolve. Today's health-care delivery systems must be sensitive to a range of personal religious and cultural beliefs and take these into consideration.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgments

We thank the group of international experts and WHO members who worked to the development of the Global Patient Safety Challenge, in particular for their participation in the two international WHO Consultations, review of the available scientific evidence, writing of the WHO draft Guidelines on Hand Hygiene in Health Care, and fostering discussion among authors and members of the different Task Forces and working groups. The complete list of participants in the development of the Guidelines documents is available at http://www.who.int/patientsafety/events/05/27AprilParticipantList.pdf (accessed Dec 22, 2005). We also thank the Patient Safety team and other WHO staff from all the departments involved at Headquarters and in the Regional Offices for their work. Didier Pittet also wishes to thank the members of the Infection Control Programme at the University of Geneva Hospitals, and Rosemary Sudan for providing editorial assistance and outstanding support.

References

1 Burke JP. Infection control. A problem for patient safety. *N Engl J Med* 2003; **348:** 651–56.

2 Boyce JM, Pittet D. Guideline for Hand Hygiene in Health-Care Settings. Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. Society for Healthcare Epidemiology of America/Association for Professionals in Infection Control/Infectious Diseases Society of America. *MMWR Morbid Mortal Wkly Rep* 2002; **51:** 1–45.

3 Pittet D, Boyce JM. Hand hygiene and patient care: pursuing the Semmelweis legacy. *Lancet Infect Dis* 2001; **5:** 9–20.

4 Pittet D, Hugonnet S, Harbarth S, et al. Effectiveness of a hospital-wide programme to improve compliance with hand-hygiene. *Lancet* 2000; **356:** 1307–12.

5 Teare EL, Cookson B, Stone S. Use alcohol hand rubs between patients: they reduce the transmission of infection. *BMJ* 2001; **323:** 411–12.

6 Pittet D, Boyce JM. Revolutionising hand hygiene in health-care settings: guidelines revisited. *Lancet Infect Dis* 2003; **3:** 269–70.

7 Jumaa, PA. Hand hygiene: simple and complex. *Int J Infect Dis* 2005; **9:** 3–14.

8 WHO. WHO Guidelines on hand hygiene in health care, executive summary. www.who.int/patientsafety/challenge/en/ (accessed Sept 12, 2005).

9 bin 'Abdul-'Aziz al-Musnad M, ed. Fatawa Islamiyah, Islamic verdicts, vol 2. London: Darussalam International Publications, 2001: 26–28.

10 Albert RK, Condie F. Hand-washing patterns in medical intensive-care units. *N Engl J Med* 1981; **304:** 1465.

11 Pittet D, Mourouga P, Perneger TV, and the members of the Infection Control Program. Compliance with handwashing in a teaching hospital. *Ann Intern Med* 1999; **130:** 126–30.

12 Kretzer EK, Larson EL. Behavioral interventions to improve infection control practices. *Am J Infect Control* 1998; **26:** 245–53.

13 Hugonnet S, Perneger TV, Pittet D. Alcohol-based handrub improves compliance with hand hygiene in intensive care units. *Arch Intern Med* 2002; **162:** 1037–43.

14 Pittet D. Improving compliance with hand hygiene in hospitals. *Infect Control Hosp Epidemiol* 2000; **21:** 381–86.

15 Pittet D. The Lowbury lecture: behaviour in infection control. *J Hosp Infect*. 2004; **58:** 1–13.

16 Stone S, Teare L, Cookson B, for the Hand Hygiene Liaison Group. Guiding hands of our teachers. *Lancet* 2001; **357:** 479–80.

17 Lankford M, Zembower T, Trick W, Hacek D, Noskin G, Peterson L. Influence of role models and hospital design on hand hygiene of health care workers. *Emerg Infect Dis* 2003; **9:** 217–23.

18 Pittet D, Simon A, Hugonnet S, Pessoa-Silva CL, Sauvan V, Perneger TV. Hand hygiene among physicians: performance, beliefs, and perceptions. *Ann Intern Med* 2004; **141:** 1–8.

19 WHO. World Alliance for Patient Safety. Global Patient Safety Challenge 2005–2006 "Clean Care is Safer Care". http://www.who.int/patientsafety/events/05/GPSC_Launch_ENGLISH_FINAL.pdf (accessed Feb 27, 2006).

20 Council on American-Islamic Relations, Washington, DC. About Islam and American Muslims. https://www.cair-net.org/default.asp?Page=aboutIslam (accessed Sept 12, 2005).

21 Maréchal B, ed. A guidebook on Islam and Muslims in the wide contemporary Europe. Louvain-la-Neuve: Academia-Bruylant, 2002.

22 Douthat R. The world in numbers: a Muslim Europe. *Atlantic* 2005; **295:** 58–59.

23 Robinson BA. How many Muslims are in the US and rest of the world. Ontario Consultants on Religious Tolerance, Toronto, Sept 18, 2002; https://www.religioustolerance.org/isl_numb.htm; accessed Sept 12, 2005.

24 30-Days Muslim World Prayer Guide. Vital statistics—growth of Islam. http://www.30days-net/statics/statgrow.htm (accessed Sept 12, 2005).

25 Henley A, Schott J. Religious beliefs and practices. In: Clarke G, ed. Culture, religion and patient care in a multi-ethnic society. London: Age Concern Books, 1999: 92–104.

26 Henley A, Schott J. Personal hygiene and grooming. In: Clarke G, ed. Culture, religion and patient care in a multi-ethnic society. London: Age Concern Books, 1999: 113–25.

27 Douglas M. Ritual uncleanness. In: Douglas M, ed. Purity and danger: an analysis of concept of pollution and taboo. London: Routledge and Kegan Paul, 1966: 8–35.

28 Katme AM. Muslim teaching gives rules for when hands must be washed. *BMJ* 1999; **319:** 520.

29 Turner P, Saeed B, Kelsey MC. Dermal absorption of isopropyl alcohol from a commercial hand rub: implications for its use in hand decontamination. *J Hosp Infect* 2004; **56:** 287–90.

30 Pittet D, Donaldson L. Clean care is safer care: a worldwide priority. *Lancet* 2005; 366:1246–47.