Disinfection of the Hands and Skin

Bibliography

- Muto, Jemigan, Ostrowsky et al. 2003 SHEA guideline for preventing nosocomial transmission of multi-drug resistant strains of S. aureus and enterococcus. Infection Control and Hospital Epidemiology 24: 362-366
- Kraus, Weber, Appali, Enders et al. Infections diseases transmissible from animals to humans. 3rd Ed. AJM Press.

General sources:

- Proceedings of the European Committee on Environmental Disinfection - various papers.
- Protocols of the European microbiological test norms in the BS-EN series.

We acknowledge the assistance of:

1. Introduction
Many microorganisms exist naturally and in reasonable harmony on healthy skin of humans and animals. Typical of the microorganisms that are “resident” on the skin and in pores and follicles are Staphylococci, micrococcoid and diptheroids. Resident microflora such as these are of low pathogenicity. Those located beneath the skin cannot be removed by washing or killed by disinfection and are commonly associated with cases of infection following surgery. Staphylococcus aureus frequently colonises the surfaces of the nostrils.

“Transient” microorganisms are those deposited on the skin from the environment, for example by touching a contaminated object. They do not usually grow on the skin and will either die, or be removed when washing or when subjected to disinfection. “Transient” floras are responsible for most cases of cross-infection whether in human or animal care facilities.

The procedures recommended here are detailed and many will say they are in conflict with the time available to the reader. However, we have not set out to create a document that advises any level of “corner cutting”, because of the risks of zoonotic events and animal patient cross infection generally, it is believed that greater attention to hygiene fundamentals must be re-stressed. Plainly, not all transient and microflora that may be present on a person’s skin will readily be developed into a risk situation if transferred to the animal patient, but that person cannot possibly know exactly what transients are on the hands in particular. For this reason, above all others, we stress the detail of hand hygiene.

Particular attention is given to some of the microorganisms in the section entitled “Zoonoses”.

2. Hand Washing and Disinfection
The hands of all people working with animals may be in frequent contact with animals or an environmental area where animals have stayed – however briefly. Given the known fact that great risks of cross infection arise from the passage of pathogens between animals and people due to inadequate hygiene measures, it is clear that hand washing is of immense importance.

Hand washing is of greater importance in highly risk units and during outbreaks of infection localised to a practice. Physical removal of transient contaminants by washing with soap and water or an alcohol preparation is a very effective means of infection control.

- Failure to wash or disinfect the hands at the right time is one of the major problems of infection control and continuing education of staff to produce sustained compliance is necessary.
- Washing or disinfecting hands thoroughly at the right time is more important than the agent used or the length of time of application. Times suggested below are not definitive and are therefore subject to debate. The importance of the necessity of hand washing is not an issue; however hand washing or disinfection may be classified as routine, hygienic or surgical.

Routine hand washing
- Routine hand washing (soap or detergent and water) is effective in removing most transient organisms and can be used as a routine procedure in places where animals are kept.
- Removing physical dirt (including food waste, blood, vomit, excretions, secretions or discharges from lesions)
- On arriving in and leaving a patient area.
- After using the toilet.
- Before handling or preparing food or medicines
- After contact with an animal care environment surface including bedding areas and fencing.

Procedure:
- Wet hands under running water and add sufficient anti-bacterial liquid soap to cupped hands to obtain a good lather.
- Wash hands for 15 –20 seconds without adding more water.
- Ensure all areas of hands are covered during the process, paying special attention to the tips of fingers and the thumbs.
- Rinse thoroughly under running water and dry with a disposable towel.

Hygienic hand disinfection
Preparations of detergent containing an antiseptic such as 4% Chlorhexidine (VETSCRUB CHX), 1.5% Triclosan (VETSCRUB Handcare) or 7.5% PVP iodine (VETSCRUB PVP), 3ml of the solution of gel (or as recommended by manufacturer) is applied upon as a permanent substitute to replace hygienic hand washing.

Procedure:
- Hands are moistened.
- 3-5ml of the VETSCRM are added to the cupped hands and applied to all areas as previously described for routine hand washing.
- Hands are rinsed and dried with a disposable towel.

Hygienic hand disinfection with alcohol formulations
Alcohol hand rubs are used as liquid or gelled products in the absence of hygienic hand disinfection. They are also used as alternatives to routine hand washing where there is no visible soiling. Alcohol gels are particularly useful for swift application between patient contacts and when on the move between risk areas generally.

Alcohol preparations are generally more effective at killing transient organisms than aqueous detergent disinfectants and can be used before aseptic procedures, in high-risk areas or after handling contaminated sites or materials. Alcohol solutions and gels are generally effective (Ethanol at 70% or isopropanol at 60% with an emollient to help prevent skin drying). However, some bacteria are resistant. In particular, and of important topical reference, Clostridium difficile, and Clostridium perfringens have proven resistant to unsupported alcohol preparations. For this reason and given that both Clostridium difficile and Clostridium perfringens are classified as Zoonoses (see below), it is important that people working with animals use alcohol gels or solutions which have been formulated with an added antiseptic known to be effective against these difficult pathogens.

One such alcohol gel is VETGEL. This preparation contains a 60% Ethanol and 15% propaanol alcohol preparation with an addition of skin emollients, an effective agent in the presence of Clostidium difficile, Clostridium perfringens and many other transient organisms. An important benefit arising from the presence of the additional antiseptic is the residual (lasting) nature of the disinfection on the skin. Another benefit is that the short exposure time prior to evaporation of unsupported alcohol preparations renders their activity susceptible in the presence of viruses. An antiseptic supported gel, like VETGEL will provide much greater likelihood of virus cleansing from skin. Note however that the use of alcohol preparations should not be relied upon as a permanent substitute to replace hygienic hand washing.

Procedure:
- 2 – 3ml of the solution of gel (or as recommended by manufacturer) is applied to the hands and rubbed to dryness covering all surfaces.
- Hands should be wet with the preparation for about 30 seconds.

Surgical hand disinfection
Surgical hand disinfection requires the removal or killing of transients and a substantial reduction in and a suppression of regrowth of the resident microflora for the duration of the surgical procedure. Gloves punctures can occur in surgery and, in this event a residual disinfectant effect assists in maintaining minimal bacterial levels.

Rings and all other jewelry are removed and nails cleaned with meticulous care then scrubbed with a sterile brush or sponge before an operating list commences. The use of a brush should be discontinued after the first operation since the risk of damage to the skin can increase the risk of colonisation with pathogenic bacteria.

Procedure:
- Hands are moistened with water and 3 – 5ml of alcohol (such greater quantity as is necessary for the complete wash) of the antiseptic detergent is applied thoroughly to the hands and forearms.
- Washing without rinsing continues for two or three minutes. All areas of the hands and forearms should be adequately covered.
5. Important Microbial Pathogens as Causative Agents of Zoonotic Infections

**Clostridium difficile** (and *Clostridium perfringens*)

- C. difficile is the major cause of antibiotic associated colitis in humans. C. difficile is present in the gut of all healthy mammals. However, over-use of antibiotics has driven an upsurge in C. difficile infections. When a patient is treated with antibiotics, gut flora (bacteria), which helps keep bad bacteria like C. difficile at bay, can be knocked out. Once C. difficile multiplies inside the gut of a weakened patient who has an inadequate “good” bacterial protection, colitis can arise which, in extreme situations will be fatal. It has been reported that cross-infection between patients is only as a result of faecal/oral route.

- C. difficile has been associated with infections in animals especially horses treated with antibiotics resulting in severe colitis. Food animals, routinely given antibiotics, are becoming susceptible also. Ironically the patient treatment for C. difficile infection is to administer two, yet more powerful antibiotics.

**Borrelia burgdorferi** (producing – VTEC 0157)

- VTEC can be passed from animals to humans. Since 1995 in the UK there have been around 175 outbreaks recorded and at least 20 directly attributable deaths. VTEC has been isolated from cattle (10% of UK herds are thought to be infected), sheep (2% of flocks), horses, farmed deer, farmed goats, geese and domestic dogs. Ingestion of infected meat products or contact with infected animals together with improper hand washing leading to faecal/oral transmission is responsible for all serious, recorded outbreaks.

**Listeria monocytogenes**

- Listeria monocytogenes is a Gram-positive, facultative intracellular bacterium, which is considered a zoonotic pathogen. The organism is predominantly transmitted to humans by the food-borne route. Recent estimates suggest that approximately 2500 human listeriosis cases occur annually in the European Community alone with a similar number in the US. Fatalities could be as high as 20% of cases. Listeriosis symptoms in humans and animals include encephalitis,
Meningitis, septicaemia and abortion. Not all strains of L. monocytogenes are thought to be pathogenic to humans. Until about 1960, L. monocytogenes was thought to be associated almost exclusively with infections in animals, and less frequently in humans. However, in subsequent years, listeriosis among the pathogenic species L. monocytogenes and L. ivanovi, began to be isolated from a variety of sources, and they are now recognised to be widely distributed in the natural environment. In addition to humans, at least 42 species of wild and domestic mammals and 17 avian species, including domestic and game fowl, can be infected. Listeria L. monocytogenes is reportedly carried in the intestinal tract of 5–10% of the human population without any apparent symptoms of disease. Listeria has also been isolated from crustaceans, fish, oysters, ticks, and flies. As with the VTEC infection, transmission is by infected foodstuffs and via contact with infected animals. Faecal/oral route is key to this transmission.

Salmonella spp
Salmonellae are widespread in humans and animals worldwide. In industrialized countries, non-typoid Salmonellae are an important cause of bacterial gastroenteritis. Although only one of about 1000 sero-types of the bacterium, Salmonella enterica subspecies enterica Typhimurium is an example of the many that can cause infections in humans and animals, Studies in The Netherlands have demonstrated non-food borne animal-to-animal and animal-to-human transmission of Salmonella enterica serovar Typhimurium. Persons in close contact with farm animals should be aware of this risk. Most human cases are food borne. However, non-food borne Salmonella infection may be transmitted during contact with animals, contaminated water, or the environment. At any one time there will be several of these many serovars of Salmonellae in the animal and avian populations. As with the common cold virus, therefore, the chances of an individual building up adequate immunity to Salmonella are remote. In the European Community, the estimated incidence of Salmonellosis is 5 cases per 1,000 inhabitants per year. In the United States, Salmonella is estimated to cause 1.4 million illnesses and 600 deaths annually.

Staphylococcus aureus and MRSA
Strains of Staphylococcus aureus live completely harmlessly on the skin and in the nose of about one third of normal healthy people. However, S. aureus can cause problems when it gets the opportunity to enter the body, with unwell people or animals being particularly susceptible. S. aureus causes abscesses and septic skin eruptions generally. It can infect wounds - both accidental wounds such as grazes and deliberate wounds such as those made for a drip or during surgery. These are called local infections. It may then spread into the body and cause a serious general infection such as bacteremia (blood poisoning). S. aureus can also cause food poisoning. MRSA stands for methicillin-resistant Staphylococcus aureus. It is a variety of S. aureus that is resistant to methicillin (a type of penicillin) and to some of the other antibiotics that are usually used to treat infections caused by S. aureus.

Animal and human strains of S. aureus are usually different and are not adapted to colonising and/or infecting their preferred host species. For example, the staphylococci that commonly infect and colonise dogs are usually from a different species, known as Staphylococcus intermedius, which differs in certain characteristics from S. aureus. Although strains of S. aureus may have a preferred host species, they may opportunistically infect other species in some circumstances.

F. A. Marian, 2003, (Clinical Infectious Diseases, vol 36, pp 26-28) described a dog and its owners suffering from persistent MRSA infection, who relapsed every time they returned home from hospital. Further investigation revealed that the dog was carrying the same strain of MRSA.

It is clear therefore, that companion animals, if colonised or infected with MRSA, will provide another potential source of the organism from which spread might occur. The advice of the United Kingdom Health Protection Agency (HPA) regarding colonised and infected people applies equally well to infected or colonised companion animals. This advice is that MRSA does not pose a risk to hospital staff (unless they are suffering from a debilitating disease) or family members of an affected patient or their close social or work contacts subject to strictest hygiene measure applying. The current view of DEFRA and the Department of Health is that animals are likely to be infected as the result of contact with colonised or infected humans.

Streptococcus
C group Streptococci are pathogenic for horses; in humans, these infections are uncommon and usually result in pharyngitis, skin and soft tissue infections, pneumonia, toxic shock-like syndrome and endocarditis. When infection is associated with bacteremia reported mortality is around 25%. Infection and especially invasive infection due to S. equi subspecies equi meningitis are very rare in humans.

Mycobacterium tuberculosis
Rare cases of tuberculosis due to Mycobacterium bovis have been described in humans who have been exposed to cattle or other infected animals. For example, L. monocytogenes was reported in the Journal of Avian Pathology in 2008 that an African grey parrot had caught M.bovis from its infected owner. One case has also been reported of tuberculosis in cattle exposed to a patient infected with M. bovis, where the strain isolated in the cattle and the patient were identical. As the patient is reported to have been exposed and infected during childhood, this seems to be the first documented case of transmission of M. bovis from animal to man and back to animal. (Int. Jnl TB and Lung Disease Vol 8 No. 7 July 2004 pp 903 – 904)

6. Conclusion
It has been suggested that the growing incidences of nosocomial infections in human health care facilities are associated with the greatly increased use of antibiotics in the last thirty years, both in clinical and in food chain applications. It is known that some bacteria have grown resistant to the use of common antibiotics and that the prevalence of infection has increased accordingly. It is also believed that this large human health care phenomenon is increasingly mirrored in all domesticated animals be they farm livestock, pets or horses consequently increasing the risks to all people who work with them.

At the same time all people working with animals have grown busier in step with the growth in the animal population through, for example, increased ownership of pets, production and management on farms, and greater popularity of horse sports. Busy veterinary practices and animal facilities can be at risk from the same pressures that trouble human healthcare establishments in that there is seldom sufficient time to attend to every task. Unwittingly short circuiting some vital hygiene areas can arise as a direct result of these pressures. Additionally, inadequate training and general knowledge has been shown to be a real issue among human health care workers. While no studies have been conducted in the veterinary, companion animal, farm and sports animal sectors, it is not unreasonable to speculate that similar trends may have arisen.

Incidents of antibiotic resistance grow and are well documented and although there has been some evidence of resistance to certain uses of standard quaternary compounds in disinfectants, official tests continue to show that correctly applied disinfection is a most efficient method of cross infection control. Official tests, showing the effectiveness or otherwise of disinfectants against specific microorganisms, are conducted under European or USA norms and are designed to prove products used independently assure that disinfectant manufacturers’ claims can be relied on. Users of disinfectants should ensure that their suppliers provide the correct EN (or USA) test certificates to prove disinfectant efficacy relevant to the type of environment in which the disinfectant will be required to work.