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Disinfection of the Hands and Skin

VETSCRUB

VETGEL

TRUSTED INFECTION CONTROL

...it is believed that greater attention to hygiene fundamentals must be re-stressed.

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, micrococci and diptheroids. Resident microfloras 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 microfloras 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 high-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 environmental surface including bedding areas and bedding.

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).

Transient organisms are more effectively removed or destroyed with a detergent-disinfectant mixture than with a soap or detergent and water wash.

Whilst a residual microbicidal effect may be had from some detergent-disinfectant mixtures, practical value of this against transient contamination acquired following disinfection is doubtful and should not be relied on as a substitute for performing a hygienic hand wash every time it is required.

Hygienic hand washing should be conducted for the following:

- Contact with contaminated secretions or excretions or other infectious materials.
- Contact with infected animals or people or their immediate surroundings.
- In high-risk units such as intensive care and isolation.
- Before aseptic procedures e.g. dressing techniques and minor invasive procedures

Procedure:

- Hands are moistened.
- 3-5ml of the VETSCRUB 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, 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% propanol alcohol preparation with an addition of skin emollients, an effective agent in the presence of *Clostridium 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 suspect 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. Glove 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 (or 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.

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- Hands and forearms are thoroughly rinsed and dried with a disposable paper or sterilised towel.

Surgical hand disinfection with alcohol preparations

The same preparations as are used for hygienic hand disinfection are used but with higher volumes and longer exposure times.

Procedure:

- Before the first procedure wash the hands with liquid soap or detergent.
- Apply 5ml alcohol to the hands and forearms.
- The solution is thoroughly rubbed into the hands and forearms.
- The solution is rubbed to dryness.
- The procedure is repeated with a second charge of 5ml of the solution.

Alcohol preparations are generally more effective at killing transient organisms than aqueous detergent disinfectants but should not be used as a permanent substitute for Hygienic Hand Washing.

Drying hands after washing

Thorough drying is important since organisms are more readily transferred from wet hands. Drying with a paper towel also removes further organisms remaining on the skin after washing and rinsing. Sterile hand towels should be used in the theatre. Roller towels are risk areas if they are not changed immediately when the roll is finished and may also transmit pathogens through their rolled surfaces if left unchanged due to infrequent use.

Gloves

Hand washing is still recommended after the removal of gloves as glove punctures can be frequent and contaminants can pass through. Glove removal technique is also important to minimise transfer risk. Although organisms are readily removed from the surfaces of gloves, washing of gloved hands is not recommended, since any contaminants that may have passed through a puncture will be left in contact with the skin.

3. Pre-operative Preparation and Disinfection of the Skin

In aiming to prevent nosocomial infections the operation site should be prepared by aseptic rules. Although, it is impossible to sterilise skin without impairing its natural protective function and interfering with wound healing, preoperative preparation reduces infection.

Hair removal

Where possible, hair should be liberally clipped around the operation site with electric clippers outside the operating theatre area. This should be done in accordance to standards laid down in respect of the particular procedure to be performed. The prepared area must be large enough to facilitate the avoidance of inadvertent wound contamination during the surgery, thus increasing the site of the disinfected field. Following clipping the area should be vacuumed to remove all trace of stray hair.

4. Zoonoses

Zoonoses are diseases or infections that can be transmitted naturally between vertebrate animals and humans and refers to any disease agent that moves into humans from an animal source.

Zoonoses are at the forefront of public awareness, not least through recently publicised problems arising from bovine spongiform encephalopathy (BSE), foot tuberculosis and avian influenza.

About 60% of known human infections are zoonotic, so it is unsurprising that nearly 75% of the diseases that have emerged over recent decades have an animal source, and are therefore classified as 'zoonotic'. A key issue with regard to human health is that many zoonotic agents cause little or no significant disease in animals and are, therefore, generally not of high priority to farmers or veterinary surgeons.

Zoonoses may be characterised as:

- Diseases of animal origin but where transmission to humans is a rare event, but once it has occurred, the cycle can be maintained through human-to-human transmission, e.g. HIV or SARS
- Diseases of animal origin in which direct or vector-borne animal-to-human transmission is the usual source of human infection, e.g. Lymes disease, leptospirosis.
- Food and water-borne diseases, the occurrence of which has in many cases changed in recent years.

Wildlife is the reservoir of a great many infections that affect domestic animals and/or man and is an important potential source of new and emerging zoonotic diseases. Changes in relationships between man, livestock and wildlife, ecological changes and changes in international trade patterns all contribute to the emergence of new diseases.

Other factors that influence the risk of becoming infected with zoonotic pathogens include changes in medicine and industry, a growing number of elderly people, greater numbers of immunocompromised individuals, shifts towards urbanisation, changes in animal production systems and changes in land use, all of which alter the dynamic between hosts, vectors and microorganisms.

5. Important Microbial Pathogens as Causative Agents of Zoonotic Infections

Clostridium difficile (and *Clostridium perfringens*)

C.diff. is the major cause of antibiotic associated colitis in humans. *C.diff.* is present in the gut of all healthy mammals. However, over-use of antibiotics has driven an upsurge in *C.diff* infections. When a patient is treated with antibiotics, good gut flora (bacteria), which helps keep bad bacteria like *C.diff* at bay, can be knocked out. Once *C.diff* 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.diff 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.diff* infection is to administer two, yet more powerful antibiotics.

Boriello *et al* (Jnl Clinical Pathology1983.36. 84-87) showed that *C.diff* was commonly transmitted by household pets, with those having a history of antibiotic treatment having enhanced likelihood of transmitting.

Campylobacter jejuni

Diarrhoea produced by this bacterium is seen primarily in younger animals, although it has been seen in animals of all ages. *C. Jejuni* can be isolated from the faeces of a high percentage of healthy farm and domestic animals. Poultry and poultry products, as well as unpasteurized milk, are major sources for human infection. Puppies and kittens are also sources for infections in humans. However, human beings may also be a source of these infectious organisms for dogs and cats. *Campylobacter* can survive for days in surface water and as long as four weeks in faeces. The duration of excretion in infected dogs and cats can be as long as four months and infected animals should be quarantined away from children during this period.

Cryptosporidia

Cryptosporidium infection begins when the cells of one of nearly a dozen species of the *Cryptosporidium* protozoan parasites are ingested. Of particular concern are the oocysts, in terms of animal cross infection. Once ingested by an animal or human, the parasites travel to the intestinal tract, where they settle into the walls of the intestines causing acute diarrhoea and vomiting. Eventually, more cells are produced and shed in massive quantities into the faeces, where they remain highly contagious.

Cryptosporidium infection can arise by touching anything that has come in contact with contaminated faeces. Methods of infection include:

- Swallowing or putting something contaminated with *Cryptosporidium* into the mouth
- Drinking water contaminated with *Cryptosporidium*
- Swimming in water contaminated with *Cryptosporidium* and accidentally swallowing some of it
- Eating uncooked food contaminated with *Cryptosporidium*
- Touching your hand to your mouth if your hand has been in contact with a contaminated surface or object
- Having close contact with other infected people or animals – especially their faeces – whereby the parasite is transmitted from hands to mouth.

Escherichia coli (verocytotoxin producing – VTEC 0157)

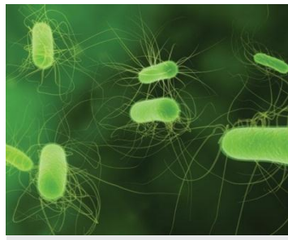
VTEC can be passed from animals to humans. Since 1995 in the UK there have been around 175 outbreaks recorded and at least 20 directly attributable deaths. VTEC has been isolated from cattle (10% of UK herds are thought to be infected), sheep (2% of flocks), horses, farmed deer, farmed goats, geese and 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. Symptoms include bloody diarrhoea, stomach cramps, vomiting and in very severe cases, impacts on liver, kidneys, heart and nervous systems. The condition is mainly self-limiting, being at its most severe in the elderly, weak and very young. Treatment with antibiotics is undertaken in severe cases but with great care not to exacerbate risks of kidney failure.

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,

Campylobacter jejuni



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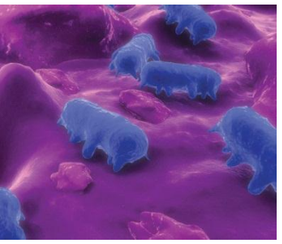

Salmonellae

Salmonellae are widespread in humans and animals worldwide.

Meningitis, septicemia 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, *listeria,* including the pathogenic species *L. monocytogenes* and *L. ivanovii,* 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 harbour *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-typhoid Salmonellae are an important cause of bacterial gastroenteritis. Although only one of about 1000 sero-types of the bacterium, *Salmonella enterica* subspecies enterica serovar 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 sero-types 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 particularly 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. Manian, 2003, (*Clinical Infectious Diseases,* vol 36, pp 26-28).described two dog owners suffering from persistent MRSA infection, who relapsed every time they returned home from hospital. Further investigation revealed that their 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.

Streptococci

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 M*ycobacterium bovis* have been described in humans who have been exposed to cattle or other infected animals. For example, it 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 contaminated 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 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 provide users with independent assurance 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.

Routinely and specifically using hand hygiene preparations like the alcohol gels and detergent/ antiseptics mentioned here will enable all who care for animals to play a major part in limiting the risks of spreading infection.

Streptococci

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