



"A curious evidence of the cleanly habits of the Japanese is seen in the chodzu-bachi, a receptacle for water at the end of the veranda near the latrine. This convenience is solely for the purpose of washing the hands... many forms chodzu-bachi are in the shape of ponderous thick blocks of stone, with a depression on the top to hold the water."

日天掃除

Nitten Soji

and the Prevention of Infections

Rafael H. Gutierrez, M.D.

and Hector Valtierra, M.A., M.S., MPH

"The cleanliness of the Japanese is one of his most commendable qualities. It is apparent in his body, in his house, in his workshop, and no less in the great carefulness and exemplary exactness with which he looks after his fields."

— Edward Morse, *Japanese Homes & Their Surroundings* (1886).

Historically, most traditional martial arts, especially in Japan and Okinawa, have included a practice known as *Nitten Soji* or ritual cleaning. While this practice may have its roots in Shinto, it has many health implications including the prevention of infections. In today's world, it is accepted that infections due to equipment and close contact are a problem in both sports and gyms. As many martial artist use mats and other safety equipment on a routine basis, there is a potential for infections. As the best cure is prevention, we looked at three types of infectious agents to find a way to minimize or prevent infection. In particular, we wish to give the three groups of training centers users; facility managers, potentially infected individuals, and un-infected participants a better understanding of the nature of infection. Sport acquired infections have

always been a problem, especially in activities where there is much close physical contact or in those using hard materials that should be regularly cleaned by participants. While most of the data is from sports such as wrestling and football, many traditional arts use similar equipment, so these data should be applicable to them as well. As many different infectious agents exist, we will address one from each major group (viral, bacterial, and fungal) for simplicity. Prevention is everyone's responsibility.

Introduction

Infections in training centers are common because of the multitude of disease sources, including new equipment and people. Exercise equipment, including mats, must be examined as possible sources of infections

because they are in immediate, repetitive close contact with people. When mats are not properly sanitized, researchers found, “potential pathogens including *S. aureus*, *Streptococcus pyogenes*, and Gram-negative rods.” This means that any exercise equipment, such as mats, where people have been sweating and rolling around, offer places where *S. aureus* and *S. pyogenes*, the bacteria that can cause impetigo, can live (Goldhammer et al., 2006).

An infectious agent is anything that can cause an infection. These include viruses, bacteria, and fungi.

A virus is an infectious particle made up of a protein coat with genetic material. Some viruses can remain infectious for more than a month after they dry (Valtierra, 2008). There are many human viruses that are found in gyms, including those that cause common colds, the flu (including HINI), cold sores (herpes simplex, type I), and warts (human papillomavirus, HPV).

Bacteria are individual cells, so are con-

sidered to be alive. Bacterial cell structure varies from human cells in many ways, so once bacterial infection occurs, antibiotic therapy is very important. The most common bacterial infection is impetigo, a skin infection characterized by blister formation. This is usually caused by *Staphylococcus aureus*, which can sometimes be MRSA (Methicillin-resistant *Staphylococcus aureus*). This can cause a life-threatening infection. In fact, this type of infection has made news as it has killed otherwise healthy athletes such as Noah Armendariz (17), who died in 2008 (Engel).

Fungal Infections are caused by organisms which share similarities to human cells. For this reason, prevention is considered superior to treatment, as the medication may harm our cells as well. There are many different diseases caused by fungal infections such as athlete’s foot, jock itch, and ringworm (*Tinea gladiatorum*). Most use human skin tissue as host cells and thus are called dermatophytes.

T. gladiatorum, also known as *Trichophytosis gladiatorum*, is extremely common in wrestling and other sports with close skin-to-skin contact during practice and competition. Based on the National Collegiate Athletic Association (NCAA) injury surveillance system, of the skin infections reported from 1991 to 2003, *Tinea* is the second most common skin infection in wrestlers (first being herpes viral infections). Lesions in wrestlers are usually found

on the head, neck and upper extremities, less often on the trunk, and occasionally on the legs. It seems that the position of wrestlers during competition and practice, and the contamination of wrestling mats with dermatophytes, are important factors that cause *T. gladiatorum* on head and trunk. Wrestlers spend much time during practice and competition in the upright, “lock-up” position, with the wrestler’s heads adjacent to each other and the cheeks in close contact. (Hedayati et al., 2007).

Infection control is everyone’s responsibility so we will examine three different categories of people; owners/operators of sports facilities, athletes with skin infections, and athletes without infection. Based on an examination of the literature, we determined that if all parties involved do their part, exercise-acquired infections can be dramatically reduced. We concluded that even if one party is unaware of a possible infection source, the chance of infection is reduced if the other two are aware and participate in prevention.

Practices all should follow:

Dirty laundry has been the cause of many diseases including lethal bacterial and viral meningitis as well as inconvenient ringworm infections. The reason has to do with damp laundry favoring the growth of bacteria (Gerba et al, 2007). To prevent the spread of disease, it is vital that all participants use clean clothing. It is highly recommended that clothes intended for gym usage be washed in hot water with detergent and chlorine bleach as it has been shown that these measures will eliminate at least 99.99% of infectious particles. Washing alone will kill at least 92% (Gerba et al., 2007).

Sport facilities managers:

Studies show that bacterial cultures from equipment sanitized twice a day did not cause disease and no pathogenic bacteria could be obtained pre or post exercise. These results indicate there is little risk of

exposure to pathogenic bacteria on exercise equipment if that equipment is sanitized at least twice a day (Goldhammer et al., 2006).

Many commercial disinfectants are sold but to prevent the broadest range of potential infections. The World Health Organization recommends the use of 0.5% chlorine solution on surfaces with sweat or blood (WHO 2006). This solution can kill most fungi and bacteria. Most mats are made of ethylene vinyl acetate, which manufacturers suggest can be washed with dilute bleach with little damage except for some discoloration.

The manager’s duty to prevent infection goes beyond cleaning the mats. They must prohibit the use of wet clothing, or used items left sitting over night, on the mats. It has been well documented in clinical textbooks, that bacteria and fungi often produce unpleasant or rancid odors. This provides one way to screen athletes. If someone smells unpleasant, there is a high probability of bacteria or fungi growing on clothes, and the possibly infectious material should not be allowed on the mat or even in the exercise area.

Another cost effective practice is to provide a screening questionnaire to, “all new or prospective players, trainers, coaches, and administrative personnel, which would be designed to collect data on recurrent skin infections and contact with individuals with skin lesions” (Archibald et al., 2008). Anyone with these conditions should be referred to a physician for further evaluation. After such evaluations, it must be the physician who decides when the infected athlete can return to exercise.

Management must be aware of the signs of inflammation and require students with infection or inflammation to sit out. The four signs of inflammation are; pain (dolor), redness (rubor), heat (calor), and swelling (tumor). An athlete with any of these symptoms should sit out until they have consulted a physician and received treatment. This will prevent the spread of infections in

the training environment.

Preventing an infection if you are not infected:

Many infections can be spread through microscopic respiratory droplets or in material suspended in the air from another person’s breath. These typically cause strep throat, common cold, or flu. Many skin infections are passed by direct contact, including herpes simplex virus, type I (cold sores), warts (HPV), ringworm, and impetigo. The good news is that there are many ways to avoid getting infections if common sense is used.

Bacteria and fungi can present many problems. As they may be free living, they can grow in your workout clothes after you have taken them off. While keeping a sweaty *keikogi* in the trunk of a car may seem like a good idea, it gives these germs the environment they need for maximum growth; both bacteria and fungi thrive in hot, moist, dark places. In essence, by allowing your wet items to remain in your car for hours, you are making your clothing a biological weapon against your school and yourself. The best prevention is to wash the clothes after each workout, and have a spare set to wear while the first is drying.

Other than washing workout clothes, it is vital to prevent disease by showering with soap after every workout. While some schools may offer shower facilities, many do not. For those that do not, it is advisable to either bring wet naps or a towel and non-rinse soap. It is also advisable not to share gloves, water bottles, towels, or toiletries and to keep up good general hygiene practices in general. (Archibald et al., 2008).

Athletes who suspect they harbor an infection:

Many wonder where they obtained their infection, or if it is a true infection or some type of skin reaction (contact dermatitis). In any case, if any of the signs of infection described above occur, the potentially infect-



Bronze fountain for use by worshippers before entering temple buildings. Nishi Honganji Temple, Kyoto, Japan.
Photo CFA staff.

ed person should avoid direct contact with others until the condition is diagnosed by a physician. Most mat-acquired infections are due either to direct contact with an infected person or from self-contamination.

Once an individual has an infection, it is vital to break the cycle of contamination to prevent spreading it to the community. There are measures that should also be taken at home. Bacteria, fungi, and viruses can live in areas that have been in contact with the infection. This means that if a person has or might have an infection, it is time to clean clothing, bedding, and towels. The ideal cleaning agent will be 0.05% chlorine in water, a solution recommended for hospital equipment and bedding (WHO 2006). As the infection clears, there will be less chance of getting it again from something in your home.

Discussion

In any martial art where contestants are in constant contact, or in arts such as kendo, where equipment is used regularly, the Shinto practice of Nitten Soji, or purification, has many great advantages. These practices, especially in the dojo, will prevent

infection and should be a part both of traditional martial arts and of any and all physical activities.

Due to the number of viral pathogens, we suggest that facility managers should clean equipment and mats using a commercial cleaning agent with anti-viral properties or a 0.5% chlorine solution in water. We also suggest that individuals with soiled or unwashed clothing not be allowed to participate on mats or in any close contact exercise. The last recommendation we make is to circulate or post a list of the cardinal signs of inflammation to remind students not to participate if they are experiencing a possible infection.

We recommend that healthy, non-infected participants, regularly wash their exercise clothing after each use or dry those clothes in bright sunlight. They should avoid keeping moist clothing in dark warm areas such as the trunk of a car or gym bags. We also recommended regular showers after close contact exercise, as well as refusal to compete with anyone in unwashed clothing

We recommend that infected or potentially infected individual avoid participation in grappling or sharing any equipment until such a time as the infection has been diag-

nosed and treated.

Infection control is everybody's obligation and many of the most common pathogens can be avoided with basic hygienic practices. If all parties participate, the risk of infections acquired from the grappling arts could be dramatically reduced at minimal cost.

Making 0.5% Chlorine solution for disinfection and cleaning usage:

Household bleach is usually about 5% chlorine so it will have to be diluted for maximum effect against infections. The process of making this solution is easy as all that is needed is to take one part bleach (5% chlorine) and nine parts water. This should be made as needed as bleach tends to lose its strength with time. ALWAYS make this in well-ventilated areas. It is important to know that this solution works better at killing microbes than a more concentrated version. This solution can be then used to clean anything in the gym. The WHO has recommended this solution for cleaning up blood and other body fluids as well as bodies. It is even effective against SARS.

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