Risk of Infection in the Use of Flotation Tanks

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ABSTRACT

Flotation tanks are lightless, soundproof chambers in which a person floats in a shallow depth of salt water. In recent years, the recreational use of flotation tanks has grown in popularity as a form of stress reduction. The risk of infection in the use of flotation tanks emphasizes the importance of practicing proper routine cleaning and disinfection.

CLASSIFICATION

Flotation tanks do not utilize hydro jet circulation, air induction bubbles, or current flow and therefore do not fall under the definition of a public pool or spa. As such, there is currently no clear protocol for the inspection of flotation tanks. Given this consideration, flotation tanks present a unique problem to local health boards. The lack of applicable legislation and differences between pool and spa classifications may create challenges when assessing associated risk. Therefore, a literature search with over 1000 studies and articles was conducted to determine the associated risk of infection for flotation tanks.

FLOTATION TANK USE AND HUMAN PATHOGEN SURVIVAL

Flotation tank water contains an extremely high concentration of Epsom salt; between 25-35%. High salt concentrations cause water to leave the cell which inhibits microbial growth and reproduction. Research conducted by the National Sanitation Foundation (NSF) analyzed the survival of various microorganisms in water collected from a floatation tank. Gram-negative bacteria are known to have a lower tolerance for high salt concentrations than gram-positive bacteria due to the thinner peptidoglycan layer of their cell wall. In addition, fungi were found to be relatively tolerant to the magnesium sulfate solution which is not surprising as it is well understood that many fungi can survive in low nutrient aquatic environments. Furthermore, an article by Criler et al. examined the effects of saturated magnesium sulfate solutions on strains of extremely halophilic (organisms that thrive in high salt concentrations) bacteria. Results demonstrated that halophilic bacteria would likely survive in magnesium sulfate solutions. Lastly, Surendran et al. assessed salt tolerance of selected cultures of Pseudomonas as well as strains of Moraxella, Vibrio and Photobacterium, among others. Results showed the maximum amount of salt tolerated by *Pseudomonas*, *Vibrio* and *Micrococcus spp*. was in the range of 10-20%. These results illustrate that a concentrated salt solution has modest microbial activity which would likely prevent the growth and replication of most pathogenic microorganisms. However, once inoculated with pathogenic microorganisms, it appears many would survive for several hours and potentially several days, resulting in possible exposure.

FLOTATION TANK USE, EXPOSURE PATHWAYS AND INFECTION

Exposure pathways for flotation tanks differ from those encountered in swimming pools or spas. Generally, flotation tank water does not come into contact with the eyes, nose, or mouth. Bathers may succumb to infection when an organism colonizes a suitable growth site in the body. These portals of entry may include the mucous membranes of the genitals, anus, or small openings in

the skin. In investigating outbreaks of whirlpool associated skin infections, *Pseudomonas aeruginosa* has been the most commonly reported. In addition, illness caused by *Staphylococcus aureus*, *Mycobacterium spp. Streptococci spp.* and *Acanthamoeba* have been reported, but less frequently. Ultimately, the degree of infectivity and pathogenicity depends on conditions of the exposure as well as host, immune system and susceptibility.

FLOTATION TANK FILTRATION AND DISINFECTION

Most filtration tanks contain recirculation systems which are typically in operation when the flotation tank is unoccupied. These recirculation systems contain filtration units designed to remove particulates from the water. Many floatation tanks also incorporate a UV disinfection unit that disinfects the water as it is re-circulated. In these cases, the risk of infection is typically low, as UV systems are highly effective at destroying microorganisms in solution. In this case, microorganisms likely to survive are those that are adhered to the sides of the chamber, thus avoiding the disinfection system. Finally, routine cleaning and disinfection will serve to minimize microorganisms on the surfaces of the chamber. To perform this type of disinfection, the chamber will have to be drained of all water, manually cleaned with a detergent, and disinfected with a suitable disinfectant. The frequency of cleaning and disinfection type will ultimately determine the level of outstanding contamination adhered to the chamber walls

CONCLUSION

The solution used in flotation tanks is inhospitable to all but the most highly salt tolerant microorganisms. While several factors reduce the ability of microorganisms to infect float tank users, outbreaks in recreational and therapeutic whirlpools appear to be directly related to inadequate operational and maintenance procedures, making routine cleaning and disinfection an important element of infection control for recreational water activities like flotation tank operation.