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Float Tanks: Review of Current Guidance and Considerations for Public Health Inspectors

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Key Messages

- The growing popularity of "floatation" and the ways in which this practice differs from the use of pools and spas have raised interesting questions in environmental public health.
- Public health agencies in the US and Canada have taken very different approaches to the classification and regulation (or non-regulation) of these facilities.
- Continuing engagement amongst environmental health practitioners, regulatory agencies, and industry may help to ensure that standards applied to float tanks are both appropriate to the activity and protective of public health.

Background

"Floating" refers to an increasingly popular health and wellness practice in which an individual floats (typically nude and in the dark) in a warm, saturated solution of magnesium sulphate ($MgSO_4$, also known as Epsom salt). Although distantly related to sensory deprivation, floatation is typically pursued as a relaxation or meditative practice in which the individual seeks to explore the "inner space" of the mind,[1] as well as to achieve certain other promised mental and physical health benefits.[2]

The "float tanks" in which this practice occurs are chambers or pods that are typically enclosed to provide a dark, quiet environment. The tanks may be built in (i.e., open basins or chambers) or fully self-contained pods, each with its own filtration and disinfection apparatus. The dense, highly buoyant solution is maintained at near body temperature (34−35°C) and is shallow (7–12"). Float tanks are usually found in dedicated commercial facilities, although they could potentially be installed in any facility that also provides access for pre- and post-float showers (e.g., hotels, recreation centres). As of 2015, there were at least 220 floatation tanks in 88 commercial centres worldwide, most of which are within Canada and the US.[3] Based on a website review,[4] we estimate that there are more than 20 float centres across Canada.

Due to the novelty of this practice, floatation tanks have raised interesting questions in environmental public health. One concern has been whether float tanks pose a health risk due to variation in disinfection methods and the potential transmission of pathogens from one user to the next. These issues have been covered in detail in the companion paper to this document entitled *Float Tanks: Considerations for Environmental Public Health*,[4] as well as a recent document from Public Health Ontario examining the literature on microbial risk and human pathogen survival in floatation tanks.[5]

Beyond disinfection, however, environmental health practitioners have questioned how to classify float tanks, how (or whether) to regulate them, and according to what standards. The principal issue is that although float tanks involve bathing, they are operated and used in a

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manner quite distinct from swimming pools or other recreational water facilities. For example, user hygiene is thought to be much better than in swimming pools due to the predominantly adult users and the requirement to shower both before and after use. Users do not submerge the face, and the stinging, bitter solution means that users will typically avoid contact with the mouth or eyes and are unlikely to float with open wounds or sores. These factors should theoretically reduce the risk of disease transmission, although this has not been objectively evaluated. Float tanks also have different operational requirements. For example, unlike pools, float tanks do not operate under continuous circulation and filtration, due to the need to provide a silent, vibration-free environment.

The objective of this paper is not to resolve the debate regarding the classification of float tanks, but to direct environmental health practitioners toward some of the existing resources and institutions that provide guidance on inspecting float tanks, and to discuss current attempts at regulation. In the final section, we also share some practical considerations for float facility inspections identified by environmental health officers working for health authorities in British Columbia, Canada.

Current guidance and float tank regulations

Several jurisdictions have developed publically available guidelines that address the safe use of float tanks and the role of public health inspectors. A few others have elected to regulate float tanks, or to specifically exclude their regulation. In this section, we discuss the efforts of various public health agencies and industry in promoting the safe use of float tanks.

In Canada, float tank guidance documents are currently only available for British Columbia and Alberta. In British Columbia, float facilities are classified and regulated as personal service establishments. The applicable guideline document covers site planning, facility design, float tank construction, facility operation, and float tank operation and maintenance.[6] They also include a sample tank data sheet, a water chemistry log, and a protocol for fecal incidents. All tanks operated within BC use chlorine or bromine as the primary disinfectant; however, the guidelines note that alternative sanitizers may be acceptable as stand-alone systems if peer-reviewed studies in support of these methods become available. Microbiological testing is not addressed.

In contrast, the province of Alberta has opted not to regulate float tanks, and Alberta's guidance document is rather intended as an educational tool for inspectors.[7] The document provides a preliminary risk assessment and advice on advantages and disadvantages of disinfection options. H_2O_2 with UV is permitted in float facilities, although operators are cautioned to ensure that UV lamps are in good working order as H_2O_2 alone would be unsuitable for use.[7] Routine microbiological testing is also recommended as a means to optimize disinfection strategy.[7]

In the US, a number of entities are actively involved in developing float tank guidance, including public health departments, the industry-led US Float Tank Association, and NSF International. The US Floatation Tank Association (www.floatation.org) is an American industry-led organization that provides a range of information resources to the float industry, as well as participates in the organization of meetings and the development of standards and best practices. The Floatation Tank Association's recommendations on tank sanitation are discussed in the companion paper to this document.[4]

Currently, NSF International has formed a working group composed of float tank manufacturers, operators, public health officials, and industry consultants, with the goal of developing evaluation criteria for float systems.[8] Although this process is on-going, a publically available component certification specification was released in January 2013.[9] This document provides detailed information on the design and testing of floatation systems for health and performance criteria, including filtration and sanitation. The NSF International criteria recommend the use of primary disinfection system using an EPA-registered chemical sanitizer (e.g., chlorine or bromine) as well as a secondary system (O_3, UV, or copper/silver ion systems). However, disinfection efficacy is tested based on the secondary system only, before and after at 3,000-hour life test. They also stipulate three volume turnovers in less than 15 minutes and a 3-log reduction (99.9%) in viable pathogens between users.[9] To date, Float Lab (Venice Beach, CA) is the only company selling an NSF-certified float tank system; this tank uses O_3 with UV (which meets pathogen-kill requirements), with an option to use a chemical disinfectant when required.[10]

US state health departments have taken differing approaches toward float tanks. At least three American jurisdictions have amended their recreational water regulations to specifically exclude float tanks, including New York,[11] Utah,[12] and North Carolina.[13] As these are regulatory documents, the public health rationale for exempting float tanks was not made public. The state of Wisconsin established float tank regulations in 2014, in which float tanks were considered a special-use pool, and later rescinded these regulations in the spring of 2015.[14] Finally, the state of Washington is also in the process of developing guidelines for float tanks that consider these devices to be special-use pools.

Very little information outside of North America was identified in our search. In Europe, guidance documents for Sweden and Germany are available online but are not available in English and will not be discussed here. In Western Australia, float tanks are classified as aquatic facilities and are subject to regulation.[15] They are required to use a halogen disinfectant with optional UV secondary disinfection; they are also required to test for four microbiological indicators (*P. aeruginosa, E.coli,* enterococci, and heterotrophic bacteria). The use of O_3 and H_2O_2 are specifically prohibited, and facilities are also required to use a "qualified technical operator" to manage water treatment. The Western Australia guidelines mention the need for client advice on hygiene and use of the tank, as well as the need for an emergency alarm button to be wired into all tanks.[15]

Considerations for floatation facility planning and inspection

Vancouver Coastal Health (VCH) has been conducting float tank inspections since the 1990s, and was consulted in the development of the BC guidelines.[6] In this section, we draw on the practical experience of environmental health officers, as well as the literature, to highlight some of the issues that may be unique to float tanks and float facilities. The VCH experience has been formalized as a floatation inspection checklist, which is available upon request from NCCEH. This insight into the VCH approach toward float tanks is intended to contribute to the evolving conversation on float tanks and it is not intended to be prescriptive or to supersede existing guidelines.

Float tank and facility design

In the planning phase, providing detailed information on the design of the tank and the facility itself (through the use of a standard tank data sheet[6] and a detailed technical schematic) can greatly facilitate the approval process. Data sheets are helpful to demonstrate that the system can achieve the required number of turnovers with a given filter capacity, and this is especially important considering the wide variety of float tank models available commercially. Sufficient filter capacity is key to minimizing debris or pathogens left by previous users. Two turnovers or 20 min of runtime are recommended in Alberta, and 3 turnovers in 15 min are recommended in BC. This interval (~15−20 min) is intended to reflect a reasonable interval between clients to allow filtration to take place; however, the evidence base for the number of turnovers is unclear. To achieve the desired number of turnovers (as an example, 3 turnovers in 15 min), the required flow rate for a 150-gallon tank would be: (150 US gal × 3 turnovers) ÷ 15 min = 30 gal/min. If the tank flow rate on the tank specification sheet is lower than this (or if the tank lacks a flowmeter such that turnovers cannot be verified), it may be necessary to extend the wait time between clients. However, even with an acceptable flow rate, debris (e.g., hair) may remain after a filtration/circulation cycle, for which reason daily scrubbing and skimming of the tank water are recommended.[6] Scrubbing may also help prevent the buildup of biofilms. Finally, care should be taken when cleaning cartridge filters as the use of a high-pressure spray can aerosolize accumulated pathogens and create a respiratory infection risk.[16] In order to control biofilm growth, reusable cartridge and bag filters should be allowed to dry completely before replacement.[17]

In addition to specific information on the tank to be installed, a scale layout may also be helpful to assess certain features of the facility design. For example, ***plumbing*** detail can help to assess whether adequate cross-connection control features are in place. ***Electrical safety*** is especially relevant for float tanks given that improper grounding was the cause of a previous float tank recall.[18] In Canada, all provinces and territories require electrical products to have a label or mark indicating that products are certified or inspected. In particular, inspectors may wish to identify ground fault interrupters for interior tank lighting and plugs in wet areas. ***Ventilation*** is also a key issue in float facilities, as the presence of multiple tanks of heated water, in addition to showering, can greatly increase humidity. As such, the facility HVAC system should be sufficient to maintain relative humidity <65%.[19] Maintaining relative humidity between 40–60% will minimize the majority of negative health effects.[20] Furthermore, because space may be limited in commercial facilities, equipment may be located in a way that might make maintenance and monitoring more difficult. Equipment specifications will identify the required clearance. Other facility design details that may be important include the ease of access to toilets and showers to help facilitate good hygiene, as well as signage with clear client instructions.

Working with saturated $MgSO_4$ solution

The use of a near-saturated $MgSO_4$ solution requires several considerations. Because the solution is extremely slippery, tanks and facilities should use slip-resistant surfaces consistent with the NSF or other applicable guidelines.[9] Because $MgSO_4$ solution invades and degrades building materials through crystal formation and swelling, impenetrable barriers or finishes such as plastic or glazing should be used.[21] Sufficient sinks and hose bibs facilitate the clean-up of $MgSO_4$ left on floors and equipment, as well as re-filling tanks during solution changes. A spray bottle of potable water should be provided to the client for eye flushing, should contact occur. Finally, all chemicals, including the salt, should be properly labelled and inaccessible to clients. The salt used should be pharmaceutical or food grade rather than a technical grade product that may introduce impurities (manganese and iron) that can discolour the tank or water.[7] MSDS sheets and personal protective equipment should be available for the safe handling of all materials for solution preparation and disinfection, as operators and inspectors may not be familiar with the products used in float tanks.

The near-saturated $MgSO_4$ solution may also affect the accuracy of chlorine, bromine, or H_2O_2 testing kits. NSF International has conducted tests to determine the accuracy and precision of several commercially available kits, and these data are freely available upon request from the NCCEH. Briefly, three products were used to measure free and total chlorine in artificial pool water and a concentrated $MgSO_4$ solution. It was shown that although all of the kits greatly underestimated the amount of free and total chlorine present in the float solution, one test strip gave measurements that were less erratic over the three chlorine concentrations tested (0.5, 2.5, and 5 ppm) compared to the other two products.[22] Because all three products underestimated chlorine levels, especially at the lowest concentration, the risk is that operators will add too much disinfectant, potentially leading to skin and eye irritation (rather than too little, leading to disinfection failure). There are no data available regarding the reliability of H_2O_2 testing methods.

Until this reliability issue has been addressed, microbiological testing on a more regular basis could be used as a means to ensure that disinfection is adequate and adjusted as necessary. However, concerns have been raised anecdotally that the float solution may also disrupt microbiological culture methods and potentially lead to false laboratory results. Given the importance of culture-based methods in microbiological testing, this issue may also require further clarification.

Operations manual and emergency response plan

To ensure safe and hygienic use of the float facility, owners should develop a detailed operations manual as well as an emergency response plan prior to opening, referencing guidance documents in their jurisdictions. In the orientation, clients should be advised not to use float tanks if under the influence of drugs or alcohol, if they have been ill with a communicable disease within the past two weeks,[7] or if they suffer from any disorder that may render them non-responsive or increase the risk of adverse events in the float tank environment. The orientation should also cover pre-float elimination, pre- and post-float showering, and the requirement to report fecal/urine/vomit incidents. Because some facilities market toward non-traditional users, such as persons with disabilities, pregnant women, and children, special consideration in terms of facility design and safety procedures should be given to these users (e.g., wheelchair accessibility, assistance entering/exiting, availability of a shower chair, and need for supervision). Finally, detailed record-keeping should be considered for cleaning, fecal incidents, water testing, humidity control, and maintenance, using (as examples) the data sheets and protocols provided by health agencies.

The emergency response plan may wish to address: 1) events that may occur within the tank (e.g., illness) or outside the tank (e.g., power outages); 2) float room doors that can be accessed from the outside; 3) consideration for how clients will be notified that an emergency is occurring (e.g., in a fire); 4) emergency lighting in float rooms; and 5) sufficient clearance within the room such that emergency personnel can assist persons in distress. Some float tank models currently provide intercom and/or alarm buttons within the tank itself, but these features (although useful) may not help non-responsive clients.

Finally, because some users may prefer to float naked, operators may be hesitant to enter the float room or open the tank when it is suspected that a person may be in distress, or in imminent danger. One solution to this may be to advise users that the operator may enter the room or knock on the tank under certain circumstances (e.g., if they do not emerge at the appointed time or an unusual noise is heard). Requiring the use of swimwear is another option to encourage operators to be more proactive in ascertaining a client's status. However, additional input of detergent and other residues from swimwear may impair water quality and require more frequent solution changes.

Knowledge Gaps and Concluding Remarks

Many jurisdictions have had to forge their own path when it comes to the regulatory inspections of float tanks. The objective of this paper is to identify and describe the most current, publically available guidelines or regulation pertaining to float tanks. These approaches vary widely in terms of how float tanks are classified and whether it is considered desirable or feasible to develop regulation specific to float tanks. It is hoped that collaborative processes, such as the NSF International working group, will serve to identify and address outstanding issues and provide consensus-based guidance. This paper further offers for consideration some of the practical experience gained by Vancouver Coastal Health over recent years. However, evidence gaps remain, particularly with regard to some of the more technical aspects of sanitation,[4] which may require additional research investment.

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Appendix A – Methods

Literature searches were conducted to identify existing guidance documents and regulation related to float tanks. Given that these documents do not derive from the academic literature, non-academic searches using Google and specific government websites (e.g., Health Canada, the US Centers for Disease Control and Prevention, Public Health England, etc.) were conducted to identify documents. Where research evidence was required, we used EBSCO, Web of Science, and Google Scholar to conduct targeted searches. Only documents in English were reviewed. In addition to database searches, documents relevant to the topic were solicited from public health and industry experts.

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