The Sanitation of Ice Making Equipment

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Fifty years ago, an article on the Sanitation of Crushed Ice was published in the Journal of the American Medical Association (*JAMA.* 1953;153(12):1101.) The authors commented that an investigation of crushed ice revealed heavy contamination with coliform organisms. They opined that the contaminants can be introduced into crushed ice in many ways, chief among which was dust from the floors of freezing rooms, trucks and restaurants as well as reusing soiled containers and through human hand contact. Of these, it was no small wonder that handling during dispensing was found to be the most prolific source.

It took another fifteen years for the Centers for Disease Control and Prevention (CDC) to issue a publication in which epidemiologists traced several outbreaks of gastrointestinal illness … including noroviruses … to the use of contaminated ice; although many of these were in hospital settings. None the less, ice is no different than food or water when viewed as a comestible. However, there are differences between ice and potentially hazardous foods. First, even though the temperature of ice is well within the "safety zone", ice machines are prone to microbial contamination. Even clean, potable water can become contaminated ice in ways that may not be readily apparent. Secondly, using a classical HACCP approach in evaluating the use of ice in the average retail food establishment will reveal that the ice manufacturing, storage, distribution and handling is quite complex because of its almost universal use in preparation, service and as a food. The analysis will reveal critical control points that we would never imagine when dealing with meat or poultry. Additionally, applying a detailed plan review to the use and traffic of ice in a typical restaurant, the patterns that are revealed would make any sanitarian cringe, particularly those that lead to multiple and inappropriate handling practices. Finally, because ice is so common and its use is constant and universal, we tend to view ice in much of the same way we do water. The assumption is that both water and ice are clean, with the latter merely being an extension of the tap.

Since the recognition of ice as a source of microbial contamination, science has given us a better understanding of biofilm production and its control. The slime formation is mold or fungus that accumulates from bacterial growth on surfaces constantly exposed to clinging water drops and warm temperatures. The biofilm may cause objectionable flavors and odors in ice. Biofilms are a collection of microorganisms, mainly bacteria, growing together in a matrix of polymers secreted by the microorganisms. Once well-developed biofilms establish themselves on surfaces, cleaning and sanitation become much more difficult. Biofilms have a shielding effect on the bacterial cells that live within them. It is well known that normal cleaning and sanitizing methods may not control or eliminate biofilms, but rather they must be physically removed or prevented from forming on surfaces. For instance, Listeria, can be 1,000 times harder to eliminate if it is living in a protective biofilm and can be a continual source of pathogenic and spoilage organisms if not completely removed.

Manufacturers of ice machines recognize the biofilm phenomenon and engineered units that minimize its formation and facilitate its removal. Clean ice, clean ice storage bins and sanitary handling practices are the key to improving the product quality; the higher the level of sanitation and hygiene, the safer is the product.

The current and traditional methods of sanitation have come under scrutiny by the manufacturers of ice machines and providers of standards for these units such as NSF International (NSF/ANSI 12–2012: Automatic Ice Making Equipment). Because of the manufacturers' initiatives, the users are given greater options of ice machine configuration, capacities and methods of delivery to minimize the inherent problems of the earlier units. These enhancements include automated cleaning cycles, light indicators when the unit needs cleaning and servicing, sensors that detect scale buildup, and, construction with materials that facilitate ease of cleaning and confer a degree of bacteriostasis on its wettable parts. In addition, the manufacturers report that seventy percent of ice-machine performance problems are associated with the water supply, through poor water quality, slow fill or insufficient water supply, and have acted accordingly to cope with these problems as well. All manufacturers now provide customers with valuable information on selection and operations.

The regulatory community has become more aware of the potential for contamination and is now asking questions as part of the inspection process regarding frequency and methods of routine sanitation, and, operations and maintenance in accordance with manufacturers' recommendations. When ice machines are inspected, it is clear that many are not cleaned and sanitized very often, if ever. Mold and slime build up inside them is quite visible. Numerous studies show that dirty, contaminated ice is more common than people think.

Although the potential for ice contamination has not been eliminated, in all, the ice machine and practices regarding its sanitation has come a long way since the 1950's.

As the ice making machine has changed, so have the laws governing ice used for human consumption; consider the following. The Federal Food Code is the standard. Chapter 1 part 1-201.10 defines ice as food. This mandates ice to the same handling and cleanliness standards as everything else in retail food, including manufacturing equipment. Ice itself falls under 40CFR141 governing drinking water purity. Ice machine cleaning is governed by Food Law 2009 Chapter 4 part 602.11 section (E) item (4a and b) which states that the machines must be "at a frequency specified by the manufacturer"; which in most instances ranges from 2 to 4 times per year, or "at a frequency necessary to preclude accumulation of soil or mold". Ice machine sanitizing is governed by Chapter 4 part 702.11 which states that the ice-contact surfaces must be sanitized after each cleaning. Annex 7 Form 2A, section 5 states: Federal law provides under the Criminal Fine Enforcement Act of 1984 for a fine up to $100,000 for a misdemeanor by a corporation or individual not resulting in death and, for misdemeanors resulting in death, a fine of up to $250,000 for individuals and $500,000 for corporations. The bottom line is that cleaning and sanitizing the ice machine on a regular basis is required by law; whereas operations and maintenance in accordance

with manufacturers' recommendations extend the optimal life of the unit and help minimize risk of contamination.

There are several common sense guidelines that should be followed to avoid liability problems associated with contaminated ice in addition to adherence with manufacturers' recommendations on cleaning and maintenance. Not mentioned in most manufacturers' instruction are the following common-sense issues.

The sanitary handling of ice. All workers who handle ice should be taught the following precautions:

- Wash hands before obtaining ice.
- Hold the ice scoop by the handle and do not touch other parts of the scoop.
- Do not handle the ice with hands, and,
- Do not return unused ice to and ice storage chest or ice machine.

The sanitation of equipment. The following practices should be part of the facility's operations.

- Keep the access doors to ice storage chests and ice machines closed except when removing ice.
- Ice scoops should be smooth and protected against contact with contaminated surfaces such as floors, access door handles, service carts and non-food contact surfaces to cite a few examples. Scoops should be kept on an uncovered stainless steel, impervious plastic, or fiberglass tray when not in use. The tray and scoop should be cleaned daily in the kitchen scullery dishwasher.
- Remove all extraneous equipment and items from around or in the ice storage chests and ice making machines, and if possible, limit access to them.
- Clean the ice storage chests on a preferably a weekly schedule, but no less than monthly.
- Consider routine microbiologic sampling of the ice and ice-contact surfaces of the machine. Although this is not necessary, it can provide guidance on cleaning frequency and methods.

As a final note, there is an excellent guideline on procedures for cleaning contaminated Ice machines developed by the U.S. Army Center for Health Promotion and Preventive Medicine, Food Sanitation and Environmental Health, DEHE. It's free for downloading on the Web.