



WATERBORNE DISEASE PREVENTION

The purpose of Health
Department regulations

In this presentation we are going to talk about waterborne disease prevention.

The purpose of Health Department regulations is to protect the health and safety of the public. For this reason, we inspect public pools to ensure that they are being properly maintained.

The main purpose of chlorine is to disinfect the water in the pool and to prevent pathogens from causing waterborne illnesses. Every year recreational waters (that includes pools, spas, and beaches) have 360 million visits from individuals in our country. Swimming is the 3rd most popular recreational activity for children. With so many people making use of pools, it is important that they are being properly maintained. Keeping the chemistry in your pool properly balanced will prevent most diseases that can occur in swimming pools.



FOUR CATEGORIES OF PATHOGENS:

- Bacteria
- Parasites
- Viruses
- Fungi



There are four categories of pathogens we will address in this lecture. Each of these categories has specific species that are able to live in a pool or spa environment (especially one that is being poorly maintained). This is an important fact that will be repeated often during this lecture; proper pool maintenance (which includes a pool with balanced chemistry) will prevent pathogens from surviving in the pool's environment. As long as the pathogens cannot survive in the pool, they can't stay around to make swimmers sick.

Chlorine in a pool must be between 1 and 10 ppm; and between 2 and 10 ppm in a spa. Both pools and spas must have a pH between 7.2-7.8. Failure to maintain this chemistry creates a health risk for swimmers AND will result in your pool being posted closed. The pool operator is responsible for maintaining the proper chemistry in the pool.



BACTERIA

- Ubiquitous
- Most are harmless or beneficial
- They can multiply in environment
- Infection results from high doses
- **Common in spas !**

Bacteria are single-celled microorganisms (usually a few micrometres in length). Bacteria are ubiquitous, which means that they are found everywhere. There are about 10 times as many bacteria cells in the human body than there are human cells (especially on the skin and in the gut).

Most of these bacteria are harmless thanks to your wonderful immune system; some bacteria are even beneficial. If you are familiar with probiotics, you know that they aid in digestion; if you like yogurt, it is bacteria that give it that tangy flavor.

Bacteria are able to multiply in the environment, not just in the human body. Bacteria can live and multiply in soil, water, even radioactive waste; pretty much anywhere.

A few bacteria species, when present in high enough doses, can cause disease. The most fatal diseases caused by bacteria are usually respiratory type illnesses; tuberculosis kills about 2 million people a year.

For pools, we know that bacteria are a very common problem for spas especially; most especially poorly maintained spas.



PARASITES

- Microscopic worms, protozoa
- Low doses can cause infection
- Extremely tough and resourceful
- **More common in pools than spas**

A parasite is an organism that lives on or in a host and gets its food from or at the expense of its host. The parasite grows, feeds, and is sheltered within the other organism. There are three main classes of parasites that can cause disease in humans; protozoa, helminthes, and ectoparasites.

For waterborne diseases, we will be focused on protozoa. Protozoa are single-celled microorganisms. They are able to multiply within the human body; a low dose of a protozoa (even just one organism) can lead to a serious infection. The two most common protozoa which cause waterborne disease are crypto and giardia, which will be discussed in greater detail.

From 2005-2006, parasites were responsible for 20 times more illnesses than bacteria. From 2007-2008, out of 105 outbreaks with confirmed labwork- 65% were caused by parasites. Giardia and crypto are estimated to cause 2 million and 300,000 infections annually; crypto being the most frequent cause of recreational water related disease outbreaks in the United States. Some of this can be attributed to the fact that they are very tough and resourceful and once they are in your pool, they can be difficult to get rid of. Parasites are more common in pools than in spas.



VIRUSES and FUNGI

- Pool-related Viral diseases:
*Hepatitis A, Norovirus,
Adenovirus*
- Pool-related fungal diseases:
*Microsporium, Trichophyton,
Candida*

Viruses are microorganisms, smaller than bacteria, which invade living cells to stay alive and then replicate themselves. The only time a virus can replicate itself is when it is inside the living cells of another organism. Viruses can infect all kinds of other organisms; animals, plants, even bacteria. Like bacteria, they can be found in just about any ecosystem in the world.

These are some waterborne diseases that can be caused by viruses. Hepatitis A is the only type of Hepatitis that can be found in pools. It can be transmitted through the feces of an infected person; it is found in the stool and blood of an infected person 15-45 days before symptoms occur and during the first week of illness. It is a contagious disease of the liver. Symptoms are fatigue, nausea, and vomiting and can last anywhere from 2-6 months.

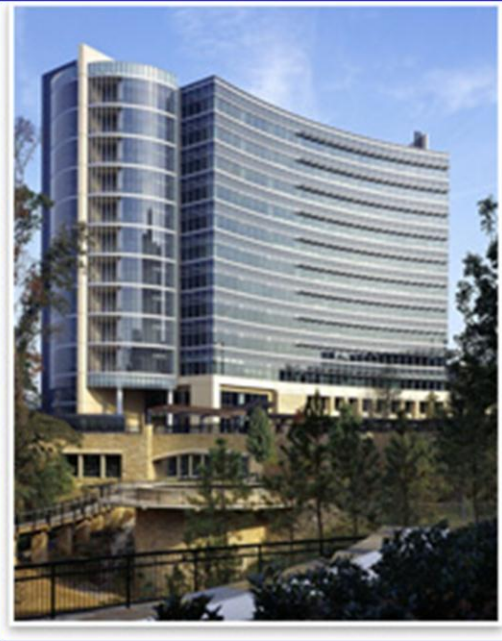
Norovirus is a very contagious virus; noroviruses are a group of viruses that are found in the stool and vomit of infected people. Norovirus can be serious for young children and older adults; it is the most common cause of acute gastroenteritis in the US. (People tend to refer to it as “food poisoning” because it is also the most common cause of foodborne disease outbreaks.) Gastroenteritis is an inflammation of the stomach or intestines (or both) that causes stomach pain, nausea, diarrhea, and vomiting.

Adenoviruses; there are over 50 types that can cause infections in humans. They are relatively resistant to chemical and physical agents and to adverse pH conditions; they can live for a long time outside of the human body. They most

commonly cause respiratory illness; once again the most susceptible will be the very young or elderly and the most likely to become seriously ill with a severe pneumonia.

A fungus is a member of the Fungi Kingdom (as opposed to animal, plant, or bacteria kingdoms). This includes yeasts, molds, and mushrooms.

Microsporium is a fungi that causes infections in the skin, hair, and nails; ringworm is commonly caused by microsporium. Tricophyton also causes skin infection; ring worm as well as other skin infections such as jock itch and athlete's foot. Candida is a genus of yeasts that can cause skin rashes such as thrush.



The Centers for Disease Control (CDC)

**A part of the U.S.
Department of
Health and Human
Services and the
primary Federal
agency for
conducting and
supporting public
health activities in
the United States.**

The Center for Disease Control (CDC) was started on July 1, 1946. The CDC works with states and other partners to provide a system of health surveillance to monitor and prevent disease outbreaks. Since 1978, the CDC, US EPA, and the Council of State of Territorial Epidemiologists have collaborated on the Waterborne Disease Outbreak Surveillance System for collecting and reporting data on waterborne disease outbreaks. The stated mission of the CDC is to create the expertise, information, and tools that people and communities need to protect their health; through health promotion, prevention of disease, injury and disability, and preparedness for new health threats.

Reported Disease Outbreaks In Commercial Pools

- **Reported outbreaks have been increasing since 1980**
 - **2005 – 2006 had 78 outbreaks**
 - **2007 – 2008 had 134 outbreaks**

Crypto Cases

- 2006: 6,479
- 2007: 11,657
- 2008: 10,500

Giardia Cases

- 2006: 19,239
- 2007: 19,794
- 2008: 19,140

**THE GREATEST NUMBER OF CASE REPORTS WERE
FOR CHILDREN AGED 1-9 YEARS OLD.**

Since the 1980s, the number of reported outbreaks has increased steadily. When we look at the numbers the CDC has reported it is important to know that these numbers only represent the people who were diagnosed by a physician with confirmed labwork, who then reported the illness to the CDC. Often, an illness occurs that is not identified (maybe the person didn't seek a doctor for treatment), investigated, or reported to the CDC.

From 2005-2006 there were 78 outbreaks. This resulted in 4,412 people becoming ill; 116 people were hospitalized and 5 people died. From 2007 to 2008 there were 134 outbreaks reported; 13,966 people became ill. This was a large increase from the previous two-year period.

Looking at some of the reported numbers of specific illnesses we can see some more increases. From 2006-2008, the number of cases of crypto increased dramatically; from 6,479 in 2006 to 11,657 in 2007, then a decrease to 10,500 in 2008. The greater number of case reports were received for children aged 1-9 years old than for any other age group.

Also during 2006 to 2008, the total number of reported cases of giardia increased slightly from 19,239 in 2006 to 19,794 in 2007 then down slightly to 19,140 in 2008. Again, the greatest number of cases was in the 1-9 year old range. Peak onsets of illness occurred annually during the early summer to early fall time of the year, when children are swimming the most.

It is important to be aware of these numbers so that it is clear that without proper pool maintenance, swimmers can and will become sick; even sick enough to require hospitalization and in a few cases illness can be severe enough to cause death.



Cryptosporidium parvum ("Crypto")

- Tiny protozoan parasite
- Oocysts (dormant form) shed by infected mammals
- Highly contagious
- Highly resistant to disinfection
- Severe gastroenteritis for 2 weeks
- Ozone kills crypto

Cryptosporidium parvum; referred to as crypto; is a tiny protozoan parasite. The oocyst, the dormant form, is what an infected person will shed; it is what can enter the next person and make him or her sick. This is a very contagious parasite; it only takes one organism to make a person sick.

Crypto is protected by a tough outer shell which helps it to resist disinfection. Crypto can actually remain active in a pool at normal operating chlorine levels for days.

Crypto causes a severe gastroenteritis in infected people. Crypto can be spread in many ways, but water is the most common way from either drinking or recreational water. Crypto is one of the most frequent causes of waterborne disease in the US.

Crypto can be killed by ultraviolet light, ozone, and chlorine dioxide; however, the most common way to get rid of crypto is to properly close and shock the pool after fecal incidents. The CDC has published guidelines for dealing with fecal incidents in pools, and those procedures will be discussed later.

CRYPTOSPORIDIUM OOCYST



This is a crypto oocyst; the dormant form of crypto. After one of these oocysts are ingested (it does only take one!) there is an incubation period of up to 7 days before symptoms appear. The parasite will burrow into the walls of the small intestine and begin its life cycle, creating more oocysts that will be shed in the feces. Symptoms of the illness include stomach cramps and pain, watery diarrhea, dehydration, nausea, vomiting, and fever. A healthy person will usually remain sick for 1-2 weeks with symptoms recurring for up to 30 days.

Usually crypto affects just the small intestine, but the infection can also affect other areas of the digestive tract or the respiratory tract. People with compromised immune systems can have more severe, even life threatening illness. Crypto can cause an opportunistic infection in HIV patients who can experience that; a very suppressed immune system can result in cholangitis or pancreatitis.

Class-action lawsuit filed over illnesses at water playground

By BEN DOBBIN
Associated Press Writer
September 13, 2005, 1:34 PM EDT

ROCHESTER, N.Y. -- The agency that oversees New York's parks and recreation sites was the target of a class-action lawsuit filed Tuesday on behalf of an estimated 3,800 people who developed gastrointestinal illnesses after visiting a popular water park in central New York..... "thousands of other people suffered the same fate because the (agency) failed to ensure the water was safe," said attorney William Marler.



This is a report of a waterborne disease outbreak which occurred in 2005 in Rochester, New York. In this case a class-action lawsuit was filed after an estimated 3,800 people became ill after visiting a water park. Thousands of people became seriously ill because the agency failed to ensure that the water was safe for swimmers.

Giardia lamblia

- Tiny protozoan parasite
- Cysts shed by infected mammals
- Asymptomatic carriers common!
- Highly contagious and resistant
- Severe gastroenteritis 4-6 weeks

Giardia lamblia is a microscopic parasite that causes the diarrheal illness known as giardiasis. It is found in the surfaces of soil, food, or water that has been contaminated with feces of infected people or animals. *Giardia*, like *crypto*, is protected by a tough outer shell that allows it to survive in harsh conditions for long periods of time. It is not as resistant to chlorine as *crypto*. *Giardia* can be destroyed by 1ppm of chlorine with a pH of 7.5 in just 45 minutes.

Giardia cysts are shed by infected mammals; they are the resistant form of the parasite and are responsible for transmitting the disease. The cysts are ingested through contaminated food or water. The cysts are hardy enough to survive in cold water for several months. Once ingested, the cysts settle into your small intestine where they trophozoites, two from each cyst; they travel down into the colon and are then passed out in the stool in an infectious stage.

Asymptomatic carriers are common; you could carry this parasite around without knowing it, because you show no symptoms. The illness is similar to *crypto* but easier to treat. Symptoms last 4-6 weeks and include diarrhea, gas, stomach cramps, and dehydration. In a small child, severe giardiasis can delay physical and mental growth, slow development, and lead to malnutrition.



Escherichia coli **(E.coli)**

- Hundreds of strains of this bacteria
- E.coli O157:H7 produces a toxin
- Gastroenteritis can be mild or fatal
- Rare event in pools
- Shigella is a bacteria similar to E.coli

E.coli (escherichia coli) is just one strain of hundreds. This one, O157:H7, produces a toxin that can cause severe illness. Symptoms include severe stomach cramps, diarrhea, and vomiting. The very young or very elderly are more likely to develop severe illness. E. coli is more of a rare event in pools but it can happen.

Shigella is similar to E. coli. It is present in the stool of a sick person for up to two weeks. Young children aged 2-4 are most likely to become sick. Illness includes diarrhea, fever, and stomach cramps. These bacteria are easily controlled in a pool where proper chlorine levels are being maintained.



Salmonella

- A bacteria similar to E.coli
- People/animal can be lifelong carriers
- Animals rarely show illness
 - birds, reptiles, rodents, raccoons



Salmonella is another bacteria and is similar to E.coli. The disease it causes is salmonellosis. Most people who are infected develop symptoms 12-72 hours after infection. Symptoms include fever, diarrhea, and abdominal pain. The illness lasts 4-7 days and most people can recover without treatment. In some people the diarrhea can be severe enough to lead to hospitalization. Salmonella can spread from the intestines into the blood stream then to other body sites, leading to death. The elderly, infants, and those with suppressed immune systems are most likely to have such serious symptoms occur. Children are most likely to become sick; the rate of infections in children less than 5 years old is higher than the rate in all other persons.

It is possible for people and animals to be lifelong carriers of salmonella, and animals will rarely show any sign of the illness. Many species of animals can carry salmonella including birds, reptiles, rodents, and raccoons.



SPA REALITY

- Gallon for gallon, four people sitting in a 1000 gallon spa is the same as having 80 people in a 20,000 pool.
- Due to the hot water and pressure washer action of the jets, the average person releases a pint of sweat and 300 MILLION bacteria into the water in a 30 minute spa soak
- If chlorine is low, these bacteria can double their population every 20 minutes

Before speaking about waterborne diseases that are found more often in spas, it is good to have a reality check and realize just what a spa entails. Most spas are somewhere around the 1,000 gallon soze range. If four people are sitting in a spa that size, it is comparable to having as many as 80 people in a 20,000 gallon pool.

A spa can be heated up to 104 degrees and most people like to use the therapy jets while they sit there. Between the hot water and the water pressure, an average person will release a pint of sweat which can contain up to 300 million bacteria after 30 minutes.

With a low chlorine level, the bacteria can double every 20 minutes. This means that if a spa is poorly maintained, the environment is perfect for bacteria for thrive and cause waterborne disease.

As well as maintaining the proper chemistry (which for a spa is 2-10 ppm chlorine and 7.2-7.8 pH) it is a good idea to regularly drain the spa, scrub the walls, and refill with fresh water. This helps with the buildup that occurs from the oils, lotions, and dirt that people leave behind when they exit the spa.



Pseudomonas aeruginosa

- The most frequently isolated bacteria
- Found in soil and on skin
- Heat-loving and resistant
- Skin, ear, eye, bladder, respiratory
- *Staph* and *Strep* bacteria are similar

Pseudomonas aeruginosa is a heat loving bacteria; it grows in warm water and so it is most commonly associated with spas. It causes what it is usually called “hot tub rash”. Common infections include dermatitis as well as infection of hair follicles. That type of infection takes the form of pus-filled blisters which usually occur under bathing suits.

This bacteria can also cause infections of the outer ear canal (known as swimmer’s ear). The ear becomes very painful and inflamed and drains pus; this tends to happen to children the most. When a *pseudomonas* infection occurs in major organs such as the lungs, kidneys, or bladder, the results can be fatal.



Legionella pneumophila

- A heat-loving bacteria (140 degrees)
- Found in lakes, streams, rivers
- Also enters through water system
- Rapidly progressive pneumonia
- Pontiac fever is the less severe form

Legionella pneumophila causes a very severe form of pneumonia; it can exist in poorly maintained pools and spas and is transmitted in the misting of water. Spa therapy jets and water fountain play areas create the type of environment where legionella can be found. This is a very serious illness that can result in death. Symptoms usually appear 2-14 days after exposure. Signs of legionnaire's disease include cough, shortness of breath, high fever, muscle aches and headaches. A rapidly progressive pneumonia can occur, leading to lung failure and death. Those most susceptible are the elderly, people who smoke, those with existing chronic lung conditions, and those with compromised immune systems.

Each year between 8,000 and 18,000 people in the US are hospitalized with legionnaire's disease. It can cause death in 5-30% of cases; healthy people can usually recover with antibiotics.

Pontiac fever is a less severe form. It has flu-like symptoms lasting 2-5 days with fever, headache, and muscle aches, but no pneumonia. Symptoms will usually go away on their own.



CDC-MMWR

January 31, 1997 / 46(04);83-86

Legionnaires Disease Associated with a Whirlpool Spa Display -- Virginia, September-October, 1996

Of the 23 case-patients, 22 were hospitalized, and two died.

In this case, a spa that was only intended for display caused an outbreak of Legionnaires Disease. A spa was set up at a home improvement store. People walking by the display were exposed to the bacteria that were present in the misting of the water. Of the 23 case-patients, 22 were hospitalized and of those, two people died. So this bacteria does cause a potentially life threatening illness that can be present in any spa that isn't being properly maintained.



WSBTV.com

The Orange County, Fla. Quality Inn closing after an outbreak of Legionnaires' disease.

Legionnaire's Disease Shuts Down Orlando Hotel

Friday, March 14, 2008 – ORLANDO, Fla

An Orange County, Florida hotel will close after an outbreak of Legionnaires' disease, WSB-TV Channel 2 learned Friday.

The Orange County Health Department says five laboratory-confirmed cases of Legionnaires' disease are linked to the Quality Inn near Universal Studios. The hotel is in the International Drive tourist corridor, popular with tourists visiting nearby theme parks.

Officials believe the outbreak may have started in the hotel's hot tub, which may not have been properly chlorinated.

One more real life example of an outbreak of Legionnaire's disease... In 2008 a hotel located near Universal Studios had to be closed down due to Legionnaire's disease. Officials believed that the outbreak began in the hotel's spa, which was probably not properly chlorinated.



Baylisascaris procyonis

- A roundworm; its eggs are found in raccoon feces
- Not killed by chlorine
- Causes a severe disease that affects the nervous system or eyes



Raccoons can be a problem for pools, especially when they leave behind the signs that they were there; the feces in the pool gutters or on the deck. Those feces can actually carry a certain roundworm's eggs that can infect humans.

These roundworm eggs are not killed by chlorine. If you have raccoon feces in your pool, it is possible to have it tested for the presence of the roundworm eggs. To do this safely, use gloves double bag the feces, throw away the gloves and wash your hands with soap and water and have a lab test the feces for you.

If lab testing isn't feasible for you, then the only safe way to proceed is by assuming that the roundworm eggs are present. The CDC gives a couple options for cleaning the pool under these circumstances.

Close the pool; allow it to filter for 24 hours; replace the filters if possible, again using gloves while handling the filters and washing your hands with soap and water afterwards.

Backwash filters when possible; drain and hose down the pool, and replace filters.

The best option is to prevent the raccoons from getting into your pool. Check fences, keep the gates closed, and don't leave trash near the pool area where the raccoons can get to it.

Human infections are rare but can be very serious, affecting the nervous system and eyes. Symptoms of infection may take a week to develop and can

include nausea, tiredness, liver enlargement, loss of coordination, lack of attention to people and surroundings, loss of muscle control, blindness, and coma.



According to the CDC.....

“The frequent reporting of low chlorine levels in outbreaks indicates a disturbing lack of awareness among pool operators concerning the role of chlorine and pH controls as the major protective barrier against infectious disease transmission in pools.”

“...In disease outbreaks traced back to pools and spas, poor maintenance was the most common cause.”

Once again, the CDC tracks the number of outbreaks that occur throughout the country. According to the CDC, the frequent reporting of low chlorine levels in outbreaks indicates a disturbing lack of awareness among pool operators concerning the role of chlorine and pH controls as the major protective barrier against infectious disease transmission in pools.

In disease outbreaks traced back to pools and spas, poor maintenance was the most common cause. The purpose of the health department is to protect the health of the public, and through this class we hope to educate the pool operators in our county so they are not unaware of the importance of proper pool maintenance. Proper pool maintenance can prevent outbreaks of waterborne disease; all of those sick people, those thousands reported every year, could have been prevented.

Proper maintenance protects you *and* the public!

- Maintain the following at all times:
 - proper water chemistry
 - required flow rate, clean filters
 - all equipment in good repair
- Drain and freshen spas routinely
- Shock pools after fecal accidents
- A maintenance log must be kept !



Proper maintenance of the pool protects you, the pool operator, as well as the public. It is the responsibility of the pool operator to maintain the proper water chemistry; in a pool the chlorine must be 1-10 ppm, in a spa the chlorine must be 2-10 ppm; in both pools and spas the pH must be between 7.2-7.8. The proper flow rate must be maintained within ten percent; filters must be cleaned regularly. All the equipment must be in good repair, from the recirculation pump to the chemical feeders.

As I mentioned before, spas should be drained and freshened routinely. Once a month would be excellent, depending on how high your bather load is.

Pools must be shocked after fecal incidents.

A maintenance log must be kept by the pool operator.



Maintenance Log

- A daily log is required by the State of Florida and is the responsibility of the pool service person
- Record Chlorine, pH and flow

SARASOTA COUNTY HEALTH DEPARTMENT
MONTHLY SWIMMING POOL REPORT

NAME OF POOL: _____ MONTH: _____ YEAR: _____

OPERATOR: _____

DAY	Cl	pH	FLOW	STAR	ALK.	Ca	FILTERS			CLARITY	COMMENTS
							IN	OUT	CLEANED		
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2											
3											
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The daily maintenance log is required by state code and is the responsibility of the pool operator. The log should be properly labeled with the month and the year and should include, at a minimum, the chlorine, pH, and flow rate. The more information you provide, the better you protect yourself. If someone were to become injured or ill after using the pool, a lawyer would request to see the pool maintenance logs. So it is important that the logs are legible and kept dry.

UNACCEPTABLE MAINTENANCE LOGS



This is an example of unacceptable maintenance logs. Logs in this condition would be written as a violation. When logs are being kept in a vak pak or an equipment area without a roof, please find a way to keep your logs dry. A plastic container is an easy and inexpensive way to keep your logs dry and legible.

**Keep our seniors and kids
safe!**



**Many have weaker immune
systems and are at high risk for
severe infection**

One last note that the people most susceptible to illness and most likely to become seriously ill are the very young and very old. Those age groups happen to frequent pools quite often, and it is up to the pool operator to ensure that the pool is being properly maintained.

G1



Wildlife

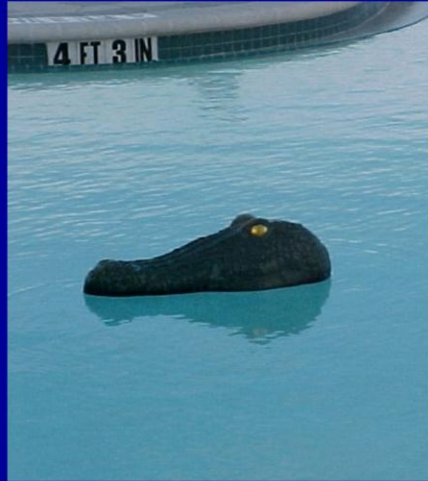


Florida has a large wild and domestic animal population that can carry and transmit many diseases to swimming pool areas.



It is important to be mindful of the population of wild and domestic animals that may pay your pool a visit. These animals can be carrying diseases with them and will leave their bacteria behind to make swimmers sick if the pool is not being properly chlorinated.

**CREATIVE WAYS TO
DISCOURAGE MESSY
BIRDS**



These images just show a couple of ways to discourage birds from getting into the pool.

Poop happens...

The Center for Disease Control website contains the instructions on how to respond to feces, vomit, blood and other body fluids in swimming pools.

<http://www.cdc.gov/healthywater/swimming/>

Fecal incidents are an unfortunate event in a pool, but then they happen they must be properly disinfected. The CDC has a set of guidelines for dealing with feces, vomit, blood, and other bodily fluids. Please visit the CDC website to save a copy of the guidelines for your records.



Pool Disinfection Times

Figure 1 *Giardia* Inactivation Time for a Formed-Stool Fecal Incident

Free Chlorine Level (ppm)	Disinfection Time*
1.0	45 minutes
2.0	25 minutes
3.0	19 minutes

* These closure times are based on 99.9% inactivation of *Giardia* cysts by chlorine at pH 7.5 or less and a temperature of 77°F (25°C) or higher. The closure times were derived from the U.S. Environmental Protection Agency (EPA) Disinfection Profiling and Benchmarking Guidance Manual. These closure times do not take into account "dead spots" and other areas of poor pool water mixing.

Figure 2 *Crypto* Inactivation Time for a Diarrheal Fecal Incident

Free Chlorine Level (ppm)	Disinfection Time*†
10	1,530 minutes (25.5 hours)
20	765 minutes (12.75 hours)
40	383 minutes (6.5 hours)

* Shields JM, Hill VR, Arrowood MJ, Beach MJ. Inactivation of *Cryptosporidium parvum* under chlorinated recreational water conditions. J Water Health 2008;6(4):513-20.

† At pH 7.5 or less and a temperature of 77°F (25°C) or higher.

When a fecal incident occurs, the amount of chlorination needed depends on the type of fecal incident.

1 ppm of chlorine will kill E.coli in less than 1 minute; Hepatitis A in 16 minutes; giardia in 45 minutes; and crypto in 15,300 minutes, about 10 and a half days.

A formed stool incident poses less of a health risk than a loose one. With a loose incident, you must assume and treat the pool as though it is contaminated by crypto. In such a case the pool must be closed down and hyperchlorinated (remember, crypto is difficult to kill). If you look at this chart, it would take over a day to destroy crypto at a 10ppm chlorine. A 40 ppm chlorine will do the trick in 6 and half hours but then of course you have to bring the chlorine level back down to 1-10 ppm before the pool can be opened.

Vomit can contain norovirus, which is very contagious; but it can be treated the same as a formed fecal incident. Blood in the pool does not require a pool closure; any germs found in blood are quickly killed by the chlorine in the water.



Questions?



Please call our office at (941)
861-6675.

If you have any questions about anything that was discussed, please give us a call.