

# Protecting Pool Workers from Chemical Injuries & Illnesses



california  
work-related asthma  
prevention program



AUGUST 2018



# PROTECTING POOL WORKERS FROM CHEMICAL INJURIES & ILLNESSES

**S**wimming pool chemicals help keep pools clean and safe. However, the chemicals used to clean and disinfect pools can be hazardous. According to the Centers for Disease Control and Prevention, pool chemical injuries account for as many as 5,200 emergency room visits each year in the U.S.

The California Department of Public Health has tracked cases of pool chemical-related worker illness and injury and has found that workers in many different swimming pool jobs have been injured or become ill while on the job. Common problems include eye damage, difficulty breathing such as from asthma, and skin burns. These injuries can occur among lifeguards, swimming

instructors, maintenance employees, pool supply retail and delivery workers, janitors, and others who work near pools. Workers handle chemicals by performing tasks such as adding chemicals to the pool or to chemical feeder systems, transporting chemicals, and cleaning up after spills. Pool chemicals and disinfection byproducts can also be found in the air near a pool, especially if the pool is indoors.

Pool operators and managers can use this guide to learn how to prevent pool chemical injuries and illnesses.



## WHY ARE SWIMMING POOL CHEMICALS USED?

Swimming pool chemicals kill germs that cause illness, prevent the growth of algae, protect pool equipment, and keep the water clean and comfortable for swimming. These chemicals are also used in hot tubs, water parks, and other recreational water sites. For California regulations regarding the requirement to disinfect public pools see Additional Resources, on page 10.

## WHAT TYPES OF CHEMICALS ARE USED IN SWIMMING POOLS?

- **Disinfectants** prevent unwanted growth of bacteria and algae in the water. Examples are sodium hypochlorite (bleach), bromine, and chlorine gas.
- **Alkalinity and pH adjusters** maintain a pH of 7.4 to 7.6, which is comfortable to the eyes, and provide for the efficient use of free chlorine. Examples are caustic soda (sodium hydroxide), muriatic acid (hydrochloric acid), and sodium bicarbonate.
- **Calcium hardness adjusters** maintain “hardness” of the pool water to prevent pool wall erosion and scale formation. Examples are calcium chloride and trisodium phosphate.
- **Others:** Include filter aids and chlorine stabilizers. An example is cyanuric acid.





Photo: Lifeguard records results of pool chemical testing.

## HOW DO POOL CHEMICALS GET INTO YOUR BODY AND CAUSE HARM?

### INHALATION

People can get sick from breathing:

- Pool chemical vapors and gases
- Toxic gases that form when incompatible pool chemicals are mixed
- Vapors from the disinfection byproducts that form in the water when pool chemicals react with sweat, urine, skin cells, lotions, and soap residues from swimmers

**Breathing in Vapors or Gases May Cause:** Cough, runny nose, sore throat, wheezing, chest tightness, shortness of breath, asthma, headache, and nausea. At very high concentrations, the lungs can be severely damaged and rarely death can occur.

### CASE STUDY

#### *Chlorine Release Sends Children to the Emergency Room*

Thirty people, including lifeguards and children, were exposed to chlorine at a public pool after the pump that added the pool chemicals ran dry, malfunctioned, and added a sudden surge of sodium hypochlorite (bleach) to the pool. Victims experienced shortness of breath, burning eyes, and throat irritation. Seventeen children were treated at the hospital and one child was hospitalized overnight.

### CASE STUDY

#### *Improper Chemical Handling Sends Lifeguard to the Hospital*

A lifeguard, who was not trained to handle pool chemicals, inappropriately added sodium hypochlorite to an automatic feeder containing muriatic acid. This resulted in the formation of chlorine gas. She began coughing and experienced shortness of breath, severe headache, and nausea. She was hospitalized for a day and was not able to return to work until two weeks later.

## CASE STUDY

### *Poor Ventilation in Pool Area Worsens Lifeguard's Asthma*

A lifeguard with asthma was exposed to pool chemicals and disinfection byproducts at an indoor pool. One day when the pool area was poorly ventilated, she had an asthma attack that sent her to the emergency room. Since then, she has had to use her asthma medications daily. Before this incident, she used them only occasionally.

## CASE STUDY

### *A Single Overexposure Can Lead to Lifelong Asthma*

A worker at a gym poured muriatic acid into a sodium hypochlorite feeder by mistake and created a cloud of chlorine gas. His manager entered the area to investigate the strong odor. The manager breathed in the gas and immediately began coughing and wheezing. He now has asthma, which he has to manage with several medications.

## **POOL CHEMICALS AND WORK-RELATED ASTHMA**

Pool chemicals and the disinfection byproducts that form when pool chlorine mixes with swimmers' sweat, urine, and other waste can cause asthma in people who work around pools, hot tubs, and water parks. They can also trigger asthma symptoms in workers who already have the illness and in pool users.

Examples of pool chemicals that can cause asthma are disinfectants such as bleach (sodium hypochlorite) and chlorine gas, and pH adjusters such as muriatic acid (hydrochloric acid). There are over 100 different disinfection byproducts that can form in swimming pools; one example is trichloramine, which can also cause asthma. These byproducts are measured as "combined chlorine."

Asthma is considered work-related when it is caused or made worse by something at work, such as exposure to pool chemicals in an unventilated indoor pool area. Symptoms can start right after an employee breathes in the pool chemicals or disinfection byproducts, or they can start hours after leaving work. An employee experiencing ongoing or periodic wheezing, chest tightness, cough, shortness of breath, or difficulty breathing, needs to see a doctor and should tell the doctor if exposures at work seem to increase or cause the symptoms.

For more information about Pool Chemicals and Work-Related Asthma go to: ([www.cdph.ca.gov/wrappfactsheets](http://www.cdph.ca.gov/wrappfactsheets)).



Photo: Swimming instructor working with a student.



Photo: Pool chemical label showing that product is corrosive.

## SKIN AND EYE CONTACT

Pool chemicals can get on the skin or in the eyes through splashes or spills, hand-to-eye contact from contaminated hands, or when removing wet gloves or clothing. Gases or vapors in the air can also harm the eyes.

**Chemicals on Skin or in Eyes May Cause** itching, burning, and/or redness.

## SWALLOWING (INGESTION)

Pool chemicals can be inadvertently swallowed, for example when bottles containing chemicals are mistaken for something else.

**Swallowing Pool Chemicals May Cause** burns to the mouth, throat, and stomach, stomach cramps, nausea, vomiting, and even death.

### CASE STUDY

#### *Chemical Splash Leads to Eye and Skin Burns*

A pool maintenance worker dissolved a chlorine tablet in a container of water. He then inadvertently splashed the concentrated solution on himself. He was not wearing eye or face protection and as a result had painful chemical burns to his eyes and face.

### CASE STUDY

#### *Drinking Muriatic Acid Leads to Hospitalization*

A worker thought a bottle containing acid was lemonade and drank out of it. He immediately had a burning sensation in his throat, stomach cramping, and vomiting. He was hospitalized for five days.

# DESIGNING POOL AND CHEMICAL STORAGE AREAS

## Limit Access

- Secure the chemical storage area and pump room
- Provide locking mechanisms for the chemical controller to prevent tampering

## Prevent Incidents by Installing Safety Checks

- Install a device that automatically deactivates the chlorine and acid feed pumps when there is no flow in the recirculation system
- Install an alarm to alert staff if the recirculation pump shuts down
- Install check valves in chemical feed lines, which will allow chemicals to flow in only one direction and stop suction events from causing overfeeding of chemicals

## Keep Incidents from Becoming Disasters

- Include secondary containment, such as concrete berms or spill containment platforms or trays, to contain pool chemical leaks or spills and prevent them from mixing with any other substances
- Provide aquatics staff and patrons with working and easily accessible safety showers, eye wash stations, and other appropriate chemical safety equipment
- Install appropriate fire suppression equipment

# CHEMICAL STORAGE

## Prevent Confusion by Keeping Supplies Organized

- Keep the chemical storage area free from clutter
- Provide adequate lighting so that workers can read labels
- Store chemicals only in original, manufacturer-labeled containers
- Label containers that are used to dilute or

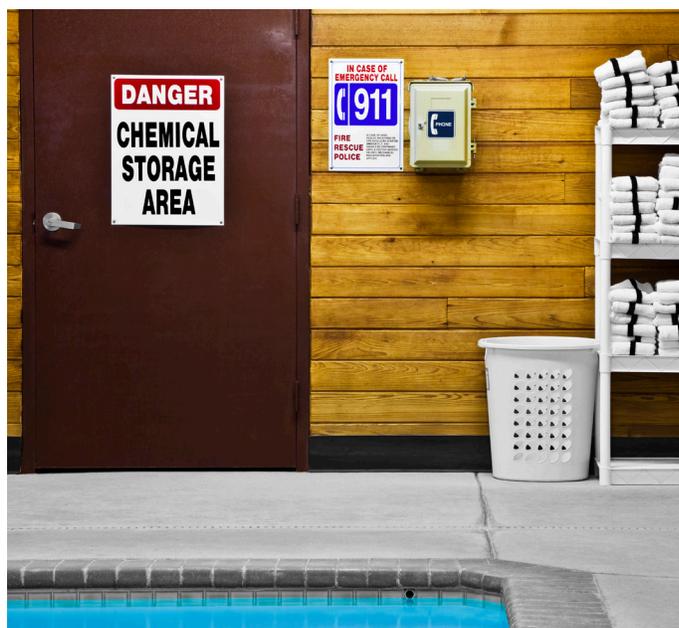


Photo: Well-marked chemical storage room.

transfer chemicals to avoid ingestion or improper mixing. Never use drink containers to hold pool chemicals

- Do not allow employees to store or consume food or beverages near chemicals
- Limit stored supplies of chemicals by having frequent, regular deliveries for amounts needed on-hand

## Protect Pool Chemicals from Heat and Flames

- Store in a cool, dry place away from sunlight, smoking areas, flammable materials, and fuel-powered equipment

## Protect Chemicals from Mixing Together or with Other Substances

- Store each pool chemical separately, with only identical chemicals stacked above or below each other
- Clean the storage area, pump room, pool deck, chemical safety equipment, and surrounding areas only with chemicals that are compatible with pool chemicals
- Protect stored pool chemicals from getting wet

# PREVENTING POOL CHEMICAL INJURIES

## HAVE CLEAR SAFETY POLICIES

- Have written policies about chemical storage and handling, maintenance, and repair
- Ensure easy access to up-to-date Safety Data Sheets (SDS) and product labels where pool chemicals are stored or used
- Only allow staff who have been trained in safe chemical storage and handling practices to order, receive, stock, or otherwise handle pool chemicals
- Make sure all workers understand what their duties are with respect to chemical handling, storage, and spill response
- Make sure all workers understand how to use emergency showers and eyewashes and how to obtain medical treatment
- Keep track of which pool chemicals are used, when, and in what quantities
- Ensure easy access to appropriate personal protective equipment in all locations where pool chemicals are stored or used. Require that appropriate personal protective equipment be used each time when working with pool chemicals.
- Close the pool when chemicals are added and when the recirculation system is not running
- Close or evacuate the pool when turning on or restarting the pool pump

## PERSONAL PROTECTIVE EQUIPMENT

Employees should wear personal protective equipment (PPE) according to Safety Data Sheet recommendations, such as chemical splash goggles, gloves, face shield, protective clothing, rubber boots or shoes, respirator.



## PROVIDE POOL CHEMICAL TRAINING FOR AQUATIC FACILITY STAFF

- Include pool chemical hazards in your workplace Injury and Illness Prevention Plan and Hazard Communication Training
- Train all staff in pool chemical safety and emergency response plan procedures, including emergency decontamination procedures and how to obtain medical treatment. This includes seasonal workers who work for only a few weeks or months a year.
- Train all workers who handle chemicals on how to follow product labels, safely use chemicals, and wear personal protective equipment. Ensure that workers always follow safe practices.
- Include all of the following topics in pool operator training:
  - Impact of each pool chemical on water chemistry and on the monitoring computer readout or manual testing numbers
  - Layout of a safe chemical storage area and pump room
  - Calculation of the appropriate amount of pool chemicals needed, and following label requirements
  - Safe chemical storage and handling practices
  - The proper use of personal protective equipment
  - Basics of preventive and safe maintenance of equipment
  - First aid for pool chemical exposures
  - Who to call in case of emergency

## MINIMIZE WORKER EXPOSURES THAT CAUSE OR WORSEN ASTHMA

- Train workers about work-related asthma, including the causes and symptoms
- Institute pool rules that decrease the amount of disinfectants needed and prevent the formation of disinfection byproducts. For example, encourage bathroom use before swimming and require swimmers to shower before entering the pool.
- Ensure adequate ventilation in the pool, chemical storage, and pump room areas
- Minimize the need for pool chemicals by using the most efficient treatment technology, filtration, and oxidation possible
- Follow product labels to ensure correct amounts of pool chemicals are used. Require regular testing and keep chemicals and pH at recommended levels.
- Keep the level of combined chlorine (which includes trichloramine) to below the maximum limits recommended by your local health agency
- Keep workers away during breakpoint chlorination (“shocking” the pool). Maintain maximum fresh (outdoor) air ventilation in indoor pools during and after addition of shock chemicals. Fans at the pool surface can help clear out the gases that form.
- Use supplemental or alternative treatment methods such as ultraviolet (UV) light or salt water pools. (Note: Salt water pool systems still generate chlorine, but require less use of bulk concentrated chemicals.) UV light will help keep combined chlorine levels low.

## DEVELOP AN EMERGENCY RESPONSE PLAN

- Develop an Emergency Response Plan that includes:
  - Spill-cleanup procedures
  - Procedures to follow in case of exposures
  - Clear chain of command and alternates with contact information
  - Evacuation plan
  - Communication plan for alerting patrons, staff, and emergency responders
- Have a phone with updated emergency numbers near the chemical storage area, pump room, and pool area
- Hold regular emergency drills with a spill or chemical release as the scenario



Photo: Lifeguard sits in lifeguard station.

## IF AN INCIDENT OCCURS

- Activate the Emergency Response Plan
- Call 9-1-1 to summon emergency medical response
- Call the Poison Control Center at 800-222-1222 for assistance with managing chemical exposures
- Identify chemicals/products involved and have labels and SDSs at hand

### For Chemicals in the Eyes, or on the Skin or Clothing

- Immediately remove the victim from the source of contamination
- Quickly remove contaminated clothing and shoes
- Wash eyes or skin with an eyewash station or emergency shower for at least 15 minutes or as directed by the SDS
- Seek medical care

### For Swallowed Pool Chemicals

- Call the Poison Control Center at 800-222-1222
- Do NOT make the victim vomit
- Do NOT let the victim drink anything unless directed to do so by the Poison Control Center

### For Inhaled Vapors and Gases or Respiratory Symptoms

- Move the victim out to fresh air and seek medical attention
- Give CPR if breathing stops

### If Medical Treatment Follows

- Always bring the name of the pool chemicals involved, the label, and the SDS to show to medical staff



## ADDITIONAL RESOURCES

CDC web page for the Model Aquatic Health Code and other healthy swimming resources:

<https://www.cdc.gov/mahc/index.html>

[www.cdc.gov/healthywater/swimming/pools/preventing-pool-chemical-injuries.html](http://www.cdc.gov/healthywater/swimming/pools/preventing-pool-chemical-injuries.html)

[www.ccohs.ca/oshanswers/chemicals/swimming.html](http://www.ccohs.ca/oshanswers/chemicals/swimming.html)

The California Code of Regulations (CCR) Public Pool Disinfection requirements are found in 22 CCR Section 65529: [https://govt.westlaw.com/calregs/Document/IA66BDDEE3F-5049318A33F8CB202AA97B?transitionType=Default&contextData=\(sc.Default\)&bhcp=1](https://govt.westlaw.com/calregs/Document/IA66BDDEE3F-5049318A33F8CB202AA97B?transitionType=Default&contextData=(sc.Default)&bhcp=1)

California Department of Public Health, Occupational Health Branch, Pool Chemical Safety topic page: <http://www.cdph.ca.gov/poolchemicals>

The Occupational Pesticide Illness Prevention Program (OPIPP) tracks and investigates cases of work-related pesticide illness and makes prevention recommendations for employers and workers. OPIPP website: <https://cdph.ca.gov/OPIPP>

The Work-Related Asthma Prevention Program (WRAPP) tracks information about California workers with asthma. The program helps workers avoid getting asthma from their jobs. WRAPP website: <https://cdph.ca.gov/wrapp>

To contact either program, call 1-800-970-6680 (toll-free to CA callers)

To obtain a copy of this booklet in an alternate format, please contact us at (510) 620-5757. CA Relay Service: 711. Allow at least 10 days to coordinate alternate format services.

# POOL CHEMICAL SAFETY BE SAFE AT WORK!

**POOL CHEMICALS  
CAN HARM YOU IF  
YOU BREATHE THEM  
IN, GET THEM IN  
YOUR EYES OR ON  
YOUR SKIN, OR IF  
YOU SWALLOW THEM.**

## **IF YOU USE POOL CHEMICALS FOR YOUR JOB**

Do not handle pool chemicals until you have adequate training.

Read and understand the Safety Data Sheet (SDS) and label for each chemical you use so you know what you are working with, possible health effects from exposure, and how to protect yourself.

Use appropriate personal protective equipment, such as chemical splash goggles, face shield, rubber boots or shoes, gloves, chemical resistant apron, etc.

## **STORE AND USE POOL CHEMICALS SAFELY**

Store chemicals as recommended by the manufacturer; prevent them from mixing or getting wet.

Read and follow product label directions.

Use chemicals in the original, labeled container. Never transfer pool chemicals into food or drink containers.

Never pre-dissolve solid chemicals or add water to liquid chemicals.

Never mix chlorine products with each other, with acid, or with any other chemicals.

Respond to pool chemical spills immediately, but only if you are trained to do so.

## **BE PREPARED FOR EMERGENCIES**

Know what to do if you are exposed to chemicals.

Be familiar with your Emergency Response Plan and make sure you know what to do if people are sick from pool chemicals.

## **IN AN EMERGENCY, CALL 9-1-1 AND/OR THE POISON CONTROL CENTER AT 800-222-1222**

For more information about the safe use of pool chemicals, visit [www.cdph.ca.gov/poolchemicals](http://www.cdph.ca.gov/poolchemicals).

**!** Tell your supervisor if you get chemicals on you, if you breathe them in, or if you have symptoms from chemical exposure. Symptoms can include skin burning or rash, eye pain, cough, runny nose, sore throat, wheezing, chest tightness, shortness of breath, asthma, **●** headache and nausea. If you have symptoms you should be sent to see a doctor.

# SEGURIDAD EN EL MANEJO DE PRODUCTOS QUÍMICOS PARA ALBERCA ¡PROTÉJASE EN EL TRABAJO!

LOS PRODUCTOS QUÍMICOS PARA ALBERCA PUEDEN LASTIMARLO SI LOS RESPIRA, ENTRAN EN SUS OJOS O EN SU PIEL O LOS INGIERE.

## SI EN SU TRABAJO UTILIZA PRODUCTOS QUÍMICOS PARA ALBERCA

No manipule los productos químicos para alberca hasta que tenga capacitación adecuada.

Lea y comprenda la hoja de datos de seguridad (Safety Data Sheet, SDS) y etiqueta cada producto químico que use para que sepa con qué está trabajando, los posibles efectos en la salud que surjan debido a la exposición y cómo protegerse.

Utilice equipo personal de protección adecuado como lentes de seguridad para evitar salpicaduras, caretas, botas o zapatos de hule, guantes, mandiles resistentes a los químicos, etcétera.

## ALMACENAMIENTO Y USO SEGUROS DE LOS PRODUCTOS QUÍMICOS PARA ALBERCA

Almacene los productos químicos como lo recomienda el fabricante; evite mezclarlos o mojarlos.

Lea y siga las instrucciones de la etiqueta del producto.

Utilice los productos químicos en su contenedor original y etiquetado. Nunca transfiera los productos químicos para alberca a contenedores de alimentos o bebidas.

Nunca disuelva previamente productos químicos sólidos o añada agua a productos químicos líquidos.

Nunca mezcle productos de cloro entre ellos, con ácido o con otro producto químico.

Responda inmediatamente a derrames de productos químicos para alberca, pero solo si está capacitado para hacerlo.

## ESTÉ PREPARADO PARA EMERGENCIAS

Entérese de lo que tiene que hacer si se expone a los productos químicos.

Conozca su plan de respuesta ante emergencias y asegúrese de que sabe qué hacer si hay personas enfermas por los productos químicos para alberca.

**EN UNA EMERGENCIA, LLAME AL 9-1-1 O AL CENTRO DE CONTROL DE ENVENENAMIENTO AL 800-222-1222**

Para obtener más información sobre el uso seguro de productos químicos para alberca, visite [www.cdph.ca.gov/poolchemicals](http://www.cdph.ca.gov/poolchemicals)

! Diga a su supervisor si le cayeron productos químicos, si los respiró o si tiene síntomas por exposición a estos. Los síntomas pueden incluir quemaduras en la piel o salpullido, dolor en los ojos, tos, escurrimiento nasal, dolor de garganta, silbidos al respirar, opresión en el pecho, falta de aire, asma, dolor de cabeza y náusea. Si tiene síntomas, lo deben mandar con el doctor.