

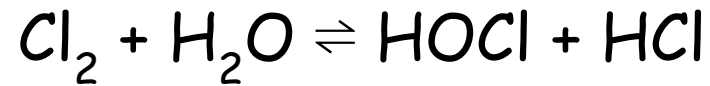


# USE OF CHLORINE

Aruzhan, Zukhra, Diana, Zayra –  
CH-2

# WATER CHLORINATION

When dissolved in water, chlorine converts to an equilibrium mixture of chlorine, hypochlorous acid (HOCl), and hydrochloric acid (HCl):



In acidic solution, the major species are  $\text{Cl}_2$  and HOCl, whereas in alkaline solution, effectively only  $\text{ClO}^-$  (hypochlorite ion) is present. Very small concentrations of  $\text{ClO}_2^-$ ,  $\text{ClO}_3^-$ ,  $\text{ClO}_4^-$  are also found.

## Chlorine is a highly disinfectant.

It kill disease-causing pathogens, such as bacteria, viruses, and protozoans. The microscopic agents of many diseases such as cholera, typhoid fever, and dysentery killed countless people annually before disinfection methods were employed routinely.

## Chlorine is a strong oxidizing agent

Chlorine kills via the oxidation of organic molecules. Chlorine and hydrolysis product hypochlorous acid are neutrally charged and therefore easily penetrate the negatively charged surface of pathogens. It is able to disintegrate the lipids that compose the cell wall and react with intracellular enzymes and proteins, making them nonfunctional. Microorganisms then either die or are no longer able to multiply.

## THE EFFECT ON HUMANS:

- ❑ **Increased Risk of Cancer** – Haloacetic acids (HAAs) and Trihalomethane (THMs).
- ❑ **Hazardous for Your Children's Health** – it can potentially increase the risks asthmatic attacks particularly in children who do not have improved airway systems; developed tumors in their intestines and kidneys; can cause irritation and burn the skin as well.
- ❑ Cell Damage
- ❑ Increases the Risk of Asthma – Sneezing; Tightness in chest; Weak cough; Mild sore throat; Increased dryness in throat; Irritation in nasal passages.
- ❑ Results in Heart Problems



# HARMFUL EFFECTS OF UNCHLORINATED WATER.



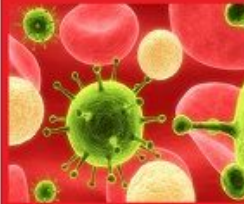
## Negative Effects of Raw Sewage

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### Key Notes

- On average, 7 million people suffer from illnesses caused by exposure to raw sewage per year.
- 7% of those 7 million become severely or fatally ill.



### Viruses

Norwalk virus, rotavirus, Hepatitis A, Poliomyelitis Virus, Adenovirus

### Gastroenteritis

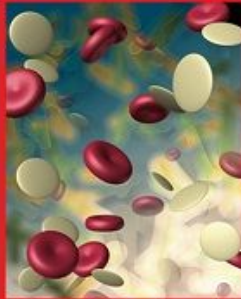
Diarrhea, Vomiting, Abdominal Pain, Nausea, Cramping

### Hepatitis A

Jaundice, Fever, Diarrhea, Fatigue, Cramping, Loss of Appetite, Nausea

### Poliomyelitis

Sore Throat, Fever, Vomiting, Nausea, Cramping, Constipation, Diarrhea



### Bacteria

Campylobacter, E. coli, Leptospira Salmonella, Shigella

### Campylobacteriosis

Bloody Diarrhea, Fever, Cramping, Nausea, Vomiting

### Escherichia coli (E. coli)

Bloody Diarrhea, Fever, Cramping, Nausea, Vomiting

### Leptospirosis

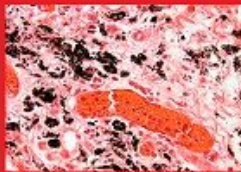
Fever, Headaches, Body Aches, Chills, Diarrhea, Vomiting, Jaundice, Rash

### Salmonellosis

Diarrhea, Fever, Cramping

### Shigellosis (Bacillary Dysentery)

Bloody Diarrhea, Fever, Cramping



### Parasites

Cryptosporidium parvum Giardia intestinalis

### Cryptosporidiosis

Diarrhea, Loose Stool, Cramping, Slight Fever

### Giardiasis

Diarrhea, Loose Stool, Cramping, Slight Fever



For more information on the dangers of sewage damage or to request sewage damage or biohazard cleanup, visit

[www.sirestoration.com](http://www.sirestoration.com)

# ADVANTAGES AND DISADVANTAGES OF CHLORINATION OF WATER



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- ❑ Chlorine is a powerful oxidizing agent thereby getting rid of a lot of bacteria in water.
- ❑ Chlorine is commercially available
- ❑ Chlorine is very economical

- ❑ Chlorine does not exterminate all bacteria. Complex microorganisms are known to become dormant in the presence of chlorine but not exactly killed
- ❑ Chlorine is not green. It is harmful to the environment.
- ❑ Commercially available chlorine (Hypo) disintegrates into Chlorine gas rapidly when exposed
- ❑ Super-chlorination poses danger to humans over a period of time
- ❑ Downstream water treatment systems like Resins, RO/UF membranes may be damaged by excessive chlorine at inlet.
- ❑ Bad taste and odor

