THE CHEMISTRY OF SWIMMING POOLS

Chlorination of swimming pools isn't as simple as you might think – and there's a lot of chemistry behind it. There's also a good chemical reason to avoid urinating in a swimming pool, due to chemical reactions that can occur. Here we take a detailed look at swimming pool chlorination and chemistry.

CHLORINATING AGENTS

L TO R: CHLORINE, SODIUM HYPOCHLORITE & CALCIUM HYPOCHLORITE

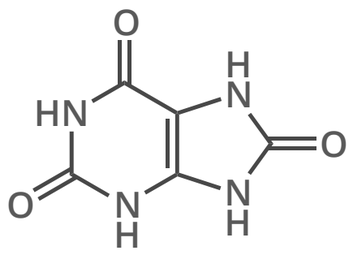
Due to the hazards associated with its storage and use, chlorine gas is now rarely used for chlorination of pools. Instead, hypochlorite salts tend to be used. Calcium chloride is also often added to pool water; this prevents calcium sulfate, which is a slightly soluble component of the grouting between tiles in pools, from dissolving.

PEE IN THE POOL & CHLORAMINES

L TO R: MONOCHLOROAMINE, DICHLOROAMINE, & TRICHLOROAMINE

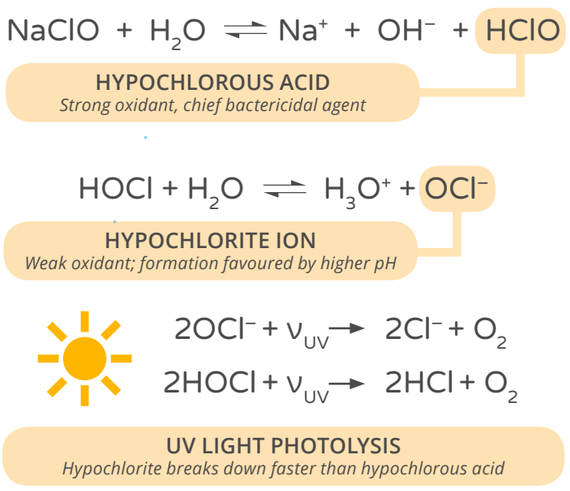
Ammonia and ammonia-like compounds found in human sweat and urine react with hypochlorous acid, producing chloramines. It is these, not chlorine, that cause the characteristic smell of swimming pools. They can cause wheeziness and sore eyes for some swimmers.

Peeing in the pool helps produce more trichloroamine, as the uric acid present in urine helps to create it. It also produces small amounts of cyanogen chloride. Chlorine contained in these kinds of by-products of chlorination is referred to as 'combined chlorine' (CC).



LEFT: URIC ACID
BELOW: CYANOGEN CHLORIDE

THE CHEMICAL REACTIONS INVOLVED IN CHLORINATION



Chlorine and hypochlorite salts both react with water to produce the strong oxidant hypochlorous acid. This is the major bactericidal agent in pool water.

In water, hypochlorous acid exists in equilibrium with the weaker oxidant, the hypochlorite ion. The combined concentration of these chemicals in pool water is referred to as 'free available chlorine' (FAC).

Hypochlorite ions are rapidly broken up by the UV light present in sunlight, and this causes 90% of the FAC loss from outdoor pools. This means that outdoor pools require more frequent chlorination – or the addition of other chemicals to stabilise the FAC levels.