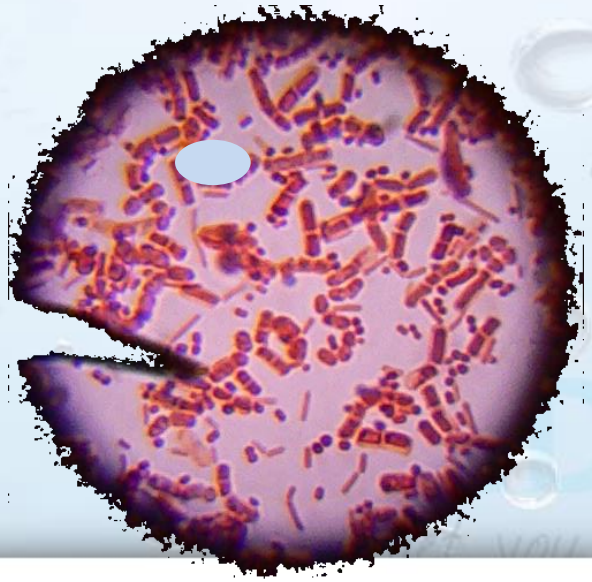
The importance of Water Hygiene In an aquatic exercise environment



Water Hygiene

- A swimming pool can quickly become very infectious, because
  - Presence of bacterial food (skin flakes, fatty oils and hairs from users, urine and sweat)
  - Water temperature around 20 to 35 degrees C is an excellent environment for bacteria to procreate
  - Many bacteria thrive in an aqueous environment

Common infectious swimming pool bacteria and viruses

- **Shigellosis** – causes bacillary dysentery
- **E. coli** – causes severe diarrhea
- **Leptospirosis** – causes Weil disease, Canicola fever, Hemorrhagic jaundice, Mud fever or Swineherd disease
- **Giardiasis** – causes asympthomatic diarrhea
- **Cryptosporidiosis** – causes parasitic infection
- **Hepatitis A** – causes serious liver disease
- **Norwalk virus** – causes Norwalk agent disease
- **Influenza virus** – causes the flu
- **Rhino virus** – causes the common cold
- **And many, many more**

Public versus Healthcare pool

- In public pools, visitors are presumed to be healthy individuals, with only average susceptibility to infections and disease
- In Healthcare pools, visitors are possibly very susceptible to infections due to:
  - Recent surgery
  - Poor physical condition
- Furthermore, they might even be carrier of multi resistant bacteria because of recent hospitalisation

Water Hygiene Conclusion

- Water hygiene is important in public pools, but ***extremely important*** in Hospital pools, used i.e. in Aquatic Rehabilitation.
- Not only from a practical point of view, but also the ***liability*** of the Hospital should be taken into consideration when organising Water Hygiene in Hospital Pools

Water Hygiene Basics

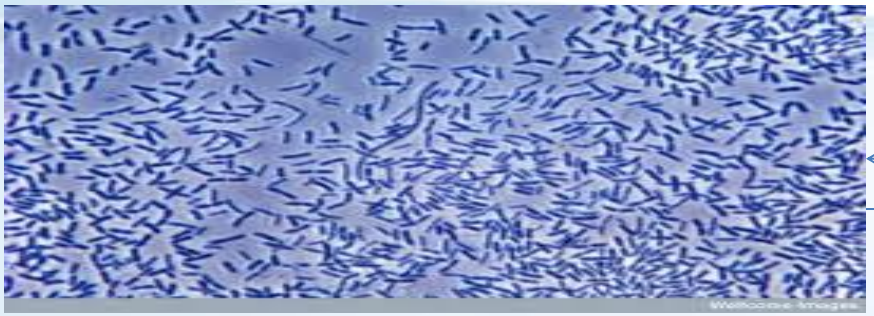
- Any pool should have a ***Water Treatment Plant***, consisting out of at least these elements:
  - A Pump (to circulate the water)
  - A (sand) filter (to filter particles out of the water)
  - A water heater (to maintain the right temperature)
  - A dosing system for chemicals (to kill any active bacteria or viruses)

How Bacteria and Viruses are killed

- The only safe agent to kill aqueous Bacteria and Viruses according to current technology is chlorine.
- There are other solutions on the market, like Ozone and UV, but these are not suited for professional use. Chlorine must still be added to the water.

Why other solutions don't work

- Think of a pool as a giant Petri Dish, with Bacteria thriving:



Filter,
Heat,
& Kill Bacteria

- We suck out a small amount of water, filter out solids, heat it and kill the bacteria. Then we pump the water back into the petri dish. ***Nothing*** has been done to stop the bacteria in the Petri dish from procreating!
- Therefore, we need to add an ***antibiotic agent*** to the water, that at least suppresses bacterial growth in the Petri Dish! Chlorine has the right properties to do this job.

Chlorine actively kills the Bacteria in the pool

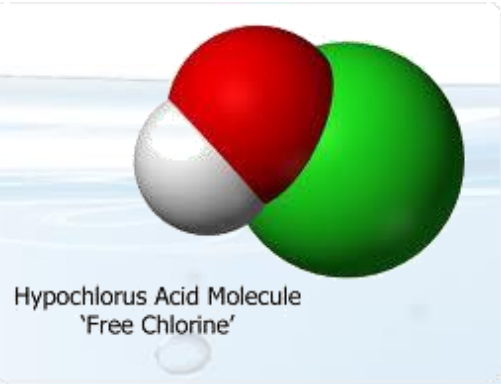
- Now, by adding a small amount of chlorine to the pool, also the bacteria that are present in the pool are killed, or at least suppressed.

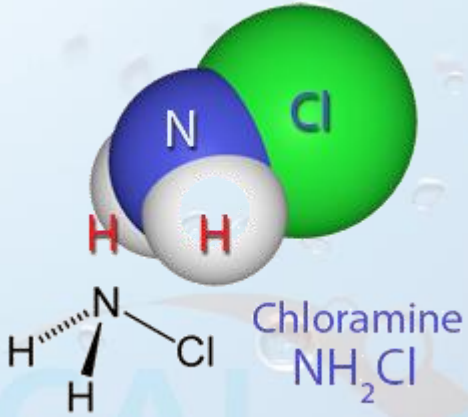
But what's that smell? Why do my eyes hurt?

- It's Chloramines! These occur when the chlorine binds to the contaminants in the water like Bacteria, Viruses, but also skin flakes, fatty acids from the skin, and ammonia.
- When there is a strong smell of Chloramines, the water has not been maintained well enough. The chlorine finds a large number of contaminants to bind to, and the Chloramines become airborne.
- ***In a healthy swimming pool, there is hardly any smell at all!***

Free chlorine vs Bound chlorine

- Free chlorine is a molecule that is ready to bind to contaminants in the water.
- The amount of free chlorine is a measure of the capacity of the water to disinfect itself when it is contaminated.
- Bound chlorine (Chloramine) is a molecule that has “caught” a contaminant, like e.g. ammonia. It becomes airborne, hence the smell.
- The amount of bound chlorine is a measure of contamination of the water. High levels of bound chlorine point to the water becoming “biologically active”.


Hypochlorus Acid Molecule
‘Free Chlorine’



Biologically active water

- When the pool has become biologically active:
  - Free chlorine that is added is immediately turned into chloramines, and therefore
  - ***Hardly any free chlorine*** can be found in the water anymore so
  - ***The bacteria have won the battle!***
  - ***Now the pool has become very unsafe.***
- Solutions:
  - ***Replace the water*** partially or even entirely
  - ***"Shock"-treat the water*** with large amounts of chlorine. During shock treatment, do not use the pool, as massive amounts of Chloramines will become airborne.

Safe levels to maintain

- Free chlorine level:
  - Higher than 0,5 mg/l
  - Lower than 1,5 mg/l
- Bound chlorine level
  - Lower than 1 mg/l
  - If higher than 2 mg/l the water has possibly become ***biologically active***!
- Maintain pH between 6,8 and 7,8

Conclusion

- Bacteria and viruses causing ***serious illnesses*** can thrive in pools
- This is ***risky***, especially when working with ***susceptible patients***
- To keep them at bay, ***chlorine*** is used as a ***antibiotic***
- Whatever other method is used to disinfect, ***chlorine must always be added***.
- A ***smelly pool*** means ***contaminated water***
- If chlorine has been added to the pool, but free chlorine cannot be measured, there is a ***real risk*** the water has become ***unhealthy***

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