

Chlorine Disadvantages and Nanosil as a Disinfectant in Swimming Pools

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Abstract: Nowadays, chlorine dosage at swimming pool causing many health effects like skin, eye and throat irritation. Due to high exposure of chloroform carcinogens causes cancer. To avoid these effects, in the present study we used Nanosil – a food grade hydrogen peroxide with nano silver. Nanosil is mainly used as a disinfectant to remove E-Coli pathogens from swimming pool. The study was conducted at CLUB CABANA baby swimming pool has a capacity of 2 KL. Sampling was done for 3 days on different day by collecting both chlorine and nanosil treated water. With nanosil treated water the efficiency of reduction in E-Coli was 97.5%, 99.3% and 98.9%. The average percentage reduction of E-Coli was 98.56% as compared with chlorine treated water. The study concluded that Nanosil gives better efficiency to kill the E-Coli pathogens without causing health problems.

1. Introduction

As we all know that silver is using as disinfectant in various sectors from ancient Rome. Some of the applications are biosensors, antibacterial products, incorporated in apparel, footwear, paints, wound dressings, appliance and cosmetics. A silver particle plays an important role in water treatment technology which acts as a very good disinfectant to remove pathogens.

Generally the chlorination is done to kill the bacteria's from swimming pool but simultaneously it is very much important to know that residual chlorine should also be maintained. Chlorination of pool water leads to formulation of various by-products and chloroform presence is abundant comparing to other by-products. Chloroform is a carcinogenic compound which causes cancer. Chlorination also leads to many health effects on swimmers like eye irritation, throat irritation and skin allergy. Therefore, NANOSIL is an unique technology advanced formulation to exploit the proven benefits of nanosilver particles. Silver particle in nano form itself has many pharmacological actions the synergistic effects are

offered when suspended in high grade oxidizing agent. Nanosil brings its action instantly, has a good contact time in action and hence works as efficient agents in inhibiting disease causing microbes. Hence to remove the pathogens and avoid formation of carcinogenic compounds in swimming pool Nanosil is very much essential and eco-friendly.



Figure 1.Nanosil bottle.

2. Materials and Methodology

Nanosil chemical has been used; and it is a rapidly oxidizing carrier agent.

Dosage Criteria:

10ml of Nanosil = 1 Lac liter capacity of pool.

To conduct the experiment we chose the place of CLUB CABANA baby swimming pool at Bangalore. This swimming pool has capacity of 2 Lac Litres. As per dosing criteria 20ml of Nanosil was diluted for the ratio 1:10. Stir it well so that the nanosil can mix properly into the water. The test was conducted for 3 days. Firstly collect the untreated water sample without adding nanosil.



Figure 2. Dilution of Nanosil.

Then take a mug and pour the diluted nanosil at the corners and middle of the swimming pool.



Figure 3. Mixing of Nanosil to the pool.

Allow the contact period of 30 minutes for dispersion of NANOSIL in swimming pool water.



Figure 4. Allow 30 minutes contact period.

Collect a water sample after 30 minutes, which includes 20 ml of NANOSIL added in swimming pool. Then E-Coli presence has been tested before and after the treatment with NANOSIL & Chlorine.

3. Results and Discussion

Table.1 Maximum permissible limits as per Bureau of Indian Standards.

Sl. No	PARAMETERS	Test Methods	Maximum permissible limits as per BIS
1	E-Coli (mg/L)	MPN test method	120/100 ml

Table.1 shows the Maximum permissible as per Bureau of Indian Standards.

Table.2 Swimming pool water sample collected on 05/11/2015.

Sl. No	PARAMETERS	Swimming pool water treated with NANOSIL	Swimming pool water treated with CHLORINE
1	E-Coli (mg/L)	28 MPN / 100ml	>1100 / 100ml

Table.2 shows that swimming pool water treated with chlorine is exceeded the permissible limit. As per BIS E-Coli must be 120 MPN / 100 ml is permissible. But, with chlorine treated water E-coli presence is > 1100 MPN / 100 ml. In the same way nanosil treated swimming pool water shows that huge reduction in E-Coli 28 MPN / 100ml. Therefore nanosil gives better efficiency in removal of E-Coli as compared with Chlorine.

Table.3 Swimming pool water sample collected on 06/11/2015.

Sl. No	PARAMETERS	Swimming pool water treated with NANOSIL	Swimming pool water treated with CHLORINE
1	E-Coli (mg/L)	7 MPN / 100ml	>1100 / 100ml

Table.3 shows that chlorine treated water E-coli presence is > 1100 MPN / 100 ml. In the same way nanosil treated swimming pool water shows that huge reduction in E-Coli 7 MPN / 100ml.

Table.4 Swimming pool water sample collected on 13/11/2015.

Sl. No	PARAMETERS	Swimming pool water treated with NANOSIL	Swimming pool water treated with CHLORINE
1	E-Coli (mg/L)	3 MPN / 100ml	210 / 100ml

Table.4 shows that chlorine treated water E-coli presence is 210 MPN / 100 ml. In the same way nanosil treated swimming pool water shows that huge reduction in E-Coli 3 MPN / 100ml. This shows the best result and huge reduction in E-Coli pathogens treated with nanosil.

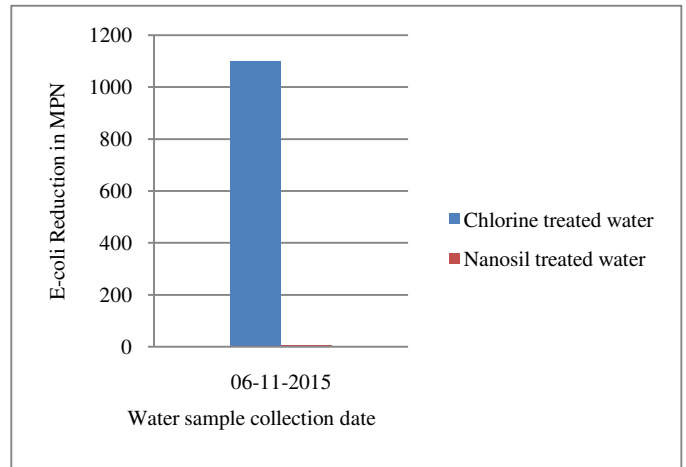


Figure 6.sample collected on 06/11/2015.

In Fig.6 the percentage reduction of E-Coli is up to 99.36%. E-Coli presence in chlorine treated water was >1100 MPN and in Nanosil treated water was 7 MPN and this value is acceptable.

4. Graphical representation

Figure 5, 6 & 7 shows the graphical representation of reduction of E-Coli pathogens in MPN with chlorine treated and Nanosil treated water.

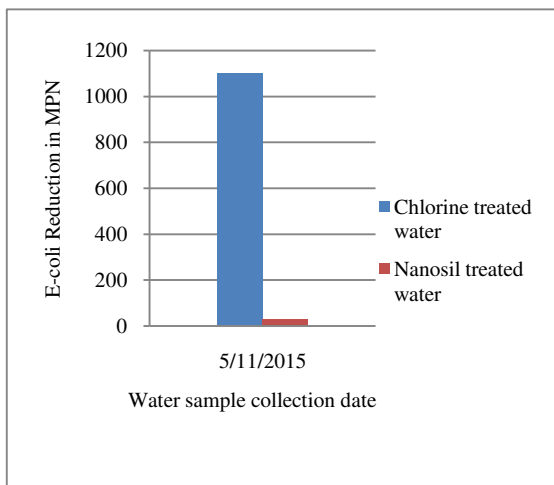


Figure 5.sample collected on 05/11/2015.

In Fig.5 the percentage reduction of E-Coli is up to 97.45%. E-Coli presence in chlorine treated water was >1100 MPN and in Nanosil treated water was 28 MPN and this value is acceptable.

As we know that E-Coli bacteria can survive with air or without air and also can survive in freezing temperature even with freezing temperature condition nanosil will work because of its liquid state. But, chlorine granules does not mix properly in water during freezing temperature due to its solid form and heavy dosage of chlorine will also cause color and algae formations in the swimming pool.

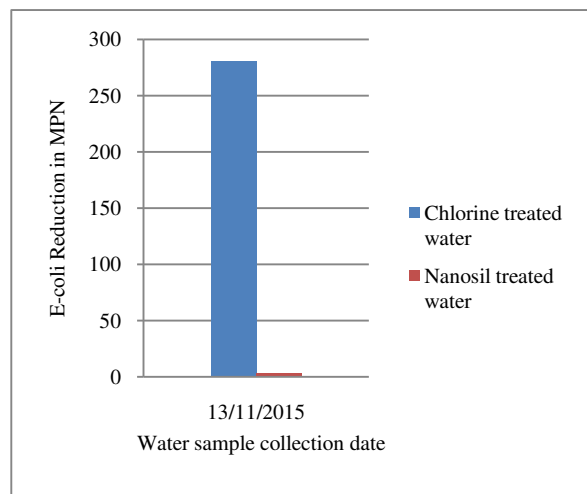


Figure 7.sample collected on 13/11/2015.

In Fig.7 the percentage reduction of E-Coli is up to 98.92%. E-Coli presence in chlorine treated water was 280 MPN and in Nanosil treated water was 3 MPN and this value is acceptable.

In each figure shows that there is a huge reduction in E-Coli, when treated with Nanosil and the average percentage reduction was up to 98.5%. It means Nanosil kills the pathogens up to 100% as compared with chlorine that means it is safe for domestic usage.

5. Conclusion

- Sample collected on 05/11/2015 the reduction of E-Coli was >1100 MPN to 28 MPN treated with Chlorine and Nanosil respectively. The percentage reduction of E-Coli was 97.5%.
- Sample collected on 06/11/2015 the reduction of E-Coli was >1100 MPN to 7 MPN treated with Chlorine and Nanosil respectively. The percentage reduction of E-Coli was 99.3% and as per BIS Nanosil treated water was within the limit.
- Sample collected on 13/11/2015 the reduction of E-Coli was 280 MPN to 3 MPN treated with Chlorine and Nanosil respectively. The percentage reduction of E-Coli was 98.9% and as per BIS Nanosil treated water was within the limit.
- From the results we concluded that as per BIS E-Coli must be 120 MPN / 100 ml should be the permissible limit and Nanosil treated water is within the limit. Therefore by compared with chlorine, nanosil gives better efficiency in removal of E-Coli.

6. Acknowledgements

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7. References

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