A Study Of Chlorine Demand Of Various Water Sources In And Around Luck ow

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Introduction :

The quality of drinking water is a factor of vital importance in public health. Much of the ill health in the under developed countries is largely due to lack of safe drinking water. There can be no state of positive community health and well being without safe water supply (Giroult, 1977).

Chlorination is one of the greatest advances in water purification. Chlorine kills pathogenic bacteria and in high doses destroys the bacterial spores and viruses. It oxidizes iron, mangnese and hydrogen sulphide. It also destroys some taste and odour producing constituents in the water (WHO, 1976).

Chlorine demand is the amount of chlorine that is needed to destroy bacteria and to oxidize all the organic matter and ammoniacal substances present in the water. If further chlorine is added beyond this point, free chlorine begins to appear in the water.

Material & Methods :

The samples of water from different water sources in the district of Lucknow (both rural and urban) were collected for the present study. Besides, water samples from various sources from the surrounding districts viz. Barabanki, Unnao, Sultanpur and Rae Bareli were also collected.

The study was carried out during post-rainy season, in the months of August and September 1988.

(a) **Collection of water samples** : About 5 liter of water sample was collected from each source in plastic container. While taking samples from hand pumps, it was first run for few minutes, and then the container was filled, To collect sample from the ponds, it was taken from a few feet away from the edge of the pond.

For collecting water samples from the wells, water was first taken out in a clean bucket and then transferred into the container. The samples taken from the City of Lucknow, were from public standposts at 3 places : i) Aishbagh-a place near to water works, (ii) Rakabganj-a place about 3 Kms. from water works, and (iii) Chowk-a place about 6 Km. from water works. The idea of taking these samples from different distances of waterworks was to find out the

amount of chlorine lost during water carriage.

All the wells from where the water samples were collected were open and shallow wells used by the local community for drinking and bathing puraposes. The ponds in all the districts were small, shallow with pollution from the surrounding areas. Ponds were mainly used for bathing, washing utensils and also bathing the animals. The hand pumps, included in the present study were locally made, drawing water from upper stratum of the soil and this was mainly used for drinking purposes.

(b) Estimation of chlorine demand : All the water samples collected were tested for their chlorine demand within 24 hours of collection by following method. A 0.1% solution of bleaching powder was prepared. 6 glass beakers were taken and filled with 500 cc of sample water. Different quantities of the above bleaching powder solution viz. 0.6, 0.8, 1.0, 1.2, 1.4 and 1.6 ml. were added to these water beakers, and allowed to stand for 20 minutes. Then a small quantity of of starch-iodide solution was added to each beaker. 20 minutes after adding the starch iodide solution, the lowest dose of bleaching powder solution giving a distinct blue colour was noted down; and this was taken as a correct dose of the bleaching powder. Number of ml. of bleaching powder solution giving this distinct blue colour $\times 2$ gives the amount of bleaching powder in pounds required for 1,00,000 gallons of water or 1,000,000 lbs. of water to be chlorinated. In other words, this amount of bleaching powder is ppm. of bleaching powder as chlorine

demand of the water sample (Stewart and Boyd, 1937).

(c) Estimation of available chlorine in the sample of bleaching powder:

5 gm. of bleaching powder was taken and dissolved in 500 cc of distilled water, making it a 1% bleaching powder solution. 10 ml. of this solution was titrated against N/10 standard sodium arsenite solution till a starch-iodine paper no longer gave a blue colour. At this stage some starch solution was added to the titrated liquid. Then, by help of a pipette drop by drop N/10 iodine solution was added to it till a permanent blue colour appeared. The number of ccs of N 10 iodine solution used was noted. The number of ccs of N/10 iodine solution solution was deducted from the number of ccs of sodium arsenite solution. The difference so noted gave the quantity of free chlorine in 10 c.c. of bleaching powder solution. Accordingly the percentage of available chlorine in the sample bleaching powder was calculated. In the present study, the percentage of available chlorine in the sample bleaching powder was 35%

(d) Calculation of chlorine demand (ppm) for given water sample.

The amount of bleaching powder required for 1,00,000 gallons of water multiplaced by 0.35 (·/. of available chlorine so as to get the ppm. of chlorine as chlorine demand of the given water sample.

Observations :

The chlorine demand of the water sample tested varied from one place to the

other and from source to source. It was lowest (2.1ppm) in the city of Lucknow and highest (7.0ppm.) in the district of Barab-anki. The chlorine demand as recorded in various water samples is given in Table.

Table : Chlorine demand of various water sample in and around Lucknow

District	Place	Source of water	Chlorine demand (ppm)
1. Lucknow (urban)	a. Aishbagh	Tap water	2.1
	b. Rakabganj	,,	2.1
	c. Chowk	,,	2.8
2. Lucknw (rural)	Banthra	Handpump	3.5
		Openwell	3.5
		pond	4.9
3. Barabanki	Ram Sanehi Ghat	Handpump	2.8
		Openwell	4.2
		Pond	7.0
4. Sultanpur	Jagdishpur	Handpnmp	3.5
		Openwell	4.2
		Pond	6.3
5. Rae Bareli	Bachhrawan	Handpump	2.8
		Openwell	3.5
		Pond	6.3
6. Unnao	Nawabganj	Handpnmp	4.2
		Openwell	4.2
		Pond	7.0

The chlorine demand of water collected from the city of Lucknow ranged from 2.1 to 2.8 In all the districts around Lucknow, the chlorine demand was lowest (2.8-4.2 ppm) for the samples from handpumps. This value was 3.5-4.2ppm for the water samples from open wells. The chlorine demand was maximum (4.9-7.0 ppm) for samples collected from the ponds.

Discussion :

In the rural areas of Lucknow and the surrounding districts, the sources of drinking water supply are mainly open wells and to a lesser extent, the handpumps. The ponds, are frequently used for cleaning the utensils, bathing and feeding the cattles and less frequently for bathing and swimming of

human beings. Occasionally, they can be used as a souce of drinking water also.

In the city of Lucknow, there is a piped water supply, however. this does not appear to be properly chlorinated. This has clearly been shown by the relatively higher chlorine demand in the samples collected.

In the rural areas, the chlorine demand was lowest for the handpump water. As it draws water from the first stratum of the soil, there is less pollution, compared to samples from open wells, which are frequently exposed to pollution. The ponds are in open areas and are usually low-lying This leads to gross pollution of its water

from neighbouring places resulting into high chlorine demand.

References :

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3. Stewart, A.D. and Boyd, T.C. (1937). Public Health Laboratory practices. Oxford University press, Calcutta.

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