Advanced Engineering Days

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Determination of water quality in Hadim district of Konya (Turkey) and the investigation of disinfection efficiency

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Keywords
Hadim
Konya
Drinking Water
Bacteria
Disinfection
Chlorination
Water quality

ABSTRACT

Drinking and usage water of Hadim Town (Konya, Turkey) has been provided from underground water. For this reason, there is no any treatment method but only disinfection with chlorine is applied. In the scope of this study, it is intended to determine the characteristic of the water quality via some analyzing method of the drinking and usage water and to explore the effectiveness of the existing disinfection method which is applied at present. Water has been analyzed collected 200 water samples from 5 points selected in the central district of Hadim water mains system. Subsequently, analyses, which are intended for characterizing the drinking and usage water of Hadim district, have been conducted both in the territory and in the public health laboratories of Konya province. Furthermore, analyses have been conducted in order to determine to what extent and at what point is effective the selected disinfection method (chlorination). Consequently, it has been determined that, on account of its chemical specialties, drinking water of the Hadim district is suitable for the standards stipulated for our country. Nevertheless, bacteriologically, it has been determined that the quality of the water is low owing to coinciding with coliform type bacteria from time to time.

Introduction

Only less than 1% of the total amount of water on earth can be used as drinking water. Existing drinking water resources, increasing population, rapidly developing industry and disappearing natural environment limit underground and surface drinking water resources. While groundwater is generally directly drinkable, surface waters, streams, streams, lakes and dams are generally not of directly potable quality. Their chemical structures mostly depend on the lands they pass through and on which they are located, on the nearby factories and settlements. Especially those close to large settlements are significantly polluted [1]. All water sources can be used both as drinking water and for industrial purposes. The natural water resources that are widely used in the industry by applying the appropriate treatment process are surface and underground waters. Despite this, it is expected that the ground waters that filter through a thick soil layer are cleaner than the surface waters, but the dissolved salt content is higher [2]. The best waters are spring waters, which are not sufficient in terms of quantity. Well water is also generally of good quality. However, these are not enough to meet the water needs of big cities. Therefore, river, stream and lake waters are used to meet the water needs. Such waters are sufficient in terms of quantity but not sufficient in terms of quality [3].

This study is to determine the conformity of drinking and utility water quality to standards by examining some properties of drinking and utility water in the center of Hadim district of Konya, which has a population of approximately 4000 people, in terms of chemical and bacteriological aspects. In addition, it is to investigate the effectiveness of the disinfection method used by the district municipality and used in the warehouses and distribution network and the disinfectant substance used in disinfection.

Material and Method

Hadim district center covers the drinking water network. On-site measurement and sampling points were selected according to the distribution of the areas covering the study area. At selected points, the physical, chemical and bacteriological parameters of the drinking water of Hadim district center were measured both in the field and in the laboratory. Since Hadim district center is small and accordingly the distribution network is short, it was deemed appropriate to choose 5 stations. For this reason, a total of 10 samples were taken, once a month for chemical analysis, and a total of 50 samples were taken from 5 points, once a month for bacteriological analyses, in order to monitor the quality changes in drinking water. In addition, in order to determine the residual chlorine ratio, a total of 200 samples were taken from 5 points, 4 times a month, once a week.

Study area

In this study, which was started on the basis of shopping centers located in Selçuklu district of Konya province, Hadim is one of the districts of Konya, located in the Central Anatolian region of our country, and is at the intersection of 37 degrees north parallel and 33 degrees east meridian in the northern hemisphere. Eunuch; It was established in a valley in the center of the Central Taurus Mountains of Konya province, and its distance from Konya is 128 km. is At the same time, it falls within the borders of the Mediterranean region. Eunuch; It is in the south of Konya. There is Karaman province in the east, Taşkent district in the south, Bozkır in the west and Alanya lands in the south-west of the district. The altitude of the district from sea level is 1500-1700 m. is

Coliform and E. Coli Determination

Results and Discussion

Some physical-chemical and bacteriological properties of drinking and utility water of Hadim district (district center) were examined and sampling and analyzes were carried out in a 10-month period in order to determine its quality. The results of the analysis of the samples taken from 5 sampling points determined in the study area were arranged separately for each month. Among the chemical analyzes, pH, conductivity, total hardness, chloride and organic matter parameters were evaluated separately and their graphs were drawn. Bacteriological analyzes were also evaluated separately. The residual chlorine parameter, which is used to control the disinfection, was evaluated alone. Organic Matter analysis results between June-2007 and March-2008 were evaluated. In the drinking water network of Hadim district center, the results of the organic matter analysis made in the 10-month period were found even at low values in certain periods. While organic matter was not found in July, November, December and February, it was found at low rates in other months. However, since these values are below the normal values; The drinking water of Hadim District center is at the desired drinking water quality level in terms of organic matter.

Bacteriological Analysis Results of Hadim Drinking Water Network Regarding Monthly E. Coli

The numbers of E. coli in 100 ml determined as a result of the bacteriological examination of the monthly water samples taken from 5 points are given in Table 1.

Table1. E. coli results per 100 ml counted at points from June 2007 to March 2008.

Sampling period	Sampling point-1	Sampling point-2	Sampling point-3	Sampling point-4	A Sampling point-5
	Prefecture	Central Pri.Sch.	Municipality Hotel	Hospital	A. Hadim Mosq
June	240 +*	240 +	240 +	240 +	240 +
July	240 -**	-	-	23	-
August	-	-	-	23 -	-
September	-	-	-	-	-
October	-	-	-	-	-
November	240 +	240 -	240 -	240 -	240 -
December	-	-	-	-	-
January	-	-	-	-	-
February	-	-	23 -	-	23 +
March	240 -	240	23+	23 +	240

* + sign indicates that reproduction continues.
** - sign indicates uremia has stopped.

No bacteriological findings were found in the analyzes performed in September, October, December and January. In June and March, E. coli was found at all sampling points in the drinking water network. In the remaining months, while E. coli was detected at some points, it was not detected at some points. This suggests that the

drinking water network was subsequently contaminated at some points. While the hospital point is the most polluted point bacteriologically, since five of the 10 measurements made, there is a pollution indicator, while the Central İÖO. point was determined as the cleanest point with 3 pollution indicators.

As a result of the analyzes made, in the 3rd week of June, 1st and 2nd week of July, 3rd and 4th week of August, 4th week of September, 1st, 2nd and 3rd week of November, December, No chlorine was found in the mains water in January, February and March. In the 1st week of September, it was found only in the 1st spot, but not in the others. In the 2nd week of September, it was absent in the 1st point, while it was found in the others. In the 3rd week of September, it was found in the 5th position, but could not be found in other points. It was found in the first 4 spots in the 1st and 2nd week of October, but it could not be found in the 5th spot. The amount of chlorine required in the samples taken at all other points was determined. According to the results and as a result of the researches, the disinfection method in the mains water of Hadim district is carried out randomly and far from scientific techniques.

Conclusions and Recommendations

The absence of disinfection in warehouses and networks in December, January, February and March carries a great risk for the public. The presence of chlorine in the samples taken from the points in some weeks indicates that the disinfection was carried out irregularly and uncontrolled during the months. According to the results, it is understood that the current disinfection system used is insufficient and ineffective in terms of protecting the health of the public. We can list the reasons why many water samples taken from the mains could not meet the drinking water standards in terms of bacteriology as follows:

Water resources are dirty or polluted in the area where they originate. Disinfection (Chlorination) is not done in accordance with scientific techniques. Since the network is very old and not constructed properly, there is leakage into the drinking water pipes either from the sewerage or wastewater puddles.

Suggestions

Persons responsible for disinfection application must be qualified and at least trained. Permanent staff should be assigned. Chemical, physical and bacteriological analyzes should be done continuously and precautions to be taken for changes should be planned in advance. Urgent solutions should be sought for chlorination, which is not done in the face of freezing and excess water in winter. Necessary thermal insulation must be provided for the chlorinator. In addition, chlorination techniques should be investigated and a more effective technique and device suitable for the warehouse and network should be used. Extra new tanks should be made in order to remove chlorination and turbidity.

Author contributions:

Sukru Dursun: Conceptualization, Methodology, -Reviewing and Editing; **Abdurrahman Sarcan:** Investigation, Experimental work, Writing-Original draft preparation, Conclusion.

Conflicts of interest:
The authors declare no conflicts of interest.

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