

Educating Delmarva Residents on Drinking Water Quality

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Abstract

A large majority of Delmarva residents rely on a private water system for their drinking water supply. The homeowners are solely responsible for managing the quality of their private water well to ensure that it meets drinking water safety standards set by their state. Proper water system maintenance and/or improvements are sometimes not made due to a lack of knowledge and/or financial assistance. Safe Drinking Water Clinics were conducted at the University of Maryland Eastern Shore to educate rural homeowners about how to avoid, detect, and treat contaminants that may affect the quality of their drinking water. All of the participants received a free water analysis of their home drinking water supply. Each sample was tested for the following parameters: pH, Total Coliform, *E. coli*, Nitrate, and Total Dissolved Solids. Of the 45 water samples tested, 30 failed to meet the drinking water standard for Total Coliform, 16 tested positive for *E. coli*, and 14 failed the standard for Total Dissolved Solids. All of the samples met the standard for nitrate. Pre- and post- tests were also completed by all of the participants to determine their level of knowledge before and after the clinic. There was an 86 % increase in the post-test scores, which indicated that the participants learned new knowledge about proper testing and maintenance of their private water system. Forty participants also completed a well owner survey before the clinic, which indicated that 17 residents had never tested their drinking water and 18 had only tested their drinking water once. Due to the high percentage of water samples failing to meet drinking water safety standards and the responses of the well owner survey, outreach programs will continue to educate residents of the Eastern Shore of Delmarva about how to properly maintain and protect their private water system.

Introduction

A large majority of Delmarva residents rely on a private water system for their drinking water supply. However, unlike public water systems that receive routine testing and treatment, the homeowner is solely responsible for managing the quality of their private water well to ensure it meets drinking water safety standards set by the state. The potential for contamination of drinking water in a private well is extremely high since it is obtained largely from wells that may be shallow or may not have proper wellhead protection. These water sources are exposed to runoff and other types of point- and non-pollution from surrounding sources, which could contribute to bacterial contamination including *E. coli* and other harmful contaminants such as nitrates, lead, iron, and arsenic. The Delmarva residents may not realize that chemicals, fertilizers, and activities in and around their home could present potential threats to their drinking water. Proper water system maintenance and/or improvements are sometimes not made due to a lack of knowledge and/or financial assistance. Therefore, water quality education is warranted to provide residents with valuable information on their private well system. Safe drinking water clinics were conducted at the University of Maryland Eastern Shore, Department of Agriculture, Food, and Resource Sciences to educate rural homeowners about how to avoid, detect, and treat contaminants that may affect the quality of their drinking water.

Objective

This project seeks to improve water quality in private water systems on Delmarva (lower eastern shore) by educating rural residents and providing them with necessary information and tools needed to properly manage their private water supply.



Figure 1: Delmarva residents participating in a safe drinking water clinic held at the University of Maryland Eastern Shore

Materials and Methods

Water Sampling

Three safe drinking water clinics (Dec. 08, May. 09, and Dec. 09) were held at the University of Maryland Eastern Shore. All of the participants received a free water analysis of their home drinking water supply. Each supply was tested for the following parameters: pH, total coliform bacteria, *E. coli* bacteria, nitrate, and total dissolved solids. The clinics were advertised and interested participants were asked to register for the clinics. Sampling kits were mailed a week before the clinic and included proper sampling instructions. The kits consisted of two sterile 100 ml water bottles, an ice pack, sampling instructions, a well owner survey and a consent form. The residents were instructed to collect their water sample and place on ice before they left their home to attend the clinic.

Safe Drinking Water Clinic

During the 2-hour clinic, the residents were educated on the following topics: proper well maintenance, land use impacts, wellhead protection, water testing and interpretation, solving water problems, and water conservation. The residents were also provided with information and resources to properly manage their private water supply. During the clinic, the residents completed a pre- and post-test to determine their level of knowledge before and after the clinic. An evaluation survey of the workshop was also conducted. Follow-up surveys were emailed (using survey monkey) or mailed 4-6 months after the clinic to evaluate any behavior changes.

Water Analysis

The water samples were processed immediately after the clinic. M-ColiBlue 24 broth, sterile disposable filtering system, forceps, and petri dishes were used to accurately monitor and evaluate total coliform and *E. coli* in the first 100 ml drinking water sample. The samples were inverted and incubated at 35o C for 18-24 hours. The second 100 ml water sample was analyzed for nitrates, pH, and total dissolved solids using a VWR SympHony meter. The water test results were mailed to the clinic participants one week after the safe drinking water clinic.

Results

Well Owner Survey (40 respondents)

- In what county is your well located?
 - 26 Somerset
 - 5 Wicomico
 - 2 Dorchester
 - 7 Other
- Water Testing History
 - 17 Water has never been tested
 - 18 Water was tested once
- How concerned are you about the quality of the water coming from your private well?
 - 13 Very Concerned
 - 9 Somewhat Concerned
 - 13 A Little Concerned

Water Analysis Results (45 samples tested)

- 30 Failed to meet the drinking water standard for total coliform
- 16 Tested positive for *E. coli*
- 14 Failed the standard for total dissolved solids
- 0 Failed to meet the nitrate standard
- 14 Failed to meet the pH standard

Pre- and Post-Test (43 respondents)

- There was a 86% increase in the post-test scores which indicate that the participants learned new knowledge about proper testing and maintenance of their private water system

Program Evaluations (45 respondents)

- 22.2% rated the clinic as “excellent”
- 46.6% rated the clinic as “very good”

Respondents (#)	Activities residents plan on doing to their well within the next six months
24	I plan on getting my water tested
3	I plan on shock chlorinating my well or spring
4	I plan on installing a sanitary well cap on my well
25	I plan on inspecting my well to ensure it is properly constructed to prevent contamination
28	I plan on being more careful with activities within 50 feet of my well or spring
13	I plan on seeking more information about water treatment devices
3	I plan on purchasing a water treatment device
8	I plan on taking some other action
6	I don't plan on taking any action on my water supply

Table 1: Program evaluation responses

Follow-up Evaluations (14 respondents)

County of Residence	Number of Respondents
•Somerset	11
•Wicomico	2
•Sussex	1

Questionnaire

- In general, how concerned were you about your drinking water supply before attending this clinic?
 - 42.9% Very Concerned
 - 28.6% Somewhat Concerned
 - 28.6% Not Concerned
- How would you best describe the clinic you attended?
 - 85.7% Very Helpful
 - 14.3% Somewhat Helpful
 - 0% Unhelpful
- Since attending the clinic, select any action that you have taken on your water supply that you would not have taken previously.

Respondents (#)	Activities residents plan on doing to their well within the next six months
6	I have tested or plan to have my water tested
3	I have shocked or plan to shock chlorinate my well or spring
2	I have inspected or plan to inspect my well or spring to ensure it is properly constructed to prevent contamination
7	I have been more careful with activities within 50 feet of my well or spring
4	I have researched or plan to seek more information about water treatment devices
2	I have purchased or plan to purchase a water treatment device
1	I have taken or plan to take some other action
3	I don't plan on taking any action on my water supply

Table 2: Follow-up program evaluation responses

Conclusion

- The results indicated that the residents gained new knowledge about their private water system.
- The results also indicate that the residents had taken or plan to take some action on their private well system, which reveal behavior changes.
- The majority of the participants felt that the safe drinking water clinic was very helpful.
- Due to the high percentage of water samples failing to meet drinking water safety standards and the responses of the well owner survey, outreach programs will continue to educate residents on the Eastern Shore of Delmarva about how to properly maintain and protect their private water system.

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