Comments on Uranium Concentration in Groundwater in Hisar City, India

Dear Editor,

I read with interest the paper on uranium in groundwater in Hisar city, India, recently published in *The IJOEM*.[1] Based on my experience, I would like to share some of my observations. In the manuscript, the details of sampling, composition of samples (pH, conductance, major cations and anions, fluoride, *etc*), period of sampling, time interval between water collection and analysis, details of instrument used, fluorescence enhancing reagent, and methodology adopted for analysis, should have been included.[2,3] The presence of fluoride in the sample might significantly affect the uranium content.[4,5] Water sample pH, uranium/conductance ratio, salinity, and alkalinity, among other important factors, should have also been mentioned in the report; these factors are the most significant aspects in ascertaining the potential of uranium presence in water samples. The reliability of the technique used and quality of the measurements depend on strict adherence to each step of sampling, preservation of samples, time interval between sampling and analysis, and on the methodology adopted, and not solely on the person who analyzes the samples and the laboratory or technique used.[4-5] Furthermore, in Figure 1 of the article, the error in the measurement (error bars) should have presumably depended on the concentration of uranium—while it is not.

In view of the above-mentioned points, the conclusions drawn based on such measurement results will be incorrect, highly misleading and unjustified. Therefore, I request the authors kindly further document the reliability of their findings.

Conflicts of interest: None declared.

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For more information on uranium concentration in groundwater in Hisar city, India see www.theijoem.com/ijoem/index.php/ijoem/article/view/374

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Authors' Reply

Dear Editor,

In response to the comments of Dr. Rathore on our recent publication in *The IJOEM,*[1] he should be aware that this article has been published as a Correspondence, which has a word limit of only 1000 words. This is why we could not mention all details and hence gave a reference where the interested readers can refer to. This work is part of a large study which has been undertaken at State level.

The uranium concentration in groundwater was quantified using laser fluorimetry (Model UA-1, Quantalase, Indore, India) employing standard spiking method to avoid any matrix interference. There are standard protocols for uranium quantification that have been reported in our earlier publications.[2,3] The method used for sampling, quality assurance and sample analysis is as follows. The water was left to run from the sources for about 10–15 min until temperature, conductivity, and pH were stabilized. To avoid wall deposition in the sampling equipment, water samples were collected in acid-washed polyethylene bottles. The samples were collected by holding the bottle at the bottom to avoid any contamination. The samples were analyzed within 6–12 h of collection. The minimum detection limit (MDL) of the instrument was 0.2 µg/L. To avoid error due to different uranium complexes, sodium pyrophosphate reagent was used; it converts various complexes into a single form having the same fluorescence yield. All the working standards were prepared from stock solution of uranium of 1000 µg/L for calibration and checking performance of the instrument. Five percent sodium pyrophosphate solution was used for the formation of stable uranyl-phosphate complexes and fluorescence augmentation reagent. The pH of the reagent was maintained at 7.0 by ortho-phosphoric acid; 0.1 M HCl, 0.1 M NaOH was used for adjusting pH of the samples.

The water samples were filtered using Whatman filter paper No. 42. Five mL 5% sodium pyrophosphate (pH 7.0) solution was added to 50 mL of the water sample; pH of the mixture was adjusted at 7.0 using 0.1 M HCl. To avoid the matrix interferences, standard spiking method was used for uranium quantification of the water samples as reported earlier.[4] The laser fluorimeter was calibrated with 1.0, 3.0, 5.0, and 10.0 µg/L standard solutions of uranium; reagent blanks were run with water samples to ensure the accuracy of the results. All samples were analyzed in triplicate and the presented results were the mean of the three measurements.

The accuracy of the results was verified by inter-laboratory comparison method. Some randomly selected water samples were re-analyzed at Bhabha Atomic Research Centre, Mumbai, India. The results of both laboratories were in good agreement with ±10% variation in the results.

Error bars in the diagram represent the 95% confidence interval for the mean concentration of water samples measured at each place (reflecting the uncertainties in the measurement in different replicates of a sample). It is not necessary that bars are concentration-dependent.

Our laboratory is well-equipped with state-of-the-art facilities in nuclear counting. The staff is well trained at BARC, Mumbai and other nuclear power plants in India where such monitoring is done on regular basis.

It is very easy to point out the hypothetical mistakes in any research. It is however, very difficult to do field studies and answer such hypothetical questions. While

surfing the Internet, we found that Dr. Rathore has given similar comments on many other publications on the topic and received almost similar replies because it is not possible to publish every minute detail of a well-known methodology in each article. While constructive comments are welcome, it is better to believe the fellow scientists who are using the available standard protocols, and not to give sweeping statements that data or results are "incorrect, highly misleading and unjustified" solely based on hypothetical imaginations.

Conflicts of interest: None declared.

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