THE APPLIED ICOH DEFLUORIDATOR

S Rajchagool*
Thailand

SUMMARY: The ICOH defluoridator has been accepted as appropriate technology. It uses charred bone meal which is prepared by heating, in an electric furnace. After ten years of using the ICOH defluoridators in the community, the problem of dental fluorosis is still unsolved. This project was carried out by three high school children, who improved the ICOH defluoridator by making it simple. This paper shows 1) the effectiveness of the student-made defluoridator, 2) the potential of the villagers in solving a problem which concerns them. The paper demonstrates that development of human resources is a very important point in solving any communities' problems.

Key words: defluoridator, dental fluorosis, bonechar.

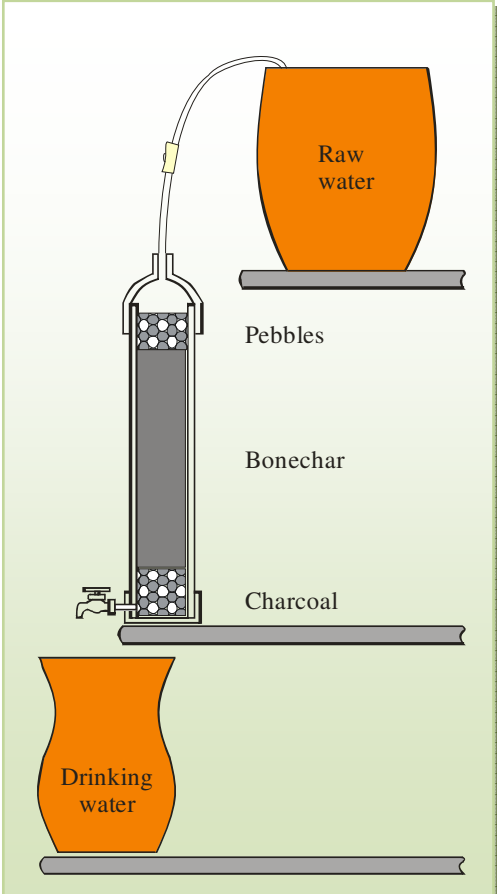

FIGURE 1. The original ICOH defluoridator.

INTRODUCTION

The ICOH defluoridator was developed in co-operation by the Intercountry Centre for Oral Health, Chiang Mai, the Dental Faculty of Chulalongkorn University and the World Health Organisation more than 10 years ago[1]. The defluoridator suitable for individual households, is based on the filtration and absorption principle and uses charcoal and bonechar.[2] (Figure 1: The ICOH defluoridator) bonechar used in the ICOH defluoridator is prepared by bone meal of 40 - 60 mesh size, produced for agricultural or industrial purposes. The bone meal is activated by heating in an electric furnace to a temperature of 600 °C for 20 minutes. The bonechar of the ICOH defluoridator remains active for 1 - 3 months, depending on the initial fluoride level and the amount of water consumed. The filter of the defluoridator has to be periodically changed. Ready-to-use filter bags prepared by ICOH were sold to the villagers. After several years, ICOH was no longer able to supply the ready-to-use filters to the community. Children born during the period of the experiment still have dental fluorosis, so the problem remains unsolved.

* Intercountry Centre for Oral Health, Chiang-mai Lumphun Rd. Nong Hoi, Muang, Chiang Mai 50000, Thailand.

One weak point of the original ICOH defluoridator is the method of preparing the bonechar which has proved inappropriate. The electric furnace used in burning bone meal is expensive and the villagers cannot produce bonechar themselves.

This project was initiated by three high school children who live in a high fluoride area. With the assistance of ICOH, they made their own defluoridator. Their approach was that a defluoridator made by themselves will be used, and that the technology will be appropriate for their community, and their lifestyle. This study was designed and run by the students in order to determine the effectiveness of the defluoridator.

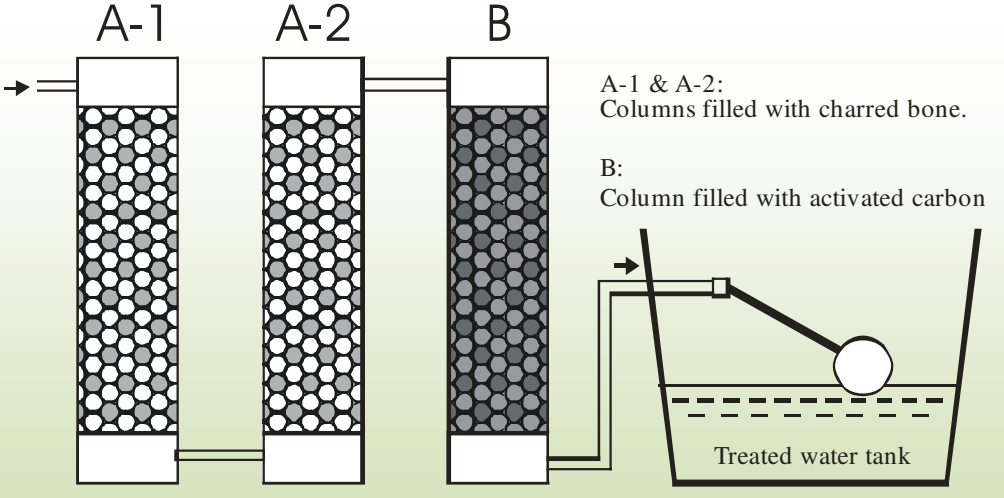

FIGURE 2. Schematic presentation of the applied ICOH defluoridator.

MATERIALS AND METHODS

The details of the Applied ICOH defluoridator are shown in Figure 2. Bonechar was prepared by burning fresh bovine bone, bought from a market, in outdoor until it turned black. When cooled it was crushed into small pieces of 0.5 cm in diameter. Cylinder A1 and 2 were filled with 10 litres of black bonechar. Cylinder B was filled with 4 litres of resin and 4 litres of activated carbon. Two sources of water were used in this experiment; water from a 120 m deep artesian well in the school grounds and a 50 m deep artesian well in the temple grounds. The fluoride concentrations were measured at the Faculty of Science, Chiang Mai University, with a fluoride electrode. The defluoridation efficiency of the defluoridator was examined at the following flow rates: 15, 12, 6, 4, 3, and 2 l/h. Water samples were kept in plastic bottles, containing 750 ml.

RESULTS

Results of measurements after filter A1 and A2 are presented in Table 1. All results are averages of four repetitions of sampling, the standard deviation being 7 % in average.

TABLE 1: Results of defluoridation by column using various flows with water from two sources.

Measured water	Flow	Water from School		Water from Temple	
	L/h	mg/l	St..Dev.	mg/l	St..Dev.
Raw water	-	8.3	±0.2	4.3	±0.3
After A1	15	6.6	±0.2	2.6	±0.1
After A1+A2	15	5.3	±0.1	2.0	±0.1
After A1+A2	12	1.0	±0.1	1.2	±0.1
After A1+A2	6	0.68	±0.09	0.69	±0.08
After A1+A2	4	0.59	±0.03	0.49	±0.03
After A1+A2	3	0.40	±0.05	0.42	±0.02
After A1+A2	2	0.23	±0.03	0.38	±0.02

DISCUSSION

The results show, that after the water has flown through the first of the two cylinders (A1) at the rate of 15 l/h, the concentration of fluoride was reduced but the concentration was still higher than standard. After the second cylinder (A2) the concentration of fluoride was further reduced but not sufficient. In order to gain an acceptable concentration of fluoride in the water, the flow of water must be adjusted. According to this experiment an adjustment of the flow rate to 6 l/h, gave adequate reduction in the fluoride concentration in the water from both sources (down to about 0.7 mg-F/l). The flow rate of 6 l/h are considered to be optimal for the designed filter. After passing the third cylinder (B) filled with activated carbon and resin, the aesthetically quality of the water was tested. The water had no smell and was suitable for drinking.

This defluoridator is better than the original ICOH in three ways 1) It can be made in the villages with local materials. 2) It gives an optimum concentration of fluoride 3) It provides ready to drink water, stored in a storage tank with an automatic switch. The lifetime of the charred bone meal and the biological properties of water was not tested in this experiment.

The main point of this paper was to show the potential of the villagers to solve their own community problems. The ICOH company assisted the school children, only by information about the ICOH defluoridator. The design of the applied defluoridator and plan for the experiment were the school children's own work. Their work demonstrated that villagers can solve problems appropriately. The technology the villagers use must be appropriate technology for that specific community, though It may not be appropriate in other communities. However, development of human resources is very important in solving any communities' problems.

REFERENCES

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