

## Southern Thailand Experience on Combating Fluorosis

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**SUMMARY:** In 2001 dental fluorosis was unexpectedly reported in school children in a southern district of Thailand, where fluorosis otherwise was unknown. A regional survey was carried out and a mitigation project was initiated in one of the affected villages. It was found that, within the past 10 years, the villagers had shifted from using harvested rainwater and shallow well water into using municipal piped water and private well water, both based on high fluoride deep ground water.

A baseline survey showed that the prevalence of dental fluorosis was 28 % among the children, some of who were found with severe Dean's index scores. The fluoride concentrations in the village's water supply ranged from 4 to 7 mg/L.

The project adopted a strategy of creating awareness and leaving it to the villagers themselves to decide about the preventive measures that fit with their daily habits and economy.

Due to the initiated project, a year later, comprehensive awareness of the fluorosis problem was achieved and the use of low fluoride water for drinking was significantly increased. In particular the school- and the day center changed from using the deep well high fluoride water, to water of low fluoride contents, i.e. 0.05-0.4 mg/L. It is concluded that the project has made a successful start that can be duplicated in neighbouring villages.

It is discussed that good coordination, easy understandable communication to beneficiaries and simplicity and appropriateness of the presented measures are some of the key factors of the encountered success.

**Key words:** Community approach, success criteria, fluoride occurrence, dental fluorosis, water supply, shallow wells, rainwater harvesting, deep wells, water use, bottled water, Thailand.

### INTRODUCTION

Songkhla is a province located in the South of Thailand. Its population is 1.28 million<sup>1</sup>. In 1996 the Songkhla provincial health office carried out a water fluoride survey covering all its 16 districts. A fluoride map of Songkhla<sup>2</sup> was made for the first time. However, dental fluorosis was yet not reported, even though it became known that some villages had high fluoride in their water sources. This was probably because those sources have not been used for drinking.

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In 2001 the dentist of the district of community hospital reported suspected cases of dental fluorosis among school children in a certain village, Tha Meanglak. An expert dentist carried out an investigation and it proved that the suspected cases actually were dental fluorosis with up to severe Dean's scores. Water samples from the village were analysed and it was found that the forty percents of the village was consuming water with fluoride concentration of 4.95 mg/L<sup>3</sup>.

A mitigation project was set up. Its objective was to find out alternatives to the high fluoride water supplies in order to prevent dental fluorosis in new generation.

This paper illustrates the strategy and efforts carried out so far in order to combat the fluorosis problem in the village.

## METHODS

**Strategy:** The strategy was selected as one baseline survey followed by two informative stakeholder meetings and then two monitoring and evaluation activities.

**Baseline survey:** Baseline community data of Tha Meanglak Village were collected. This included oral examination for dental fluorosis among students in the community's primary school. The Dean's Fluorosis Index was used, modified in one respect, i.e. score 1 indicating primarily fluorosis instead of questionable.

Furthermore drinking water samples were collected from households and the school and analysed for fluoride concentrations.

Also household members were interviewed in order to establish knowledge about the types of drinking water consumed.

**Stakeholder meetings:** The dentists and health personnel facilitated a meeting between stakeholders and related government organizations to gather their proficiency and resources. Altogether these are dental and sanitation team from Provincial Health Office, financial and technical support from the Dental Health Division and the most important group is the local team including personnel from the district hospital, health centres, teachers and Local Administrative Organization and representatives from village households.

Two meetings were arranged in the village, both of about 4 hours duration. The first one was among key persons and Local Administrative Organization members and the second among villagers and key persons. In the meetings selected knowledge was presented. This included:

- General information about dental fluorosis and its aetiology.
- General information about fluoride and its environmental occurrence.
- Survey data about the prevalence of dental fluorosis in the village.
- Survey data about the fluoride concentrations in the village's drinking water.
- Information about fluorosis mitigation methods.

This was followed by a discussion of what actually can be done in order to combat the problem. The second meeting is held with all villagers in attempt to get full participation and to ensure co-ordination. In this meeting, in addition to the above given issues, more technical information was given on how to collect hygienic rainwater, how to treatment fluoride water and how to improve shallow wells.

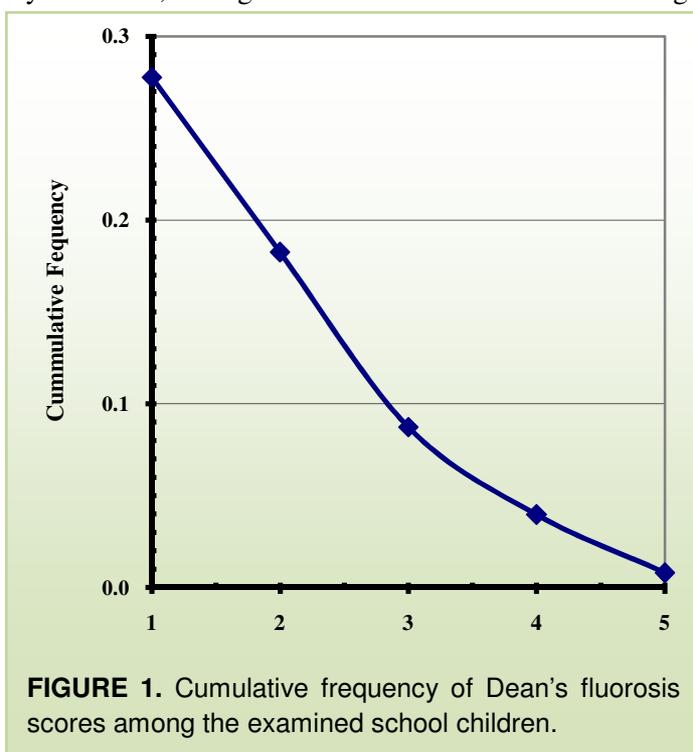
Monitoring and evaluation: The follow up is set up as two activities of monitoring and evaluation. These took place 6 and 12 months after the initial baseline study and the educational meetings. Health workers and village health volunteers collected data of community water sources and the water consumption behaviours of the villagers.

### RESULTS

**Fluorosis prevalence:** Out of 126 children in the primary school, belonging to 4 different villages and all of age 6-12 years, 35 children, approximately 28 %, had dental fluorosis of primarily or above, cf. figure 1. The affected children belonged mostly to the Tha-Maenglak Village.

**Fluoride water use:**

The results of the fluoride testing in the village water sources and supplies are given in table 1. Fluoride concentration in the village's water supply ranged from 4.45 to 6.85 mg/L, however, many households had private deep wells of 30 meters or more, installed with electric pumps. The water of these wells contained fluoride of 4.6 mg /L.



**FIGURE 1.** Cumulative frequency of Dean's fluorosis scores among the examined school children.

The public water well contained fluoride of 4.45 mg /L.

Shallow wells were common as a drinking water source in the past. At present some still exist in or nearby the houses. Some wells that are still in use and contained fluoride of 0.11 to 0.57 mg/L. Some villagers improved their seasonally drying shallow wells by drilling boreholes through the existing dug wells. In this way the reliability of the well was ensured but the well water became a mixture of low fluoride surface- and high fluoride ground water.

Table 1 shows that also bottled water and rainwater, both having low fluoride contents, were used in the village. The baseline study showed that out of 161 households about 30 % of the villagers consumed high fluoride water supply.

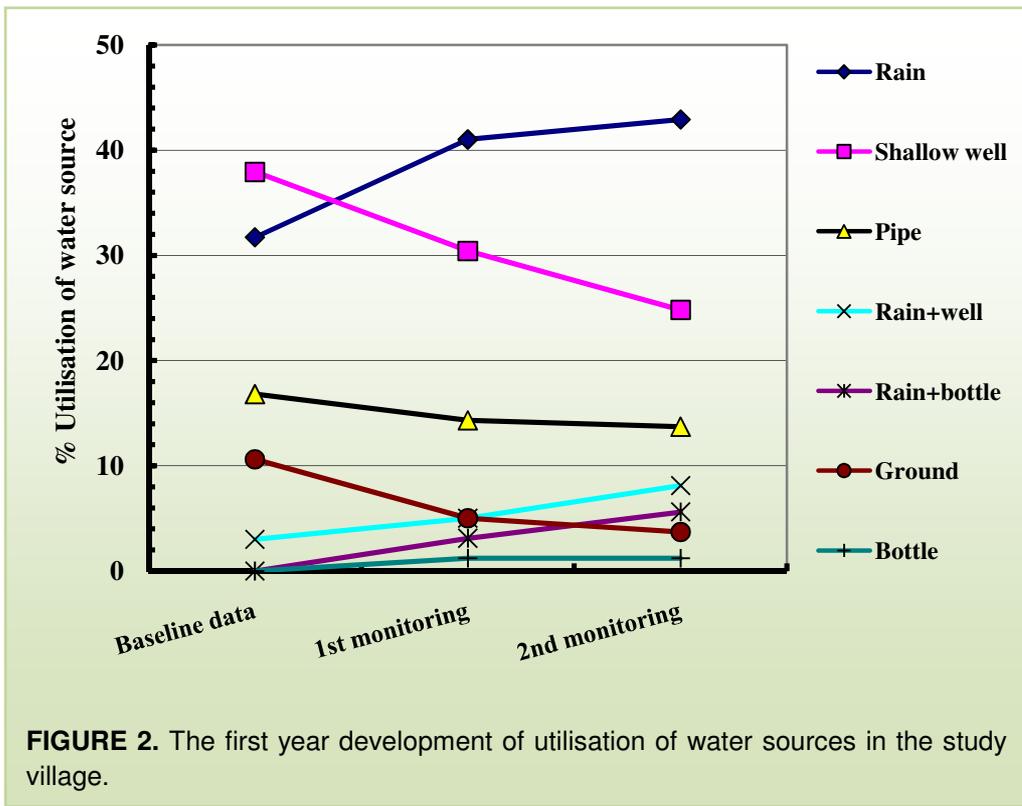
**TABLE 1:** Baseline data on fluoride in water sources and supplies of the studied village.

Supply & Source	mgF/L
<b>Public Supplies:</b>	
Deep well water used for village piped supply	3.45 - 4.75
Artesian borehole well with hand pump	4.45
Deep well water used for the Primary School piped supply	6.85
Deep well water in Day Care Centre for 3-5 years Children	4.95
<b>Private Supplies</b>	
Deep well water with motor pumps in village households	1.18 - 5.47
Shallow wells with household motor pumps	0.11 - 0.57
Shallow well water used earlier in village households	0.08 - 0.41
Bottled water	0.06 - 0.40
Harvested rain water	0.05 - 0.32

The survey revealed that the primary school, with its 6-12 years old children, consumed the piped water supply containing 6.85 mgF/L. Furthermore, that the school has been using this water supply for the last 5 years. The supply is based on ground water from a deep well. The school had rainwater-harvesting containers, but these were used for storage of ground water instead.

Also the village's day-care center, with 3-5 years old children, had large concrete rainwater containers. Even though the center is supported by and attached to the village temple, it also had containers that were used for storage of water from the deep well and this fault has been going on for some years. The water contained fluoride at level of 4.95 mg/L.

**Meeting resolutions:** The first meeting resulted in a decision that dental fluorosis is an issue of priority for the community and that the villagers should be informed about facts and data of dental fluorosis in the village. Hereafter, in the second meeting, the health workers and community leaders should persuade the villagers to change their drinking water sources, from deep ground water to rain water or shallow wells.



One of the main outputs of the second meeting was the community’s decision about the change of the water source for the primary school and day care center. Rainwater should be harvested and used as a first choice. Then more rainwater containers should be provided. The villagers, especially those who have children less than 8 years old, would change their drinking water to rainwater or bottled water or improving shallow well in their houses.

Another conclusion was for the village health volunteers to distribute the information to the other villagers who could not come to the meeting. At the same time the local administrative organization would search for new source for the village pipe scheme.

**Monitoring and evaluation:** The monitoring, 6 and 12 months after the meetings, could reveal the changes and the improvements achieved as follows:

- In the primary school rainwater containers were cleaned and taken in to use for storage of rainwater. The rainwater was then used by the school children for drinking. Due to the schoolteachers' encouragement the children abandoned the pipe water and were now consuming harvested rainwater instead of deep well water.
- At the village day care center, children brought their water from their homes.
- The household survey revealed that many people were more concerned of dental fluorosis and has changed their water sources. The number of families drinking rainwater was increasing, cf. figure 2.
- The village pipe scheme was still utilising high fluoride water but village administrative committee continued to search for alternative water source.
- Plans were made for future yearly combined surveillance of the dental fluorosis and fluoride contents in the village drinking waters.
- Utilising the gained experiences, plans were adopted to propagate the same strategy to neighbouring villages.

## DISCUSSION

Obviously the sudden prevailing of dental fluorosis in Southern Thailand is to be attributed to the shift in use of water sources that has been taking place during the recent decade or so. As a part of what was believed to be a good development, the villager, who used harvest rainwater and utilise shallow well water for drinking, have changed their habits into using municipal piped water and private deep well water. Until recently it was unnoticed that both these waters contained high fluoride concentrations, 5 - 7 mg/L. Thus dental fluorosis appeared as a new calamity, total not-understood by the local people.

A year after the initiation of the Tha Meanglak village project, comprehensive awareness of the fluorosis problem was achieved among the village people. This was also expressed through the general increased use of low fluoride water for drinking. In particular the school- and the day center changed from using relatively high fluoride water, to water of negligible fluoride contents, i.e. 0.05-0.4 mg/L. Thus it may be concluded that, though the fluorosis problem was not yet solved in the village within this short period, the project in total constituted a successful start.

It is believed that this immediate success is attributed to some main factors, observed as follows:

- A strategy that relies on the dental and local health personnel only as facilitators and the beneficiaries taking their own decisions in agreement with their own way of life and economy.
- An educational and easy understandable information and presentation of knowledge to the given community.

- The simplicity and technical appropriateness of the presented measures.
- A good coordination between the related sectors.
- A full mobilisation and active participation of key persons and villagers.
- A commitment among the dental and local health personnel.
- In spite of the immediate success, it is believed that an appropriate follow up of motivation and monitoring would be needed if the prevailing fluorosis is to be eradicated.

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