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Local adaptation of WHO’s sanitary inspection for drinking-water quality in Grande Mefou, Cameroon

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Editor’s Note: This issue of SCN News begins a series of articles on water’s role in promoting health and nutrition. Contaminated or unsafe water supplies can compromise nutritional status, especially in vulnerable groups such as children. Proper water and sanitation systems must be promoted in order to reduce the number of diarrheal incidences and parasitic infections. In the two articles below, authors discuss methods of determining drinking-water quality and methods of water disinfection. Emphasis is placed not only on the quality of water at the source, but also on the point of use, including water transportation. The next series of articles in SCN News #28 will discuss SODIS, an effective method of water disinfection.

Although considered a human right, the provision of adequate drinking water is a major problem in developing countries. Water related diseases cause the death of more than 3m people each year. In Cameroon, water quality is a major health problem; only 54% of the total population has access to drinking-water (39% in rural areas). The Grande Mefou is a tropical humid region situated in south-eastern Cameroon. Access to water is difficult, with long distances between water holes and habitations and uneven ground. There are few roads and loads are carried by women and small children.

In this study, water quality of covered hand-pump wells of the Grande Mefou was evaluated for the first time using bacteriological analyses (thermo-tolerant coliforms). The World Health Organization’s (WHO) Guidelines for drinking water quality provide an example sanitary inspection form (see check-list 1, page 63) to help collect information regarding specific points of risk to the water supply. These sanitary inspection procedures were compared to bacteriological analyses, resulting in no correlation between the two methods. Since the sanitary inspection form did not seem to represent the situation of the wells in Grande Mefou, new criteria (the modified sanitary score, page 63) have been proposed. Further, the importance of adapting criteria and health education messages to local situations is discussed.

Methods and results

In March 1996, 37 covered hand-pump wells were subjected to a sanitary inspection in Grande Mefou. These wells were chosen for their proximity to a sanitary structure (e.g., dispensary, small hospital) and each served a population of between 100 and 1000 people. The sanitary inspection consisted of an evaluation of the exterior aspects of the wells and their close environment. This allows for identification of wells that are likely to pose an actual or a potential danger to the health of the consumer.

The sanitary inspection form for a tubewell with a hand-pump was taken from WHO’s Guidelines for drinking water quality (see check-list 1). Since none of the examples given in the Guidelines were similar to our local situation, the closest was chosen. The hazard (high, medium, small risk) attributable to the source and supply was quantified by using the contamination risk score proposed by WHO. The sanitary inspection was then compared to bacteriological analyses performed the same day. Thermo-tolerant coliforms bacteria was used as an indicator of faecal contamination of water.

Table 1 WHO’s sanitary inspection score and bacteriological analyses show poor correlation.

<table>
<thead>
<tr>
<th>WHO’s sanitary inspection score</th>
<th>Number of wells</th>
<th>Number of CFU/100ml/ wells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small risk (0-2)</td>
<td>14</td>
<td>14.4</td>
</tr>
<tr>
<td>Intermediate risk (3-5)</td>
<td>20</td>
<td>3.9</td>
</tr>
<tr>
<td>High risk (6-8)</td>
<td>3</td>
<td>9.7</td>
</tr>
</tbody>
</table>

Table 2 A good correlation exists between the modified sanitary inspection score and the bacteriological analyses.

<table>
<thead>
<tr>
<th>Modified sanitary inspection score</th>
<th>Number of wells</th>
<th>Number of CFU/100ml/ wells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small risk (1.5)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Medium risk (2.5)</td>
<td>24</td>
<td>7.2</td>
</tr>
<tr>
<td>High risk (3.4)</td>
<td>11</td>
<td>11.9</td>
</tr>
</tbody>
</table>
Bacteriological analyses was conducted in the field using the Millipore® set membrane filtration method for thermo-tolerant coliforms. The degree of contamination is expressed in colony forming unit (CFU) per 100ml, with 10 CFU/100ml considered tolerable for drinking water quality. The bacteriological analyses show that the 37 wells contained a total of 308 thermo-tolerant coliforms. Approximately one third of the wells contained more than 10 CFU/100ml. As shown in Table 1, WHO's inspection score correlated poorly to the bacteriological analyses. The modified sanitary score, however, correlates well with the bacteriological analyses (Table 2).

### Discussion

The bacteriological analyses showed that approximately one third of the wells contained more than 10 CFU/100ml, which is above the tolerable limit for drinking water. The contamination is most likely the result of infiltration of stool into the ground water, in addition to the poor conditions of the wells resulting from years of wear and tear. The lack of latrines, or their construction in places without precise notions of local hydrogeology, most likely contributes to the infiltration of stool into ground water. Adequate sanitation and education are thus deciding factors in water quality.

More alarming is the major discrepancy between the bacteriological analyses and results of the WHO's sanitary inspection criteria. This is probably due to criteria not representing the reality of the local context. Two points seems particularly pertinent to the infiltration of stools into the well areas. First, areas around the wells were not protected by a fence, hence animals (especially goats and chicken) were allowed to wander freely. Second, there is a hatch located on the cement floor of the wells, which accessed the water.

After observation of the situation of the covered hand-pump wells in the Grande Mefou, a modified sanitary inspection score was proposed, which strongly correlates with the bacteriological results obtained. Yet, the new inspection score is not perfectly adaptable because it does not take in account people's behaviours and habits. For example, even if latrines are situated within 10 meters from a hand-pump, people may choose to use fields located much closer and/or above them. The wells may also be used as bathrooms and/or washing areas. Sanitary inspection should therefore not only take into account the static situation of the wells, but also the dynamics of their use. WHO state that the inspection procedures cannot be widely applicable, but it must also be stressed that any procedure has to be locally validated before utilization. It is therefore very important for local health professionals to be very critical when using such procedures.

This is also true for health education messages transmitted to the population. Many educational messages made by international organizations are widely distributed without being properly tested for their interpretation and comprehension by local populations. In 1986, in the north of Cameroon, Robert et al studied people's knowledge of health and their day-to-day health practices to determine the feasibility of establishing a community-centred system for the monitoring and prevention of schistosomiasis. The goal of their anthropological survey was to devise relevant educational messages and practical educational tools. An analysis of an educational message and its impact on the villagers' comprehension was also assessed. The study raised some fundamental issues concerning the intelligibility of such messages. For example, conventional perspective was a mode of representation not understood by all. A person drawn smaller than another was taken to be a child rather than a more distant adult.

The primary difficulty in health education is its transcultural nature. Interventions should not be implemented in developing countries without a clear understanding of social, cultural, geographical and economic contexts.

### Acknowledgements

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### References


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Check-list 1  
WHO’s Sanitary Inspection (Deep and shallow tubewell with handpump)

A. General Information  
Health Center:……………… Village:……………
Date of visit:……………………
Is water sample taken:  y/n
Thermotolerant coliform grade:………………….

B. Specific diagnostic information for assessment  
1. Is there a latrine within 10m of the handpump?  y/n
2. Is the nearest latrine on higher ground than the handpump?  y/n
3. Is there any other source of pollution within 10m of the handpump? (eg, animal excreta, rubbish, surface water)  y/n
4. Is the drainage poor, causing stagnant water within 2m of the handpump?  y/n
5. Is the handpump drainage channel faulty? Is it broken, permitting ponding?  y/n
6. Is there inadequate fencing around the handpump with which would allow animals in?  y/n
7. Is the cement floor less than 1m radius all around the handpump?  y/n
8. Is there any ponding on the cement floor around the handpump?  y/n
9. Are there any cracks on the cement floor around the handpump which could permit water to enter the well?  y/n
10. Is the handpump loose at the point of attachment to the base? (which would permit water to enter the casing)  y/n

Contamination risk score:  9-10/10=very high; 6-8=high; 3-5=intermediate; 0-2=low


Check-list 2  
IMSP Modified Sanitary Inspection

1. Is there a latrine within 10m of the handpump? Y=1 point
2. Is there a hatch on the cement floor around the handpump? Y=1 point
3. Is there any pooling on the cement floor around the handpump? Y=1/2 point
4. Are there any cracks on the cement floor around the handpump which could permit water to enter the well? Y=1 point
5. Is the handpump loose at the point of attachment to the base? (which could permit water to enter the casing) y=1/2 point

Contamination risk score:  3-4=high; 2-2.5=intermediate; 0-1.5=low. A score of 2.5 or more implies a bacteriological analysis.