Jolivert Project Assessment - May 7-10, 2005

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The Jolivert Safe Water for Families (JSWF) Project is an in-home water purification project for families in northern Haiti that began in September 2002 with 200 pilot project families. The project is located at, and sponsored by, the Missions of Love Clinic in Jolivert. Missions of Love, Incorporated is a faith-based NGO with headquarters in Hartford, Kentucky.

The village of Jolivert is located along the *Les Trois Rivières*, a river that runs about 60 kilometers from the middle of Haiti's northern peninsula to the coast and into the sea near Port de Paix. The clinic is about 3 kilometers south of Bassin Bleu, and a 1.5 hour drive north of Gros Morne.

Sodium hypochlorite solution, branded *Dlo Pwòp*, is produced at the Jolivert Clinic using a hypochlorite generator. Families purchase this disinfectant in refillable 250 ml bottles either at the clinic (at a cost of 3 gourdes per bottle) or from 13 designated resellers throughout the surrounding towns and communities (at a cost of 5 gourdes per bottle, with the margin going toward the reseller). Users add one capful, 6 milliliters, of *Dlo Pwòp* to 5 gallons of water stored in a modified safe storage container, which is provided at subsidized cost to program participants by the JSWF project. The Haitian Administrator of the project keeps track of income, expenses, and supplies. The two Haitian Technicians produce the hypochlorite solution, conduct trainings to bring new families into the program, conduct household visits to provide ongoing training and chlorine residual testing, sell the hypochlorite, and maintain records for the project.

Jolivert Bucket and Solution Bottle

An independent evaluation of the pilot project in January 2003 documented a diarrheal disease incidence reduction of 55% among users. Based on these successful results, the project began organically expanding thoughout the Jolivert area. There are currently approximately 1,000 families enrolled in the program.

In order to have a better understanding of the current state of the project, and to assess the program and provide recommendations for moving forward, Rochelle Rainey (USAID/Washington Environmental Health Technical Advisor), Daniele Lantagne (CDC/Atlanta Safe Water System Staff Engineer), and Bill Gallo (Jolivert Safe Water for Families Program Coordinator) visited the project on May 7-10, 2005 and completed the following activities:

- Review of records maintained by JWSF Haitian Staff.
- Random survey of households in three communities to assess current use of system and whether users are using it correctly.
- Observation of training conducted by JSWF Haitian Staff for new families entering the program.
- Observation of sodium hypochlorite production run.
- Quality control testing of sodium hypochlorite solution.
- Meetings with the JWSF Haitian Staff and the expat Project Director.
- Water testing and meetings at potential new project site in Gros Morne, Haiti.

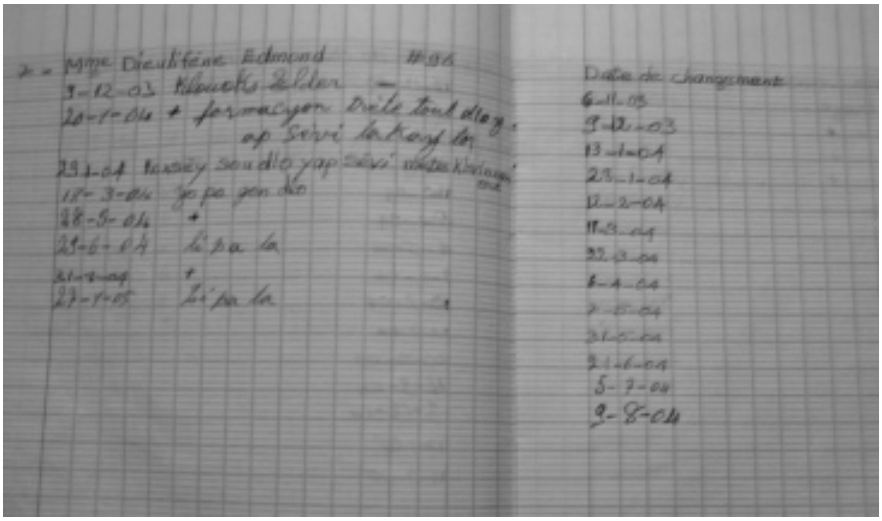
Information learned during these activities is presented in the following sections, and recommendations and conclusions are presented in the last section.

Activity 1: Review of records maintained by JSWF Haitian Staff.

The Jolivert Safe Water for Families staff consists of one part-time Administrator, Christophe, and two full-time Technicians, Madame Evelyn and Renald. The staff maintains an excellent system of paper records that include:

- An accounting program income and debit balance book.
- Information on each authorized program reseller.
- Information on each family who is a member of the program, with name, bucket number, each day of household visit and results of chlorine residual testing, and each day that the family purchased hypochlorite solution from either a reseller or the main clinic. This information is organized by community – each community in the area has one or more school booklets full of individual records of families in that community that are part of this program.
- A log of production of the sodium hypochlorite solution.
- A daily log of sales.
- A weekly summary log of sales.

These records are very well kept and organized. For example, each reseller maintains a list of names of people who purchase solution from them, and delivers this list to the JSWF program staff when they purchase their next container of solution from the clinic. The program staff then enters this information into their community booklets.



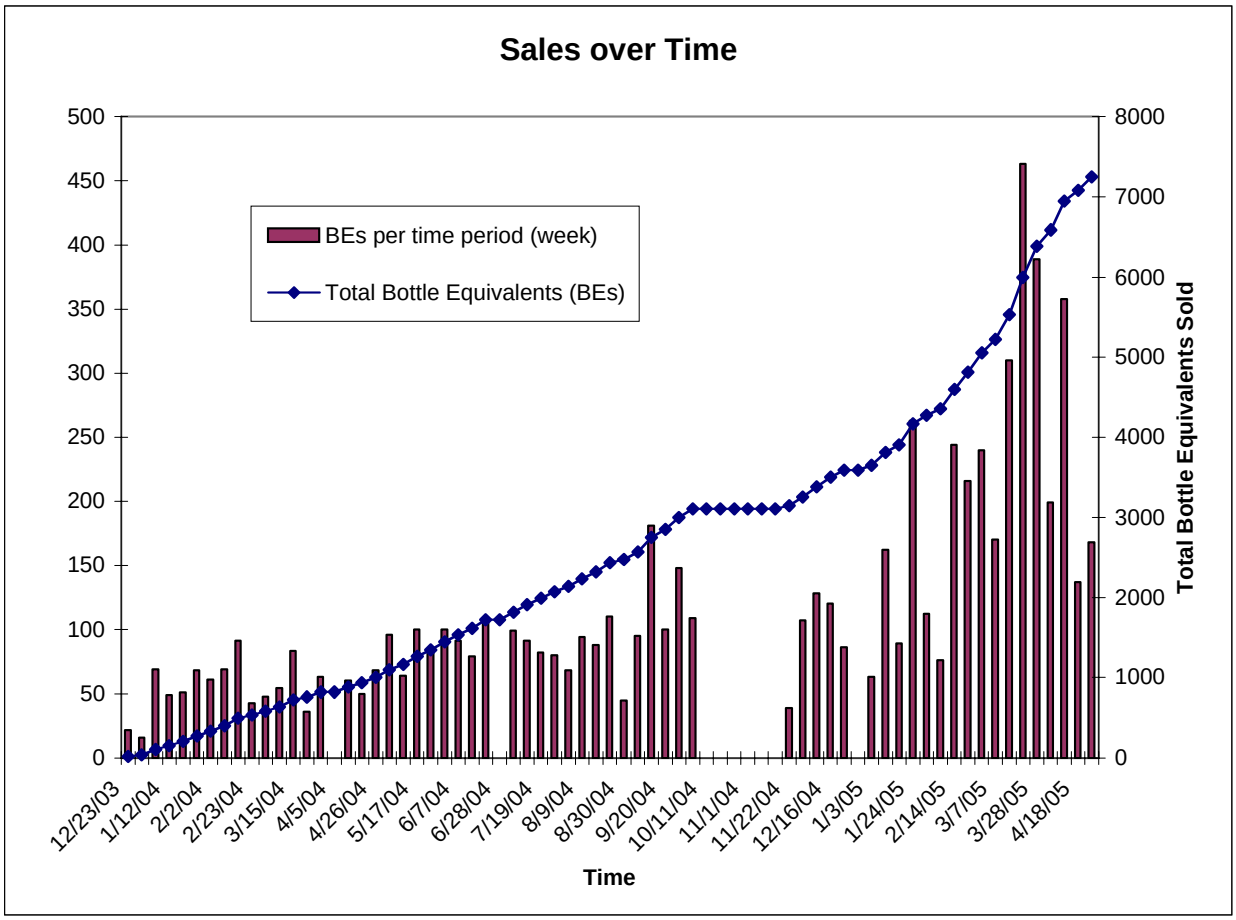
Record for Family #96 –
Showing Household Visitation Notes and Chlorine Residual Results on the left, and Chlorine Purchase Dates on the right

Of note is that as the project has expanded to over 1,000 families the paper system to maintain the records of each individual family is becoming a bit burdensome – as there is a stack of approximately 30 booklets, with 1-2 booklets per community. It is recommended that a database of families be developed that includes all the information already in the booklets and allows the staff to enter in future sales data

and household visit results. Both Christophe and Madame Evelyn have the capacity to use and maintain a database, but not to develop it themselves.

In addition, during the program assessment visit, the weekly sales log information was entered into an Excel spreadsheet to understand sales patterns. The gap in sales data during October – November 2004 is due to the fact that during the hurricane emergency, solution was distributed for free to hurricane-affected families and normal record keeping was suspended.

As can be seen from the graph below, there have been steadily increasing sales since the beginning of this record book at the end of December, 2003. The program is currently selling 150-500 bottles of solution per week, and has sold over 7,000 bottles of solution since December 2003. What is particularly interesting is that the rate of growth of the program (as measured by the slope of the total bottle equivalents sold line) is increasing since January 2005. This potentially could be attributed to two factors: 1) increase awareness of the program after the hurricane response; and 2) availability of a 1-gallon bottle of solution (equivalent to 15 bottles) to more resellers and individuals. Interestingly, this 1-gallon bottle of solution, sold at 50 gourdes (15 bottle equivalents multiplied by 3 gourdes per bottle plus 5 gourdes for the gallon container) is in high demand.



This sales data can be converted into the Population Services International (PSI) indicator *person years of treated water* (PYTW) to give an indication of the success of this program relative to the PSI PuR project. Since it's launch in late 2004, the PSI project has sold approximately 500,000 sachets of PuR – leading to a total of 5,000,000 Liters of treated water provided, and 3,425 person years of treated water. Since late

2004, the JSWF project has sold 3,993 bottle equivalents – leading to a total of 3,327,500 Liters of treated water provided, and 2,279 person years of treated water. Thus, the JSWF project, a small non-national project, is relatively successful compared to the PSI national scale program, as JSWF has had 2/3rd of the impact (according to sales data) of the PSI project in liters of treated water and person-years of treated water.

Activity 2: Random survey of households in three communities to assess current use of system and whether users are using it correctly.

In order to tie the sales data obtained through the records to actual use, a random survey of users was conducted. A cluster sampling model was used. First, three communities were selected based on their relative distance to the Jolivert clinic and center of the program (Jolivert, close; La Hatte, medium distance (approximately 30 minute walk to clinic); Bassin Bleu, further distance (approximately 1 hour walk to clinic)). Using the community booklets that detail each household that is part of the program, five homes and two alternates were selected using Excel's random number generator. During the visit to these five homes (and potentially two alternates if needed) in each community a short survey was administered, chlorine residual was tested using a Lamotte Digital Colorimeter, and a sample of the sodium hypochlorite solution was collected for later analysis of chlorine concentration using the Hach Iodimetric Digital Titration Method. Results of these visits are presented below – please note that only four of the seven random households selected in Jolivert were available at the time of the unannounced visit, and thus the total number of households visited was 14. For the purposes of this reporting, samples 1-5 are in La Hatte, samples 6-9 in Jolivert, and samples 10-14 in Bassin Bleu.

Survey Results

The survey was a series of very short questions administered by Christophe or Madame Evelyn in Creole. Household members were asked how long they have been a part of the program, where they purchase the hypochlorite solution, how often they use the solution, when they last purchased solution, when they last treated their water, if they had any questions or problems with the program, and how long one bucket of treated water lasts. Results from the survey show:

- People are purchasing from the reselling stations and are generally happy with the program.
- There was some inconsistency in the time answers – as for example, as household might respond they use the hypochlorite solution once a day, but a bucket lasts 2 days. However, there was consistency that people were interested in obtaining a greater amount of solution at one time and using it for more purposes that just for their drinking water.
- One household was using a soda bottle for hypochlorite storage, as their bottle was missing.

Chlorine Residual Results

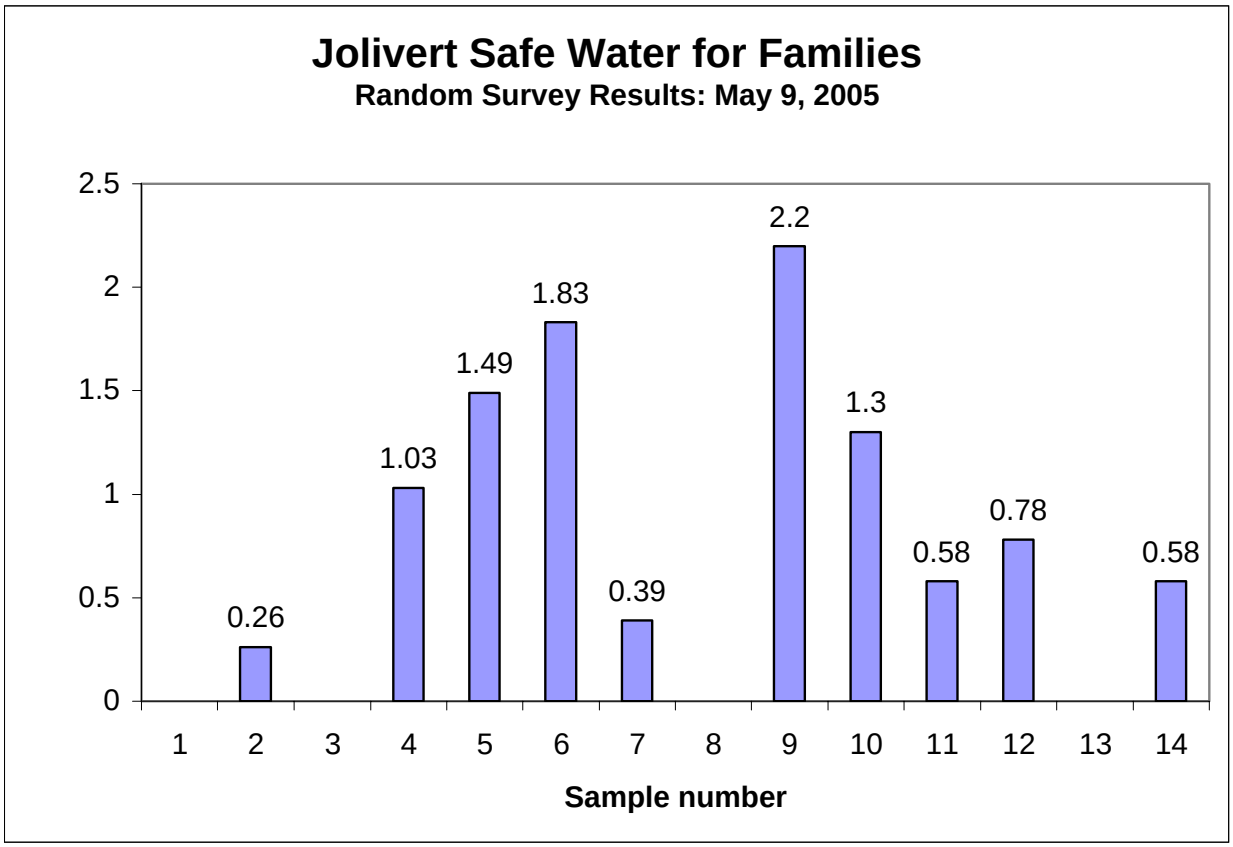
At the time of the unannounced visit, 9 of the 14 households (64.3%) had correct levels of chlorine in their drinking water (as defined by a level between 0.2-2.0 mg/L free chlorine). There is such large variation in the chlorine residual results because chlorine degrades over time once you add it to the water – so if a household is randomly visited near to the time they added the solution, it will have higher residual and if the water was treated less recently, the residual

will be lower. In addition, an additional household had chlorine present, making a total of 10 of the 14 households (71.4%) with chlorine present at the time of the unannounced visit. This household had a residual of 2.2 mg/L, slightly high, but not a concern as the WHO guideline value for maximum level of residual chlorine in drinking water is 5 mg/L.

The reasons given for not having residual chlorine in the water at the time of the unannounced visit are as follows:

Sample 1:	Said she treated yesterday, unknown why no residual.
Sample 3:	Dropped out of program because she does not like reseller in community.
Sample8:	Has been out of solution for three days. Needs to repurchase.
Sample 13:	Out of solution as no one available to repurchase yet.

Of note is that these levels of correct (64.3%) chlorination (71.4%) in unannounced random household visits are highly encouraging and indicate a successful program. Three duplicate samples were analyzed of free chlorine residual (30% of total samples) and had an average percent error of 14.1%, which is below the acceptable error of 20% for free chlorine residual sampling in the field.

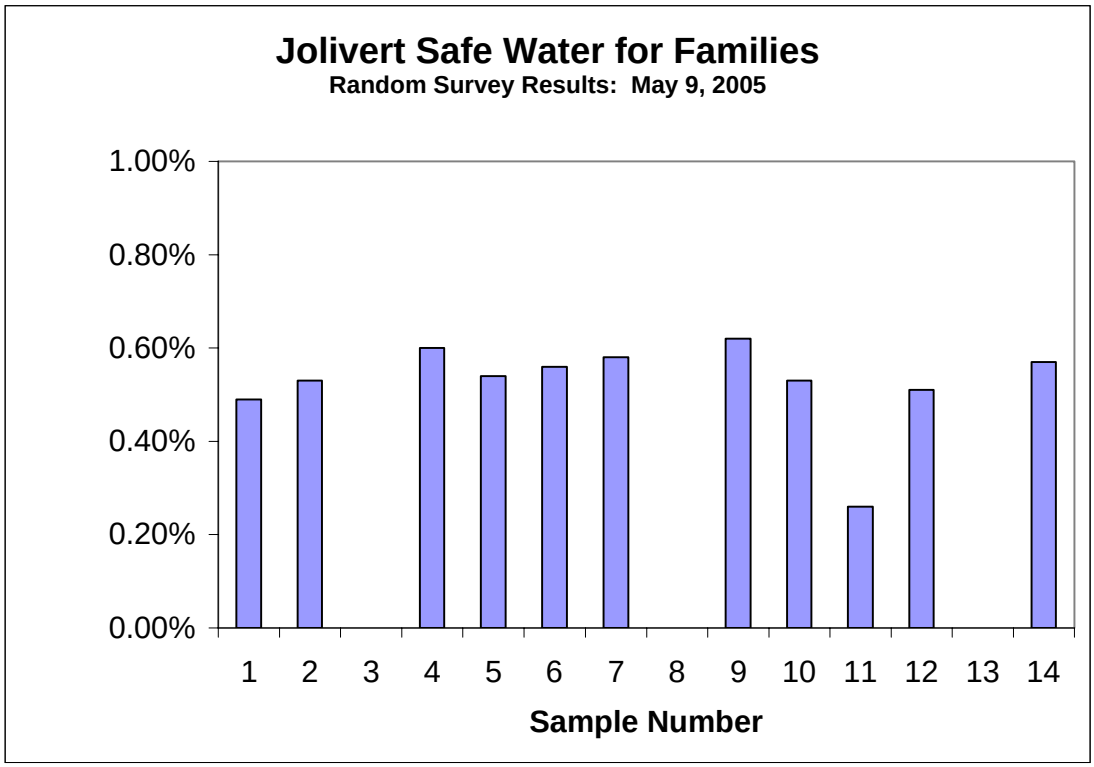


Chlorine Concentration Results

At the time of the unannounced visit, 11 of the 14 households (64.3%) had hypochlorite solution in their bottle in their household. The concentration of the hypochlorite solution produced in the Jolivert clinic is 0.6%, and an acceptable range of concentrations at the household level 0.51-0.69%, representing a 15% error range. Nine of the 11 samples tested were within that range, an additional sample was very close (0.49%), and one sample was quite low (sample 11). The low sample was literally the last 2 mL of chlorine solution left at the bottom of the bottle, and was likely low due to the fact so little solution was left. It is of note that the chlorine residual in the drinking water of sample 11 was correct, even though the concentration was low.

The reasons given for not having hypochlorite in the bottle at the time of the unannounced visit are as follows:

Sample 3:	Dropped out of program because she does not like reseller in community.
Sample8:	Has been out of solution for three days. Needs to repurchase.
Sample 13:	Out of solution as no one available to repurchase yet.



These results, in conjunction with the chlorine residual results, highlight the need for emphasizing the repurchase of chlorine solution as soon as the bottle is emptied – as 10 of the 11 households with hypochlorite solution in the bottle at the time of the unannounced visit had chlorine residual in their drinking water. Two duplicate samples were analyzed (18% of total samples duplicated) with an average error of 2.36%, well below the acceptable error of 10%.

Activity 3: Observation of training conducted by JSWF Haitian Staff for families entering the program.

The JSWF staff had arranged a training for 10 new program participants during our field visit. Before our visit, the new participants dropped off their existing water storage bucket for modification with a tap, and so the buckets were prepared and ready to take home after the participants received the 1.5-hour training at the clinic.

The training consisted of an introduction to the program by Christophe, information about diarrheal diseases and safe practices, and then a demonstration of how to use the system by Madame Evelyn. A question and answer session and distribution of materials followed.

Modifying the Buckets with Label, Tap, and Lid

Covering the Storage Container

Adding the Chlorine

Distributing and Paying for the Products

The training was well led, with interest from the participants and many questions and answers. The training, as is culturally normal in Haiti, was not hands on, as the participants watched, but did not participate.

Suggestions to improve the training are as follows:

- Make the training more participatory, both in presentation of the information (interactive questioning with audience as key points are presented) and in demonstration of the process (demonstration by trainer and by then by a member of the audience, with interactive questioning during both demonstrations).
- Develop and distribute written and pictoral information on how to use the product and what to do in case of accidental ingestion. This could be a single set of materials for both users and resellers. The users should receive this information at the time of initial training.
- Develop a poster, perhaps a calendar, with pictures of the proper steps, that can be posted outside authorized resellers.
- Expand initial training to include more information on diarrheal disease transmission (the F diagram showing flies, fingers, fluids, feces, and food as potential pathways of contamination), and how specific interventions (water treatment, safe storage of treated water, proper handwashing, safe disposal of feces) can block these pathways and reduce diarrheal disease. Alternatively, this could be done by the technicians during the followup visits.
- Develop or obtain pictoral and written materials in Kreyol to demonstrate the concepts above.
- Include a formal or informal evaluation of the training by the participants to get feedback on how the information was received and how they might present it more effectively.
- Administer a simple pre test and a post test to the audience to provide feedback on the effectiveness and give information on how to modify the training to make it more effective.
- Look for and encourage users to be “model users” who promote the product and provide information on where to obtain the product and the training in their own communities.

Activity 4: Observation of sodium hypochlorite production run.

The entire sodium hypochlorite production procedure was observed by Rochelle Rainey and Daniele Lantagne in order to provide quality control and to provide documentation of the procedure. The only concern with the entire procedure is that the pH meter was being calibrated at 7.5 with the 7.0 solution instead of 7.0, and thus the pH meter was reading slightly higher than the actual pH when the lye is added to stabilize the pH of the solution. It is recommended that the program add 5 teaspoons of lye instead of 4 teaspoons to each 17-liter container in order to stabilize the solution a bit more than they already are. The entire rest of the procedure was performed correctly and accurately.

Ventilation in the Production Facility

The JSWF Team and Production Facility

Mixing the Brine Solution

Cleaning the Brine Solution with Racket and Straining

Straining the Brine Solution

Connecting the Leads of the Generator

Starting the Chlorine Generation Process

Letting the Process Run for 2 hours

Cleaning the Generator After Use

Preparing to Adjust the pH to Stabilize the Solution

Testing the pH to see if it is correct after adjustment

Activity 5: Quality control testing of sodium hypochlorite solution.

For the past year, the JSWF program has been keeping representative samples of the produced hypochlorite solution for quality control testing. During this visit, we took the opportunity to test the chlorine concentration and pH of these samples, and the results are detailed in the table below. As can be seen, all samples fell within the 0.52-0.63% range, which shows excellent quality control, and no concerns with a 1-year expiry date. In addition, the recent samples all show high consistency, which is also an indication of very good quality control. Lastly, the first two samples from July 6, 2004 show the importance of stabilizing with sodium hydroxide (lye) to stabilize the pH.

Date of Production	Chlorine Concentration	pH
July 6, 2004 (without pH stabilization)	0.00%	--
July 6, 2004 (with pH stabilization)	0.60%	11.2
July 12, 2004	0.52%	11.5
July 13, 2004	0.56%	11.4
July 26, 2004	0.63%	9.9 9.9
August 2, 2004	0.60%	11.5
August 3, 2004	0.60%	11.4
August 13, 2004	0.63%	11.4
September 16, 2004	0.69%	9.1
September 17, 2004	0.62%	11.3
September 20, 2004	0.55%	10.0
September 30, 2004	0.61%	11.6 11.6
January 16, 2005	0.52%	10.1
February 15, 2005	0.54%	10.0
February 21, 2005	0.61%	11.4
February 23, 2005	0.62%	11.5
May 2, 2005	0.59%	11.3
May 3, 2005	0.59%	11.3
May 4, 2005	0.59%	11.3

In the future, the JSWF project will keep a sample from one batch every week in sample vials obtained from the clinic. These samples can be used for future analysis of quality control of production, as was just completed here. In addition, 18 vials of solution from one production run are being transported to Atlanta to complete accurate expiry date testing.

Activity 6: Meetings with the JSWF Staff

Throughout the four days in Jolivert, we had meetings with the JSWF staff. In these meetings a number of thoughts, program development ideas, and issues were raised. To summarize:

- The staff is feeling the need for a moto as the program expands to more remote and distant areas.
- Due to demand, the staff is selling the solution in 1-gallon containers for 50 Gourde. However, the containers are not opaque – it will be important to find opaque 1-gallon containers to protect the solution from sunlight. Chlorine concentration samples were taken from the 1-gallon containers sold at retailer locations, and the results were an average of 0.52%. This is slightly lower than the 0.6% average in other locations, and is probably due to degradation in the transparent containers. If the concentration is 0.52%, there is still enough chlorine to adequately disinfect, but it is not ideal to be selling the product at a concentration of 0.52%.
- The program has expanded geographically in the past six months – with families now in La Tortue, Port-de-Paix, and other remote locations. It is unclear how to follow-up with these remote families, and an expansion plan addressing this should be developed as soon as possible. Both the record-keeping and the IEC and educational materials need to be updated and perhaps modified in response to these new program expansions.

Activity 7: Water testing and meetings in potential new project site in Gros Morne, Haiti.

Curt, a volunteer in the Religious of Jesus and Mary mission in Gros Morne, Haiti contacted CDC about starting a SWS project in Gros Morne. We referred him to Bill Gallo and Bill and Curt have been working together to develop a water committee in Gros Morne, and start a project. Although Gros Morne could be a "satellite" station of Jolivert, Gros Morne will likely become a large enough project to need its own chlorine generator. Thus, we spent one night and day in Gros Morne meeting with Curt, the Sisters who live in the Mission (Sister Jackie and Sister Pat), the Water Committee, and also conducted water quality sampling of the sources available in Gros Morne.

We tested 11 sources (7 protected wells, 2 rivers, 1 reverse osmosis system, and 1 deep well) for total coliform and *E. coli*. In addition, we sampled water from seven households near the seven wells, and from 1 household near the river. Although incubation was not complete when we left, all eight household water sources showed contamination, even though not all seven well sources showed contamination. This is consistent with other published research, and indicates the need for point-of-use water treatment and better household water practices in Gros Morne.

Of note is that in one household in Gros Morne they were using Jif to treat their water, however, there was no chlorine residual in the treated water. This was attributed to the fact that the Jif was very low concentration. In addition, the dosing was difficult, as the family poured Jif into the cap, and then dropped 15 drops out per 5-gallon container. This is an inaccurate method to dose.

A river source in Gros Morne

A protected well source in Gros Morne

Gros Morne is currently ready to begin their project, and should at this point move forward to maintain momentum. We will investigate how to provide Gros Morne with either solution from Jolivert or setting up a chlorine generator.

A household water source in Gros Morne

Summary of Recommendations

- Technical Recommendations for Jolivert Project
    - Use opaque 1-gallon containers
    - Move to selling 500 mL bottles as the standard sodium hypochlorite container due to demand for more product and willingness to pay for that. Keep the 250 mL containers at 3 gourdes for those that prefer them
    - Calibrate the pH meter to 7.0 instead of 7.5 and use 5 teaspoons of lye instead of 4 for pH adjustment
    - Begin labeling batches with date of manufacture. Include an expiration notice indicating "expiration date one year from date of manufacture" and "use within two months of opening container"
- Record Keeping Recommendations for the Jolivert Project
    - The record keeping is incredibly strong in Jolivert, however the system is being taxed as the project expands and people start informally reselling solution out of 1-gallon containers. It is recommended that an Access database be developed (CDC can help with this) and the Technicians trained on its use.
    - In addition, sales records should separate out sales for 1-gallon containers, 250 mL bottles, and the 500mL bottles when they are launched.
- Due to the very strong record keeping and local knowledge of households evidenced in this project, this program is an ideal location to conduct research on barriers to use, user preference, and actual use practices. It is recommended that CDC/USAID develop a protocol to assess barriers to use that cause users to not treat their water in this program, and to assess reasons for correct and continued usage by interviewing all program participants, with special focus on those that purchase solution each month or have dropped out of the program, and implement this study in late 2005/early 2006.
    - This study would be best conducted while the program is still relatively small, and it is recommended this be done as soon as possible.
- Promotional Materials Recommended for the Jolivert Project
    - Maintain spot checks of households and potentially hire more staff to accommodate the growing population to do this.
    - Develop and distribute written and pictoral information on how to use the product and what to do in case of accidental ingestion. This could be a single set of materials for both users and resellers. The users should receive this information at the time of initial training.
    - Develop a poster, perhaps a calendar, with pictures of the proper steps, that can be posted outside authorized resellers.
    - Develop or obtain pictoral and written materials in Kreyol to demonstrate the concepts of diarrheal disease transmission (the F diagram showing flies, fingers, fluids, feces, and food as potential pathways of contamination), and how specific interventions (water treatment, safe storage of treated water, proper handwashing, safe disposal of feces) can block these pathways and reduce diarrheal disease. Once trained, technicians can also use this time to present messages about more general water/sanitation/hygiene issues during the spot visits checking chlorine residuals in households.
- Training Recommendations for the Jolivert Project
    - Posters, calendars, and brochures (see above for specific recommendations)
    - Make the training more participatory, both in presentation of the information (interactive questioning with audience as key points are presented) and in demonstration of the process (demonstration by trainer and by then by a member of the audience, with interactive questioning during both demonstrations).

    - Include a formal or informal evaluation of the training by the participants to get feedback on how the information was received and how they might present it more effectively.
    - Administer a simple pre test and a post test of knowledge about water quality, water treatment, and diarrhea transmission to the audience to provide feedback on the effectiveness and give information on how to modify the training to make it more effective.
    - Look for and encourage users to be "model users" who promote the product and provide information on where to obtain the product and the training in their own communities.
- This project is at a stage where funding to complete specifics tasks such as development and production of educational materials, purchase of a moto, and purchase of a larger chlorine generator is appropriate and could be very well spent. Additional funding would also help support more staff to do the house visits, which are critical to motivate and encourage correct and consistent use of the product. Thoughtful expansion to more customers can easily be accommodated. However, an expansion plan should be developed by the Program Coordinator and the JSWF to ensure quality of training and of the product as more retail outlets are established.
- Recommendations for Gros Morne Project
    - The Gros Morne project should obtain a chlorine generator and begin by enrolling 200 families as soon as possible.

The authors would like to express their sincere appreciation of the hospitality and work of the JSWF staff Christophe, Madame Evelyn, Reynald, and Lucknie, and congratulate them on their very high quality work.