

A Proposal for Assessing, Treating, & Preventing Schistosomiasis in Communities

Adjacent to the Bujagali Dam in Uganda

By

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EXECUTIVE SUMMARY:

While developing countries with sufficient water power often pursue the construction of dams for electricity generation, there are a number of environmental impacts that must be considered first. Among these is the frequent outbreak of Schistosomiasis. This potentially deadly infection is caused by parasitic worms which are transmitted to humans through infected snails. People become infected when larval forms of the parasite — released by freshwater snails — penetrate their skin during contact with infested water.

In countries where schistosomiasis is endemic, river water often contains a parasite that bores right through the skin of its victims, wreaking havoc on the bladder and other internal organs and tissue. The results are bloody urine, stunted growth, and poor school performance. School-age children are most susceptible to ... Schistosomiasis, probably due to the time they spend playing in the water.... The disease runs rampant in rural areas without access to sanitation and clean water. When the urine from an infected person, which contains the eggs of the parasite, is passed into water, the eggs hatch and infect snails. The infectious form of the parasite is released from the snails, completing the parasite's life cycle."¹

It can consequently be understood that large development projects, which cause significant disruption of water sources, are a risk for increased outbreaks of water-related diseases such as Schistosomiasis. It has been one of the unfortunate consequences of such dam projects as the Three Gorges Dam in China²; the Erinle Dam in Osun State, Nigeria³; and the Diama Dam in the Senegal River Basin.⁴ The government of Uganda, with funding from the World Bank and African Development Bank, is constructing a dam near Bujagali Falls on the Nile that will be completed in the spring of 2011. However, while the Ugandan government and its funders planned for various environmental, cultural, and logistical issues, a significant increase of Schistosomiasis (which is endemic in the areas adjacent to lakes and rivers) seemingly was not one of them.⁵

Since the eradication of Schistosomiasis is one of the Ugandan Health Ministry's key agenda items⁶, they are enthused about the prospect of our assistance with alleviating the dam's projected negative impact on the Schistosomiasis problem.

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- ¹ "Parasite-Fighting Medicine Brightens Nigeria's Future." January 10, 2011. <http://cartercenter.org/news/features/h/-Schistosomiasis/parasite-fighting-medicine-nigeria.html>. Web. 5 Feb. 2011.
- ² Sleight, Adrian, and Sukhan Jackson. "Public health and public choice: dammed off at China's Three Gorges? (health effects of large dam)(Commentary)." *The Lancet* 351.9114 (1998): 1449+. *Health Reference Center Academic*. Web. 22 Jan. 2011. Kittinger, John N., et al. "Toward Holistic Evaluation and Assessment: Linking Ecosystems and Human Well-Being for the Three Gorges Dam." *EcoHealth* 6.4 (2009): 601+. *Health Reference Center Academic*. Web. 22 Jan. 2011. Zhu, Huai-Min, et al. "Three Gorges Dam and Its Impact on the Potential Transmission of Schistosomiasis in Regions along the Yangtze River." *EcoHealth* 5.2 (2008): 137+. *Health Reference Center Academic*. Web. 22 Jan. 2011.
- ³ Oladejo, S.O., and I.E. Ofoezie. "Unabated Schistosomiasis transmission in Erinle River Dam, Osun State, Nigeria: evidence of neglect of environmental effects of development projects." *Tropical Medicine and International Health* 11.6 (2006): 843+. *Health Reference Center Academic*. Web. 22 Jan. 2011.
- ⁴ Campbell, G., et al. "Low genetic diversity in a snail intermediate host (*Biomphalaria pfeifferi* Krass, 1848) and Schistosomiasis transmission in the Senegal River Basin." *Molecular Ecology* 19.2 (2010): 241+. *Health Reference Center Academic*. Web. 22 Jan. 2011.
- ⁵ "Summary of Inspection Panel Report, Bujagali Dam, 2008." International Rivers. <http://www.internationalrivers.org/en/node/3492>. Web. 31 Jan. 2011.

Therefore, BCKM Health Interventions Inc. has developed a three-year program for educating the communities around the dam that are likely to be affected, preventing infection of snails and humans through advance measures, and treating those who become infected in spite of preventive measures taken. Rather than reinvent the wheel, however, we will follow processes and frameworks which have already proven effective for dealing with the endemic schisto problem. In particular, we will draw on the long-time expertise and experience of the Bill & Melinda Gates Foundation, the Carter Center, and the World Bank in combating schistosomiasis — not to mention what is already in place through the Uganda Ministry of Health.

Based on preliminary responses to our grant proposals, we anticipate that funding will come from WHO, the World Bank, and the Gates Foundation. Also, we are hopeful that Johnson & Johnson will donate enough doses of Vermox to treat all the children in the affected areas, as they did in Cameroon in 2008. Praziquantel is also now available free of charge to a few high-disease burden least developed countries (LDC), through a donation from Merck KGaA to the World Health Organization. Additional stakeholders will include the Ugandan Ministry of Health, frontline health workers, and schoolteachers. BCKM's Anti-Schistosomiasis Project will launch with an onsite survey of the residents of communities adjacent to the dam who have not been relocated — to record information about infected individuals, to find out whether there is a community health worker (CHW), and to train an individual (whether a resident CHW or schoolteacher) to administer medication to infected individuals and conduct the schistosomiasis prevention instruction in each community to help prevent new or repeat infections. This frontline contact person will be equipped with and trained to use a cell phone that will enable him or her to send regular reports to a central database which we will install at the Uganda Ministry of Health. We will use that data to periodically send reports to our CHWs, donors, information partners, international health organizations, and the Ministry of Health.

At the end of our project, we will assess the impact of the project to determine (1) the degree to which our prevention efforts have been effective and schistosomiasis infection rates reduced, and (2) whether an extension of the project is warranted. At that time, a final and comprehensive report will be published and given to all institutional stakeholders.

THEORY OF CHANGE:

Our proposal is based on a three-year plan. Success in reducing the burden of Schistosomiasis will first depend on the work of an expert environmental management and engineering team at the onset of the project, immediately after completion of the dam project, but also again at the end of our three-year initiative. We recognize that cost and necessary expertise are significant challenges; and while this proponent is necessary to interrupt transmission by reducing the parasite, our intervention is also formed around capacity building within the community. The bulk of our initiative revolves around creating awareness; educating the community on risk factors, prevention methods, and safe behaviors; and setting up an effective, community-sustained surveillance plan.

Schistosomiasis screening has been shown to be effective based on a simple questionnaire, thereby reducing the need for trained medical specialists and lab resources. Teachers in particular are considered to be effective resources, as regular screening can be

⁶ "Health Sector Strategic Plan II 2009-2010." Ministry of Health, Republic of Uganda. <http://www.hrresourcecenter.-org/node/2808>. 31 Jan. 2011.

integrated into the school curriculum in order to ensure all children are seen. Periodic mass treatment is also recommended, as the benefits are significant. It reduces the number of severe cases, and as long as they are scheduled regularly during periods longer than the parasite's life cycle, it has not been found to cause risk for drug resistance (World Health Organization). (For more information about activities, see Appendix 1.)

STAKEHOLDER ENGAGEMENT STRATEGY:

Our stakeholders can be divided into three categories: (1) inhabitants of the communities who are in the vicinity of the dam (ordinary citizens plus CHWs or schoolteachers who we will train to treat Schistosomiasis, conduct public prevention education sessions, and report pertinent health data on a regular basis via text messages), (2) public organizations (the Ugandan Ministry of Health, the World Health Organization (WHO), USAID, and the World Bank), and (3) private organizations (The Bill & Melinda Gates Foundation, The Carter Center, and Johnson & Johnson).

One of the concerns voiced several years ago by Ugandans was that involuntary relocation of inhabitants was going to be a part of the Bujagali Dam project. Therefore, one of our assumptions (since we have not been able to obtain updated information) is that forced relocation is still part of the plan. With that in mind, depending on what percentage of the population (100%, 75%, 50%) is relocated, the need to educate and treat those who are (or could become) infected will be proportionately reduced.

We will engage the inhabitants in five steps: (1) An on-site research survey of all willing adults to assess Schistosomiasis infection rates and current hygiene/sanitation practices that may increase vulnerability to the disease, (2) a Schistosomiasis treatment program for all infected individuals, (3) a Schistosomiasis prevention education program conducted by a CHW or trained schoolteacher, (4) treatment of new infections at the one-year and two-year points, and (5) a research survey at the end of our three-year project to assess the change in infection rates and the impact of treatment and education efforts. Uganda's Ministry of Health has a Parasite Control Division tasked with combating various endemic tropical diseases, particularly malaria and parasitic diseases such as Schistosomiasis. It already has working relationships with WHO, USAID, the World Bank, and the Gates Foundation⁷, which hopefully will make it easier for us to achieve constructive and effective working relationships to implement our program in the areas adjacent to the dam. Since the World Bank is the primary source of funds for the dam construction, it has agreed to provide partial funding for combating what will be an unfortunate effect of the dam — an increase in Schistosomiasis infection rates.

Before contacting the Ugandan Ministry of Health, the anthropologist on our staff did some cultural research so as to ensure that our initial contacts would be as culturally appropriate and effective as possible. Learning that we needed a senior person with a longstanding relationship to “introduce” us, we were able to set up an initial meeting with the help of the World Bank official who is overseeing the dam project in Uganda.

⁷ "USAID support for NTD [neglected tropical diseases] control in Uganda is provided through a cooperative agreement with RTI and the Schistosomiasis Control Initiative, working alongside the Uganda government and Ministry of Health. The Program also engages with a wide range of dedicated local stakeholders, including The Carter Center ... the Bill and Melinda Gates Foundation ... [and the] World Health Organization ..." http://www.neglecteddiseases.gov/-countries/-country_profiles/uganda.html. 28 Jan. 2011.

The meeting was successful: the Ministry of Health approved our project. Ministry officials are relieved at the prospect that BCKM's project will greatly alleviate the potential health setbacks from the dam project and possibly even decrease Schistosomiasis infection rates below their pre-dam levels.

We have applied to the Gates Foundation and Johnson & Johnson for grants. While we are waiting for final decisions on our grant proposals, preliminary indications are that Johnson & Johnson will donate at least a portion of the Vermox (mebendazole) needed to treat all infected individuals in the dam-adjacent communities over the three-year time span of our project. (They donated 4 million doses to treat infected children in Cameroon in 2008.) For a decade, the Gates Foundation has been a powerhouse in the fight against NTDs (Neglected Tropical Diseases). To date, Gates has given almost \$50 million in grants to The Carter Center, WHO, and the Schistosomiasis Control Initiative at Imperial College London.⁸ Since BCKM Health Interventions will treat and prevent Schistosomiasis on a cost-effective and sustainable basis, we anticipate that Gates will become a funding partner on some level.

The Carter Center has been fighting Schistosomiasis in Nigeria for more than a decade⁹; and through its partnership with the World Bank, it has obtained millions of doses of the anti-Schistosomiasis medication Praziquantel, which is manufactured by Merck. As a result of the Carter Center's determined efforts, Schistosomiasis infections have been reduced from more than 50 percent to less than 5 percent — a remarkable success. Therefore, the Carter Center has offered to serve as an informational consultant to our project. We anticipate that any remaining medication needs not provided by Johnson & Johnson will be covered by funds from USAID's Neglected Tropical Diseases (NTD) Program, WHO, and the Ugandan Ministry of Health.¹⁰ With the assistance of the Ministry of Health, we will contact the frontline health worker (or, if none is available, a schoolteacher or other respected individual) in each affected community to arrange for training in Schistosomiasis assessment, treatment¹¹, and the Schistosomiasis prevention education program (which each community's representative will teach to the inhabitants using simple pictorial educational materials that we will provide). Regardless of the skill level of any existing frontline health workers, we will brief them on the procedures and protocols necessary to ensure that our project results can be tracked and success ensured.

As part of our comprehensive three-year Schistosomiasis assessment, treatment, and prevention program, BCKM will offer to provide the Ministry of Health with a centralized database for storing the data that the CHW or teacher in each community will send via text message, using the open source Frontline SMS program¹² that we will include on their BCKM Schistosomiasis Project cell phones.

⁸ "Leading Global Health Organizations Receive \$46.7 Million from Gates Foundation to Integrate Programs Fighting Neglected Tropical Diseases." December 19, 2006. <http://www.gatesfoundation.org/press-releases/Pages/neglected-tropical-diseases-061219.aspx> (accessed February 5, 2011).

⁹ "Parasite-Fighting Medicine Brightens Nigeria's Future."

¹⁰ "National Programme for the Control of Schistosomiasis and Intestinal Helminthiasis in Cameroon." http://www.schisto.com/tab_pnlsh.php?lang=en (accessed 28 Jan. 2011).

¹¹ Since the drugs are easy and safe to administer, teachers and other responsible adults can administer the medications.

¹² Frontline SMS is an open source program that was pioneered in Mali and uses text messages from CHWs to maintain health records on patients in outlying communities.

Frontline SMS will enable us to establish two-way communication with the affected communities and provide a means for tracking Schistosomiasis infection/treatment rates and hygiene/sanitation training efforts. When a CHW sends text messages on pre-formatted templates, they will go right into the Uganda Ministry of Health's database and get added to the CHW's and patient's files automatically as long as the information is keyed in correctly.

FINANCIAL SUSTAINABILITY PLAN:

Uganda is one of the few countries in the world today endowed with an abundance of untapped natural resources exhibiting great potential with its massive fertile land and mineral deposits for investment. Although the country's economy has been suffering severely for decades due to chronic political turmoil and frivolously managed macroeconomic policies, the Ugandan government has initiated economic reform programs to reverse this deteriorating situation in order to help and serve the needs of millions of Ugandans.

As BCKM Health Interventions Inc., our initial goal is to estimate and effectively implement preventive measures to counter future incidence rates of Schistosomiasis and other water-borne diseases to avoid any unforeseen effects on human health and the environment while establishing adequate monitoring systems to assess the progress of our diagnosis as well as our health intervention program following the post-construction period of the Bujagali dam from Spring 2011 onward. In order to optimize the use and allocation of resources and to ensure the financial sustainability of our health intervention program on all levels, we will rely primarily on the data retrieved from our onsite CHWs who conduct research surveys on willing adults. The information obtained from the research surveys will be fed directly into the centralized database which will allow us to make projections about the cost-effectiveness and the long-term applicability of our program. This is an essential part of the financial sustainability plan as it provides us with sufficient technical data to compare the incidence rates at periodic intervals while enabling us to track the stance of any potential Schistosomiasis outbreak. In addition to these measures, BCKM will employ consultants to evaluate the infection rates with surveys as well as technicians and other experts to test and assess the parasite levels in local waters and monitor snails that might present a potential infection threat to the surrounding communities.

With medication donations from Johnson & Johnson and possibly Merck, BCKM Inc. will be able to use any additional funds to help Ugandans to gain greater access to health systems in the years after the initial completion of the Bujagali Dam. Contingent upon the amount of funding received from the Gates Foundation and the World Bank, BCKM will devote and shift its resource base to focus on the development of local infrastructure and on the improvement of the communications sector — specifically, by purchasing equipment that allow medical personnel to rapidly respond to an emergency situation with accurate data acquired through the Frontline SMS system and BCKM-provided cell phones. "Health systems development will entail the establishment of systems for continuous identification and surveillance of health risks, followed by development of interventions to respond to them."¹³

¹³ Dzenowagis, Joan & Kernen, Gael (2005). "Connecting for health: global vision, local insight: Report for the World Summit on the Information Society." World Health Organization (WHO) Library Cataloguing-in-Publication Data, Geneva, pg.19

One of the major issues regarding the construction of the Bujagali dam involves the relocation of Ugandans from their native communities, which will create a pathway for the transmission of Schistosomiasis through environmental channels: water and snails.

During the first year period of our project, the Carter Center will act as informational consultants and offer onsite, research-based findings. Concurrently, as underwriting funders, the World Bank and the Gates Foundation will offer financial aid support packages to help us identify new threats and halt the spread of the disease. BCKM will work in close coordination with the Ugandan Ministry of Health and immediately report new infections to the appropriate authorities. We will also utilize our financial resources in the production as well as the distribution of educational materials and brochures that provide both written and graphic, easy-to-understand information about potential risk factors for infection.

In the second phase of our project, considerable efforts will be made to expand our outreach capacity and to disseminate emergency messages through donations from our financial partners. In order to most effectively communicate health messages, we will equip frontline community workers as well as other influential people in the community with technological tools that have enhanced visual functionalities, which will also be the core drivers of cost for our project: notebooks, computers, cell phones and other portable devices that offer simplified visual digital media to raise the general awareness levels of local communities, especially among vulnerable populations residing in the vicinity of the dam. Third, of paramount importance to our financial sustainability plan is the elimination of the Schistosomiasis threat — the core element of our three-year comprehensive health intervention curriculum. Based on the socio-demographic composition and behavioral patterns of the community, BCKM will establish parameters to facilitate the uptake of information while preventing the further spread of the disease by constantly providing medical drugs to the inhabitants living in close proximity to the dam. At the end of our three-year project, we will conduct an extensive qualitative and quantitative research survey with our local partner, the Carter Center, to reassess and reevaluate the impact of our treatment and education efforts.

EVALUATION PLAN OF THE HEALTH INTERVENTION PROGRAM:

This study will conduct a Health Impact Assessment modeled after a methodology created by the UCLA School of Public Health. The evaluation will occur during the first and third years of implementation.

Phase 1: Scanning/Screening

The goal of this project is to reduce the burden of Schistosomiasis in surrounding communities of a recently built dam based on peer reviewed literature that has established a relationship between this water-borne parasitic disease and the implementation of dams. A Health Impact Assessment is appropriate to evaluate the impact of the project's interventions on the incidence and prevalence of Schistosomiasis in the environment and communities surrounding the dam. Financial and human resources to conduct the evaluation will be allocated in the project budget.

Phase 2: Scoping

A preliminary assessment of current health issues of the populations at risk will be performed to predict how implemented measures may affect health determinants and

outcomes. The methodologies utilized to quantitatively and qualitatively assess the project's impact include surveys, interviews, and epidemiological methods and testing to determine Schistosomiasis incidence and prevalence and to monitor snail populations.

A steering committee must be established to manage the Health Impact Assessment. Their duties will entail overseeing the evaluation. This committee will comprise stakeholders (community members, regional health officials, government representatives, and donors/funders), a specialty treatment team (health, environment, and epidemiological experts), and an evaluation team (members who will be conducting the evaluation on the ground).

Phase 3: Profiling

During the Year 1 of implementation, a preliminary assessment of current health concerns of the populations at risk will be performed to create a baseline to evaluate the possible health impacts of the project's initiatives. The national rates of Schistosomiasis for Uganda will be used as a control. A profile of the environment and community composition will be compiled to predict who, what, and where will be affected by the project. This will entail socio-demographics, health data, environmental data, and behavioral patterns. A description of the key factors and aspects of the communities' health status — including factors that are vulnerable to change or indicate future health issues and impacts — will be determined.

This step will be repeated during Year 3 of implementation to assess how the project has truly affected the health of the community by comparison to the baseline data collected during the first 3 to 6 months.

Phase 4: Impact Assessment

During Year 3, we will identify the positive and negative health impacts of the project by conducting qualitative and quantitative statistical studies on the impact of the interventions on Schistosomiasis incidence and prevalence within the populations at risk. By utilizing the methodology established during the scoping phase, we will evaluate the impact of the education and awareness campaign, community health workers, drug treatment, and monitoring of snail populations.

To assess effectiveness of the education and awareness campaign, we will look at the effectiveness in creating a behavioral change. Eradication of Schistosomiasis was not the goal of this project but, rather, the increase in education and awareness for people to integrate Schistosomiasis preventative measures into their daily lives to reduce the burden. Evaluation of the community health workers will be determined by the effectiveness of training community members to educate, identify, monitor, and provide Schistosomiasis (case and parasite) surveillance. The positive impact of drug treatments will be assessed based on access, affordability, and medical compliance. Assessing the effectiveness of monitoring snail populations will be based on whether there we find a direct relationship between reducing snail populations and the reduction of Schistosomiasis cases.

We will also identify the occurrence of new health risks during the course of implementation and determine if there were any unforeseen health impacts due to our prevention interventions. An epidemiological study will be conducted to evaluate incidence

and prevalence of other illnesses within the communities. A cost-benefit analysis will be conducted to evaluate the project's positive and negatives in relation to the cost to conduct the health impact assessment. Should this project continue beyond the 3-year plan?

The sustainability of the project will also be evaluated. Can the education campaign, community-based health workers and surveillance, drug treatment, and snail population monitoring continue without the project? Have the interventions been implemented in a way that the community members can continue them? Can the interventions be integrated into everyday life?

Lastly, based on our findings, recommendations will be generated for intervention modification and project future based on data provided from the evaluation.

Phase 5: Report Preparation

The results of this health impact assessment will be compiled and the findings presented to CHWs, donors, international health organizations, and the Ugandan Ministry of Health.

WORKS CITED

- 1 -) ADKAR, "Brief Guidelines to Stakeholder Engagement Strategy." www.programmanagement.com.au/.../11A_Guidelines_to%20Stakeholder_Engagement_Strategy.pdf (accessed January 31, 2011).
- 2 -) Campbell, G., et al. "Low genetic diversity in a snail intermediate host (*Biomphalaria pfeifferi* Krass, 1848) and Schistosomiasis transmission in the Senegal River Basin." *Molecular Ecology* 19.2 (2010): 241+. Health Reference Center Academic. Web. 22 Jan. 2011.
- 3 -) "Health Impact Assessment (HIA): Decision-making tool to address health issues in project planning process." First Inter-Ministerial Conference on Health in Africa: Health Security through Healthy Environments. June 19, 2008. <http://www.unep.org/health-env/pdfs/TD-Health-Impact-Assessment.pdf>
- 4 -) "Health Sector Strategic Plan II 2009-2010." Ministry of Health, Republic of Uganda. <http://www.hrhresourcecenter.org/node/2808> (accessed January 31, 2011).
- 5 -) Kabatereine, Narcis B., Simon Brooker, Edridah M. Tukahebwa, Francis Kazibwe, and Ambrose W. Onapa. "Epidemiology and geography of *Schistosomiasis mansoni* in Uganda: implications for planning control." *Tropical Medicine and International Health* 9, no. 3 (3, 2004): 372-380.
- 6 -) Kittinger, John N., et al. "Toward Holistic Evaluation and Assessment: Linking Ecosystems and Human Well-Being for the Three Gorges Dam." *EcoHealth* 6.4 (2009): 601+. Health Reference Center Academic. Web. 22 Jan. 2011.
- 7 -) Minter, Adam. "Breeding snail fever: Three Gorges Dam boosts parasitic infections." *Scientific American* 293.1 (2005): 21+. Health Reference Center Academic. Web. 31 Jan. 2011.
- 8 -) "National Programme for the Control of Schistosomiasis and Intestinal Helminthiasis in Cameroon." Cameroon Centre for Schistosomiasis and Parasitology. http://www.Schistosomiasis.com/tab_pnlsh.php?lang=en (accessed January 31, 2011).
- 9 -) Oladejo, S.O., and I.E. Ofoezie. "Unabated Schistosomiasis transmission in Erinle River Dam, Osun State, Nigeria: evidence of neglect of environmental effects of development projects." *Tropical Medicine and International Health* 11.6 (2006): 843+. Health Reference Center Academic. Web. 22 Jan. 2011.
- 10 -) Seto, Edmund Y. W., et al. "Impact of Changing Water Levels and Weather on *Oncomelania hupensis hupensis* Populations, the Snail Host of *Schistosomiasis japonicum*, Downstream of the Three Gorges Dam." *EcoHealth* 5.2 (2008): 149+. Health Reference Center Academic. Web. 22 Jan. 2011.
- 11 -) Sleigh, Adrian, and Sukhan Jackson. "Public health and public choice: dammed off at China's Three Gorges? (health effects of large dam)(Commentary)." *The Lancet* 351.9114 (1998): 1449+. Health Reference Center Academic. Web. 22 Jan. 2011.

12 -) "Summary of Inspection Panel Report, Bujagali Dam, 2008." International Rivers. <http://www.internationalrivers.org/en/node/3492> (accessed January 31, 2011).

13 -) *USAID's NTD Program. profiles/-uganda.html* (accessed January 31, 2011).

14 -) World Health Organization. "*Schistosomiasis: Strategy*" page. <http://www.who.int/-Schistosomiasis/strategy/en/>

15 -) Young-Il Song; Daeryong Park; Gihye Shin; Cheoljin Kimc; Neil S. Grigg. "Strategic environmental assessment for dam planning: a case study of South Korea's experience." Korea Environment Institute, Seoul, South Korea; Illinois State Water Survey, Champaign, IL, USA; K-water, Daejeon, South Korea; Colorado State University, Fort Collins, CO, USA. Web. 22 Jan. 2011.

16 -) Zhu, Huai-Min, et al. "Three Gorges Dam and Its Impact on the Potential Transmission of Schistosomiasis in Regions along the Yangtze River." *EcoHealth* 5.2 (2008): 137+. Health Reference Center Academic. Web. 22 Jan. 2011.

APPENDIX 1:

Example of Educational Points

Awareness/Education:

Awareness of signs and symptoms including, fever, headache, myalgia, and respiratory symptoms.

Avoid swimming or wading in freshwater when there have been recent cases or an outbreak. Drink safe water. Although Schistosomiasis is not transmitted by swallowing contaminated water, if your mouth or lips come in contact with water containing the parasites, you could become infected.

Water used for bathing, drinking and cooking should be brought to a rolling boil for 1 minute to kill any cercariae, and then cooled before bathing to avoid scalding. Water held in a storage tank for at least 1 to 2 days should be safe for bathing. Storage tanks should be fully enclosed to avoid secondary contamination for other diseases.

Comprehensive water/sanitation/hygiene program to reduce risk factors.

Treatment/Prevention:

Targeted distribution of *Praziquantel* . periodic treatment of at-risk populations will cure subtle morbidity and prevent infected individuals from developing severe, late-stage morbidity due to Schistosomiasis. In children, lesions may be reversed following specific treatment.

Eligible population for mass periodic treatment:

- School-age children, adults considered to be at risk, from special groups (pregnant and lactating women; groups with occupations involving contact with infested water, such as fishermen, farmers, irrigation workers, or women in their domestic tasks), to entire communities living in endemic areas.
- *Praziquantel* is the recommended treatment for Schistosomiasis at 40 mg/kg body weight. The cost of a single 600-mg tablets is about US\$ 0.08 and an average treatment is estimated to be between US\$0.20–0.30.