CDC Global Health E-Brief

Helping to Ensure Access to Safe Water and Food Globally

Second Quarter 2007

WELCOME to the second global health e-brief, designed to educate and inform readers about key global health activities at the Centers for Disease Control and Prevention (CDC). Our second issue is focused on global safe water and food. Over a billion people worldwide lack access to safe water. In addition, recent international foodborne outbreaks have caused considerable illness and made headline news through the world. Whether people get basic vitamins and minerals, or don't, has an enormous impact on worldwide human health. For all of these reasons, CDC is committed to achieving core public health needs of safe and adequate water and nutrition.✧

Evidence-based Integration

Safe Water and HIV Interventions

Jemima is a woman living with HIV in rural western Kenya, where rates of HIV are among the highest in the world. Nearly one in five adults is infected, and nearly 20% of children are orphaned. Jemima became a leader in her community by founding a group that provides emotional support and small loans to HIV-affected families in her home area. However, Jemima's own HIV disease continued to progress. She grew ill with diarrhea and wasted to a low of 77 lbs. A local volunteer found Jemima at home, bedridden, weak, and with oral thrush and skin infections.

The volunteer brought Jemima, her husband, and her sick grandchild to a USG-supported clinic, where staff provided the family a "Basic Care Package" to treat their symptoms and to prevent further illness. Developed in 2002, the 'Basic Care Package' is a bundle of evidence-based, high-impact, and low-cost health interventions developed by CDC Global AIDS Program public health researchers in Uganda (in partnership with other CDC scientists) to prevent the most debilitating opportunistic infections among people living with HIV. With suppressed immune systems, Jemima and others living with HIV are more vulnerable to opportunistic illnesses, such as those transmitted through contaminated water. These illnesses can be costly and difficult to treat in settings with limited resources.

The elements of the Basic Care Package are designed to be simple to implement, so they can be delivered at primary health care centers. The essential elements—delivered together or separately—include cotrimoxazole (a powerful antibiotic), insecticide- treated bed nets to prevent malaria, screening and management of STDs, Prevention of Mother to Child Transmission (PMTCT) services, and counseling (e.g., condom use and family planning), and point-of-use safe water systems. The safe water system of the Basic Care Package includes education as well as:

- Use of household-based water treatment methods and water storage in containers that limit hand contact (e.g., plastic containers with spigots and dilute chlorine tablets)
- Proper disposal of human or animal feces
- Promotion of hand washing with soap after handling human or animal feces, before food preparation, and before eating, along with the provision of soap

Each intervention has been shown to improve health outcomes while remaining cost effective. Alone, the Safe Water System has been documented to reduce diarrhea among persons with HIV by 25-35%, at a cost to $10 per family per year. Combining the safe water system with

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Simple interventions such as the provision of nutritional supplements, low-cost antibiotics and clean water can have significant impact in the quality of life for those living with HIV/AIDS.

cotrimoxazole reduces diarrhea episodes among people living with HIV by 77% and days of work or school lost to diarrhea by 47%, at a cost of roughly $15 per family, per year. Because of these successes, the integrated Basic Care Package is now being scaled up under the U.S. President's Emergency Plan for AIDS Relief.

After receiving her Basic Care Package, Jemima's condition improved dramatically, and she regained a healthy weight of 132 lbs. She now promotes health interventions in her community and sells health products to help support the eight sick and orphaned children she has adopted. Jemima is a fervent advocate for the U.S. government-supported clinic and has referred more than 100 HIV-infected men, women, and children to receive care at the facility.✧

Safe Water

CDC's Safe Water System Project in Kenya: Reaching at-risk populations through schools

Nearly 2 million child deaths each year are attributed to diarrhea and other infectious diseases acquired from unsafe drinking water, inadequate sanitation, and poor hygiene. Diarrheal disease is one of the leading causes of child deaths in developing countries. These deaths are preventable with access to safe drinking water and hygiene.

The CDC Global Health E-Brief is produced quarterly by the Centers for Disease Control and Prevention's (CDC) Coordinating Office for Global Health (COGH). To find out more about CDC and COGH, go to www.cdc.gov and www.cdc.gov/cogh.

Globally, CDC works in collaboration with the social marketing, non-governmental organization Population Services International (PSI) to market a small bottle of dilute chlorine solution that is used to treat water in the household. The bottle holds a 4- to 6-week supply and costs a family only 25 US cents.

The Safe Water System (SWS) has been proven to reduce diarrheal diseases in users by 22-84%. The SWS incorporates three main elements:

- Point-of-use water treatment by consumers with a locally manufactured, dilute sodium hypochlorite (bleach) solution.
- Safe storage of treated water in containers designed to prevent recontamination.
- Behavior change communications to improve water and food handling, sanitation, and hygiene practices in the home and in the community.

Safe drinking water and hygiene are essential to reducing diarrheal disease in Kenya. In May 2005, CARE Kenya, CDC, and Emory University implemented a school-based safe drinking water and hygiene intervention in 45 rural primary schools in Nyanza Province, which is located in western Kenya. Each school received portable handwashing stations (pictured) and water storage containers, along with several months supply of WaterGuard solution for water treatment and soap for handwashing. Teachers in each school were trained to organize student-run Safe Water clubs and to teach students to promote handwashing. An evaluation demonstrated a marked reduction in student absenteeism, improvements in student's knowledge of correct water treatment and handwashing procedures, and transfer of the knowledge and practices to students' families and homes. Funding for the pilot project, evaluation efforts, and an expansion of the program to 500 schools in Nyanza Province was provided by the Coca-Cola Africa Foundation, USAID, and the Gates Foundation.

Two members of the safe water club at Sino SDA Primary School in Rachuonyo District, Nyanza Province in rural Kenya treating the school drinking water with WaterGuard®.

Besides the decrease in diarrheal episodes, Kenya benefits economically. Because the bottles of chlorine solution are produced locally and sold through existing distribution networks, jobs are created and manufacturers, distributors, wholesalers, retailers, and kiosk owners profit.

This project shows that linking local community education mechanisms with existing health-beneficial products and messages can leverage funding to reach hundreds of thousands of students and their families.✧

CDC Launches Safe Water Project in Guyana

Water Treatment Plant in Linden, Guyana.

Poor access to safe water continues to be a major threat to human health around the world. WHO estimates that 1.1 billion people lack access to improved water supplies. In January of 2007, CDC, the National Oceanic and Atmospheric Administration, the U.S. Geological Survey, the Pan American Health Organization, and CARICOM's Caribbean Environmental Health Institute selected Linden, Guyana, as a demonstration site for an exciting water safety project to protect drinking water for thousands of people.

This pilot project will assess how to lower land-based sources of pollution by protecting the watershed with a Water Safety Plan (WSP)—a risk-reducing approach to improving drinking water quality. As a result of the project, it is expected that 35,000 residents of Linden, Guyana, will have access to cleaner drinking water and watershed management will improve.

The first workshop to kick-off the WSP Project was recently held in Linden, Guyana, to train key stakeholders in the process and to lay the groundwork for developing a National Program of Action. The demonstration project will be showcased at World Water Week in Stockholm, Sweden, in August. When the project is completed in Fall 2007, other countries in the region will be trained to undertake similar activities within their borders.✧

Improving Global Health by Fortifying Foods

Investigating Micronutrient Deficiencies in Papua New Guinea: From Data to Intervention

After enduring three months of rough seas and a near-fatal shipwreck, a team of field workers landed on Bali (an outlying island of Papua New Guinea) in July 2005. The team of Papua New Guinean natives, supported by CDC and UNICEF, was conducting a national survey to assess the presence of micronutrient deficiencies including iron, anemia, and vitamin A in women of reproductive age and children aged 6-59 months. This survey offered the team members an opportunity to travel beyond their home provinces to collect, for the first time, information about the nutritional status of some of the world's most isolated people.

Vitamin and mineral deficiencies can lead to premature death, poor health, blindness, growth stunting, mental retardation, learning disabilities, and low work capacity. For example, iron deficiency reduces capacity for learning and the ability to work in 4 to 5 billion people. In addition, approximately 30% of the world's population is anemic. Vitamin A deficiency is associated with 2.5 million annual deaths in children.

The International Micronutrient Malnutrition Prevention and Control (IMMPaCt) program, launched by CDC in 2000, is committed to advancing global efforts to eliminate vitamin and mineral deficiencies. This program is a global effort that includes partners such as United Nations Children's Fund (UNICEF), WHO, and USAID.

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An outbreak of an illness characterized by rash, conjunctivitis and joint pain has recently been described in Yap (an island in the Caroline Islands of the western Pacific Ocean, the westernmost state of the Federated States of Micronesia). Scientists from CDC's Division of Vector-Borne Infectious Diseases (DVBID) in Fort Collins, Colorado have determined that this illness is caused by Zika virus. Zika virus is a mosquito-transmitted flavivirus with transmission epidemiology that is similar to dengue viruses. Outbreaks of Zika virus illness have been described in Africa and Asia but have not been previously detected in Micronesia. CDC's Global Disease Detection (GDD) program is providing support for a team of epidemiologists and entomologists from DVBID to assist the Micronesia authorities in the investigation and control activities. For more information, please see the press release at www.fsmgov.org/press/pr06260a.htm

China has made substantial progress in implementing universal, timely hepatitis B vaccination for infants and reducing disparities in coverage. During 2003--2006, approximately 42 million children nationwide received hepatitis B vaccine. More information can be found in the May 11 issues of the Morbidity and Mortality Weekly Report [56(18) 441-445] www.cdc.gov/mmwr/PDF/wk/mm5618.pdf.

Laos is now a full participant in the global influenza surveillance network. The Lao national influenza laboratory (established with on-site assistance from CDC) is up and running. In March 2007 the Lao laboratory identified a human case of H5N1 without outside assistance and sent the specimen to a WHO Collaborating Center for confirmatory testing. This is a major milestone in the development of capacity for pandemic influenza detection and response in a priority country likely to be critical in detecting and therefore controlling an early pandemic.

CDC staff member David McQueen recently co-edited a book entitled Global Perspectives on Health Promotion Effectiveness. This document was specifically developed for public health practitioners and researchers to implement international health programs. Dr. McQueen is the Associate Director for Global Health Promotion at the National Center for Chronic Disease Prevention and Health Promotion.

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Papua New Guinea National Micronutrient survey

IMMPaCt staff have worked in more than 50 countries to develop national capacity to assess and monitor micronutrient status; conduct epidemiological research; and develop, monitor and evaluate national interventions to eliminate micronutrient deficiencies.

Results from the Papua New Guinea survey have led to several new or planned nutrition interventions. Planned interventions include fortifying flour and flour products with iron and folic acid, oil with vitamin A, and sugar with vitamin A. Similarly, the findings motivated health officials to improve existing nutritional interventions, such as greater vitamin A supplementation for infants and lactating mothers. Expansion of the national salt iodization program is also becoming a top priority. IMMPaCt is working with local partners to design novel ways to increase exposure to iodized salt.

Given the difficulty in reaching people in remote areas of the country, approaches that focus on access and purchasing power are particularly important. Such interventions offer great promise for improving the nutrition and health status of Papua New Guineans.✧

Food Fortification to Prevent Birth Defects: Improving the health of infants and children

The high prevalence of neural tube defects (NTDs) related to folic acid deficiency is a major global health problem. Food fortification, as has been implemented in the U.S., is one way to reduce that problem.

For almost three decades, CDC researchers in the National Center on Birth Defects and Developmental Disabilities (NCBDDD) have been investigating the role of folic acid in preventing birth defects. In 1993, China and CDC collaborated on a large-scale intervention assessing the effects of consuming 400 micrograms of folic acid daily before and during early pregnancy on the prevention of (NTDs). This study showed that folic acid can prevent a large number of NTDs and alleviated concerns about possible links between folic acid and miscarriage or multiple births.

Today, Central America suffers an especially high burden of NTDs related to folic acid deficiencies in women. As many as 10 in 1,000 infants are born with an NTD despite having wheat flour fortification policies in place since 2003. Unfortunately, these policies are not enforced. Last year, CDC began working closely with the governments of Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama to promote a regional approach that focuses on multiple nutrients to prevent micronutrient deficiency. The program is funded through a competitive grant to Central America by the Inter-American Developmental Bank, a regional arm of the World Bank.

This collaboration is working to fortify foods with key micronutrients—iron, folic acid, B complex vitamins, zinc, vitamin A, and iodine—to reduce pregnancy complications, anemia, and serious birth defects that cause death and severe disability.

Countries will agree as a region on minimum levels of fortification for staple foods such as corn flour, rice, milk, and juice. Each country will then select the staples to be fortified. By having common standards and legal requirements for food fortification, these regions will be identified as valuable customers in the global market for fortified foods. Other expected benefits to the region include economies of scale in carrying out the fortification, uniformity and compliance in enforcing fortification standards, and an opportunity for countries to work together to develop and test strategies to reach populations with less access to fortified foods, micronutrient supplements, or vitamin pills.✧

Food fortification in several Central American countries has potential to reduce birth defects.

Safe Food

PulseNet International: Tracking Foodborne Disease Outbreaks throughout the World

In February 2007, millions of Americans heard news reports about a large multi-state outbreak of Salmonella traced to peanut butter produced in Georgia. Because foodborne disease outbreaks do not respect borders, and with increasing international trade of food, CDC's PulseNet program was also working closely with federal and international partners to ensure global detection of the outbreak.

PulseNet USA is the national surveillance network for foodborne infections. Members of PulseNet USA include public health and food regulatory agency laboratories that perform DNA "fingerprinting" on bacteria that may spread through food. Network members identify and label each

"fingerprint" pattern for rapid comparison through an electronic database maintained at CDC. This helps identify and track particular strains of bacteria that are harmful to human health.

During the Salmonella outbreak, PulseNet International, a global network modeled after U.S. PulseNet, informed network countries that the contaminated product had been exported to many countries. Suspect cases were reported in several European countries, but tests ultimately showed none had the "fingerprint" identified in the U.S. outbreak.

PulseNet International has confirmed global cases in other outbreaks. One example is an outbreak of shigellosis that was associated with air travel from Hawaii in 2004. By sharing DNA fingerprints from the bacterial strains isolated from patients, public health officials confirmed cases in the United States, Canada and Japan.

Today, 67 countries/regions are members of the PulseNet International network. Goals for PulseNet International include:

- Developing partnerships between public health laboratories throughout the world
- Establishing efficient communication systems between the networks
- Building capacity for molecular surveillance of foodborne infections

Today, PulseNet USA and PulseNet Canada are sharing data in real-time through direct connection between their respective databases. This real-time communication is also planned with the other PulseNet networks. PulseNet International is currently exploring the possibility of establishing PulseNet networks in Africa and the former Soviet Union. This work is done in cooperation with WHO's Global Salmonella Surveillance program (WHO GSS). These expanded collaborations are expected to further improve global surveillance and control of foodborne diseases, which in turn will lead to fewer people being affected by foodborne infection worldwide.✧

WHO Global Salm-Surv: Providing Tools for Foodborne Illness Surveillance and Outbreaks Globally

The WHO Global Salmonella-Surveillance program (WHO Global Salm-Surv) recently conducted two major international trainings in advanced foodborne illness surveillance. From March 19-23, WHO Global Salm-Surv conducted a training in Guatemala City, Guatemala. Hosted by the Universidad del Valle, this training brought epidemiologists and microbiologists from numerous countries and organizations in the region to learn about foodborne outbreak investigation and the impact of these illnesses on a community. A second recent training was held from March 25-29 in Cairo, Egypt. Thirty-nine participants attended, representing countries such as Egypt, Jordan, Kuwait, Lebanon, Oman, Saudi Arabia, Sudan, Syria, and Yemen.

These trainings are vital due to the fact that foodborne illness cost U.S. companies and consumers millions of dollars in medical and labor costs and impact developing countries in a far, far greater way. For example, in the developing world foodborne illness outbreaks go undetected, cases of foodborne illness are not reported, and death can occur due to lack of training and communication between scientists working within the human, animal, and food sectors. WHO Global Salm-Surv is working to reverse this trend.

WHO Global Salm-Surv is a World Health Organization network of institutions and individuals which train public health and food safety microbiologists, epidemiologists, environmental health officers and managers to conduct foodborne illness surveillance and outbreak investigations. CDC participates in the global Steering Committee, along with the Food and Drug Administration (FDA), and other international institutions. The Steering Committee works in close partnership with WHO Regional Food Safety Advisors, the Training Programs in Epidemiology and Public Health Interventions Network Inc (TEPHINET), and PulseNet International.

The main activity of WHO Global Salm-Surv is training courses, such as those mentioned in Guatemala and Egypt. WHO Global Salm-Surv has conducted 45 International Training Courses and Workshops in English, Spanish, French, Portuguese, Chinese, Arabic and Russian for more than 600 public health microbiologists and epidemiologists from more than 100 countries.

Participants in the WHO Global Salm-Surv classes have remarked on the educational as well as the networking benefits of the trainings. "It was a meeting of ideas and dreams of different [countries] in one space of time," remarked a participant at the 2007 Training Course for the Middle East. Cherae' L. Robinson of the CDC explains that ".the microbiologists and epidemiologists had the opportunity to talk, some of them for the first time, and even plan projects for their countries. The course was an excellent example of how important collaboration is to public health." Indeed, it is these activities like these that equip countries and regions with critical scientific and public health tools so that they can carry out disease detection in their respective countries.✧

WHO Global Salm-Surv has conducted 43 International Training Courses and Workshops in more than 100 countries.