Summary of the Fourth Meeting of the ITFDE(II)
April 16, 2003

This fourth meeting of the International Task Force for Disease Eradication (ITFDE) was convened at The Carter Center from 9:00am to 4:00pm on April 16, 2003. The Task Force reviewed the status of efforts to control meningococcal meningitis (cerebro-spinal meningitis) and to eliminate taeniasis/cysticercosis. Task Force member Dr. Yamagata also made a brief presentation on the Japan International Cooperation Agency's (JICA) work to help control Chagas' disease in Guatemala, Honduras and El Salvador, in collaboration with the Pan American Health Organization (PAHO).

The Task Force members are: Sir George Alleyne, Pan American Health Organization; Dr. Yves Bergevin, UNICEF; Dr. Mariam Claeson, The World Bank; Dr. Julie Gerberding, Centers for Disease Control and Prevention; Dr. David Heymann, World Health Organization; Dr. Donald Hopkins, The Carter Center; Dr. Adetokunbo Lucas, Nigeria; Professor David Molyneux, Liverpool School of Tropical Medicine; Dr. Mark Rosenberg, Task Force for Child Survival and Development; Dr. Harrison Spencer, Association of Schools of Public Health; Dr. Dyann Wirth, Harvard School of Public Health, and Dr. Yoichi Yamagata, Japan International Cooperation Agency. Six of the Task Force members (Hopkins Lucas, Molyneux, Rosenberg, Spencer, Yamagata) attended this meeting, and four others were represented by alternates (Dr. David Brandling-Bennett for Alleyne; Dr. Maria Costales for Bergevin; Dr. Mark Eberhard for Gerberding, and Dr. Kees Kosterman for Claeson). Dr. Sally Stansfield of the Bill and Melinda Gates Foundation, which funds the work of the Task Force, also attended this meeting.

Cerebro-spinal (meningococcal) meningitis

The presentations on cerebro-spinal meningitis (CSM) were given by Dr. Nancy Rosenstein of the Centers for Disease Control and Prevention (CDC) and Dr. David Salisbury of the Department of Health in the United Kingdom.

This often fatal disease usually results from infection with one of five meningococcal (*Neisseria meningitidis*) serogroups, designated A, B, C, Y and W-135. Serogroup A is commonly found in Africa and East Asia, B in Europe and the Americas, C in the Americas, Europe and Asia, and Y in North America. The first reported outbreak of W-135 first occured in 2000 and has been reported worldwide since then with one epidemic in Africa. About 614,000 cases and 180,000 deaths due to endemic bacterial meningitis are usually reported officially per year, with highest incidence among children and adolescents. In addition in Africa, where CSM is normally three to eight times more prevalent than elsewhere, large epidemics occur at 8-12 year intervals during the dry season in a belt of countries just below the Sahara Desert, stretching from Gambia to Ethiopia. These epidemics typically last 2-3 years, during which they cause high

mortality, have great economic impact and disrupt routine public health services as countries scramble to contain the outbreaks. Humans are the only reservoir of this pathogen.

Up to 10% of populations may be carriers, of whom only a small fraction develops disease. Exposure to tobacco smoke is a risk factor. In the United States, the disease is more common in people in lower socio-economic groups.

The most effective control for CSM is rapid detection and mass immunization, which must be specific for the serogroup concerned (no widely accepted or licensed vaccine is yet available for Group B). Polysaccharide vaccines, which are available for types A, C, Y and W-135 (bivalent, trivalent or quadrivalent), provide serogroup specific protection but they do not work well in young children who are at highest risk for disease, do not induce effective herd immunity or prevent the carriage state. Because of these limitations, current control efforts focus on rapid detection and mass immunization. "Conjugated" vaccines, where the polysaccharide meningococcal antigen is conjugated to proteins (as in the very effective vaccine against (*Hemophilus influenza* B), are more effective, including in infants, induce herd immunity when used in mass vaccination, reduce carriage rates, are heat stable, and hold great promise for the future, but are more expensive (US$4-$50 per dose) when available. Starting late in 1999, the United Kingdom became the first country to use the new Group C conjugate vaccine in a model mass campaign involving public-private partnership that has effectively controlled Group C meningococcal disease in the UK. Quadrivalent (A, C, Y, W-135) conjugate vaccines are currently under development for use in the United States. The Bill and Melinda Gates Foundation recently funded an effort to develop and introduce a serogroup A conjugate meningococcal vaccine for use in Africa. Chemoprophylaxis with antibiotics, such as a single intramuscular injection of chloramphenicol, is another, less satisfactory means of prevention.

Meningococcal meningitis was among the diseases screened for potential eradicability by the first ITFDE ten years ago, but was not judged to be eradicable with existing tools. Important developments since then include the potential for better vaccines, and the demonstration of the efficacy of one of the new conjugated vaccines for mass immunization in the United Kingdom.

Conclusions and Recommendations

1. CSM is an important disease which causes major loss of life and could be much better controlled than it is if improved vaccines are made available at affordable prices.
2. A serogroup A conjugate vaccine is urgently needed for Africa. A quadrivalent conjugate vaccine for serogroups A, C, Y and W-135 is needed urgently for use in developed countries, and would be effective in Africa, and such potential dual use may facilitate its development and marketing by the private sector.
3. There is urgent need to improve surveillance for, and reporting of, cases and outbreaks of CSM, including laboratory confirmation of the diagnosis.

4. The costs of epidemics and the microepidemiology of epidemics of this disease need more study, especially in Africa.

Cysticercosis

The presentations on *Taenia solium* cysticercosis were presented by Dr. Peter Schantz of the CDC and Dr. A. Lee Willingham of the WHO/FAO Collaborating Center for Parasitic Zoonoses in Denmark. Dr. Hector H. Garcia of the Cysticercosis Unit in Lima, Peru, was an invited observer, and also participated in the discussion.

This zoonotic disease is endemic in many pig raising/pork consuming areas of the world, both rural and urban, and it is closely associated with poverty. Humans who eat inadequately cooked pork may become carriers of the adult tapeworm and excrete infective eggs and proglottids of the parasite in their feces. People who ingest parasite eggs from food, water or fingers contaminated with human feces may develop potentially fatal cysticercosis caused by larval stage cysts that may infect their brain or other tissues. Pigs that ingest the feces of people who harbor the adult *T. solium* parasites then develop larval cysts (cysticerci) in the pigs' tissues, and those larvae will develop into adult worms in people who eat inadequately cooked flesh of such pigs. Passage through both humans and pigs is required to sustain the parasite's life cycle. Dogs may serve as less important intermediate hosts in parts of Africa and Asia, but there is no reservoir of this infection in wildlife. An estimated 75 million persons live in endemic areas of Latin America alone. Cysticercosis is considered the commonest preventable cause of epilepsy in the developing world. The presence of a human pork tapeworm carrier in a household is the main risk factor for human cysticercosis; for this reason domestic workers from endemic areas may import the disease into even non-pork consuming households in otherwise non-endemic areas. The lifespan of the adult tapeworm can be more than 25 years. Increased domestic pig-raising may be partly responsible for apparent increases in the disease in East and Southern Africa, as well as improved diagnostic tests and survey methods globally. Whilst modern industrial pig-raising is not associated with transmission of *T. solium*, but domestic pig-raising, which in less developed countries is where a pig rearing subsistence economy allows pigs access to human excreta, is usually a less expensive, more practical and important source of income in areas where the disease occurs. The World Health Organization is conducting an on-going assessment of the burden of cysticercosis, including its impact on human health, animal husbandry and agriculture.

The main proven control measures are a) surveillance of the infection in humans and pigs, b) improvements in personal hygiene and sanitation (hand washing, disposal of human feces), pig raising practices (fenced, not fed human feces), and proper cooking of pork, c) treatment of infected people, and d) diagnosis and treatment of infected pigs (also abbatoir inspection). The previous ITFDE concluded ten years ago that *T. solium* cysticercosis was one of only six diseases that were potentially eradicable, but it also stated that there was need for "simpler diagnostics for humans and pigs." Several important advances have been made since then, including improved clinical imaging of

lesions in the brain, diagnostic antibody and antigen tests for larval stages of the parasite, diagnostic antibody and coproantigen assays for intestinal adult stages of the parasite, and effective medical treatment suitable for single-dose, mass usage in humans (praziquantel, albendazole) and in pigs (oxfendazole). A vaccine to prevent cysticerci in pigs is being developed. The new diagnostic measures are not yet widely available, however, and so far only Peru has used all the new tests to comprehensively assess local prevalence of *T. solium* in humans and swine. There is also increasing recognition of the extent and impact of the disease.

Successful pilot demonstrations of control measures have been or are being conducted in Mexico, Ecuador and Peru (the latter with support recently provided by the Bill and Melinda Gates Foundation), and a regional action plan for Eastern and Southern Africa was developed in 2002 with support by the WHO, the Food and Agriculture Organization (FAO), and the World Bank. However, the infection has not yet been eliminated from any region by a specific program, and no national control programs are yet in place. China intends to include cysticercosis in its national disease surveillance system beginning 2004. A report on this disease was presented to the 2003 World Health Assembly.

Conclusions and Recommendations

1. Demonstration of effective control or elimination of *T. solium* transmission on a national scale would probably be the greatest single stimulus to further action against this potentially eradicable disease. A program strategy that includes multiple interventions in flexible mass or targeted approaches would probably have the greatest chance of success. Given the importance of domestic pig husbandry to local traditional subsistence economies in endemic areas, economic factors should be considered in designing any control program.
2. Although evidence of the importance of cysticercosis is greater now than it was a decade ago, there is still need to better document the prevalence and economic impact and for epidemiologic studies to understand better the transmission dynamics of this disease.
3. Since programs involving the mass distribution of praziquantel (for schistosomiasis) and albendazole (for lymphatic filariasis) are currently underway or being planned for large areas where cysticercosis is endemic, it would be useful to evaluate the impact of those interventions on the latter infection.