Assessment Team: Increasing Animal Source Foods in Diets of HIV-infected Kenyan Women and their Children: Can Treatment Outcomes be Enhanced?

Narrative Summary

The HIV & AIDS nutrition and agriculture project is focused on the effect of increased amounts of animal source foods in the diets of HIV-infected Kenyan women and their children. Preliminary evidence suggests that improved nutrition early in HIV may delay disease progression and delay initiation or improve the effectiveness of antiretroviral drug therapy.[1-4] In particular, animal source foods (ASF) such as meat, milk and eggs provide nutrients in utilizable forms that support the body's ability to maintain lean tissue, immune function, and daily activities. A high prevalence of HIV and AIDS in rural communities superimposed on existing poverty, erodes family and community infrastructure, exacerbates food scarcity and undermines the ability of rural Kenyan communities to eliminate poverty and attain self-sufficiency. The overall goal of this research is to determine if there is a "right mix" of food in both quantity and quality that will protect the immune system and prevent severe infection, prevent the loss of body mass and enhance the quality of life among HIV-infected Kenyan women who are not yet experiencing metabolic inefficiencies associated with the disease. These women may then be able to sustain themselves and their families with increased agricultural productivity.[5]

The assessment team project resulted in a full project proposal. The objectives of the proposed project are:

1) to determine if ASF added to local diets have a significant effect on the overall health and progression of disease in HIV-infected Kenyan women and their children living in rural households in the Nandi District
2) to determine if the Kenyan agricultural system has the potential to provide the ASF needed to maintain nutritional status, particularly to improve lean mass and immune function as well as provide food security for those families living with HIV and AIDS.

Proposed methodology:

- Objective 1: A nutrition intervention trial at one HIV and AIDS treatment clinic near Eldoret, Kenya will compare the health status of patients provided ASF with those who are not provided ASF; a meat-supplemented group will also be compared to a milk and egg supplemented group.
- Objective 2: Nutrient profiles of foods with the potential to improve health outcomes will be developed and constraints to increased production of those foods in Western Kenya will be identified.

This research is of interest to health professionals, agricultural research and extension personnel and policy makers worldwide. The initial research will be implemented by faculty and staff from three United States universities, two Kenyan universities and the Kenya Agricultural Research Institute (KARI), in collaboration with the Academic Model for Prevention and Treatment of HIV/AIDS (AMPATH) at Moi University, as well as Kenyan and international non-governmental organizations (NGOs). AMPATH is funded to provide care that includes highly active antiretroviral treatment (HAART) to 40,000 patients and is recognized by the Kenyan government as the lead training site for HIV care in Western Kenya. The lead principal investigator for the proposed research will be Carol Boushey, Department of Foods and Nutrition, Purdue University. Other United States universities involved are Indiana University and University of California, Los Angeles (UCLA). Kenyan involvement is from Moi University, Eldoret, and Egerton University, Njoro.

Research

Problem Statement and Approach. The Activities listed below resulted in the problem statement: HIV and AIDS have a profound effect on the human system and agricultural productivity and cause barriers to adequate nutrition. Even with appropriate medical care that includes antiretroviral drugs, persons living with HIV & AIDS (PLWHA) are more likely to develop AIDS and die when poverty and food insecurity prevail. Low agricultural productivity is a direct consequence of HIV and AIDS and results in nutritional deficiencies of energy, protein and micronutrients. Increased agricultural productivity will help to provide a reliable supply of a variety of foods in enough quantity that energy needs are met and protein intake is spared to support immune function and to maintain lean body mass. A variety of foods rich in micronutrients will be available inclusive of animal source foods for vitamin B12, bio-available iron and zinc and essential and conditionally essential amino acids. This increased availability of improved quality food, we hypothesize, will prevent or slow the progression of HIV disease. Impact can be measured from changes in immune status, lean body mass, HIV viral load, work productivity, quality of life and mortality.

Team Formation. We formulated a team of US researchers and met in person and via conference call in 2004 on October 6, November 23 and December 13 and in 2005 on January19, February 15, April 14, May 31, June 6 and June 9. We included input from senior researchers formerly funded by the GL-CRSP for nutrition projects in Kenya and discussions with AMPATH program faculty. We also discussed potential collaboration with members from the Bean/Cowpea CRSP and the Beans for Health Alliance who are studying the effect of various pulses on health with projects in Tanzania and Botswana.

Travel to Kenya. US researchers traveled to Kenya in November, 2004 and again in February/March, 2005 to investigate collaborative partnerships. A workshop was held in Eldoret, Kenya. US and Kenyan university faculty and professional staff in nutrition, agriculture and behavioral sciences participated. From these meetings and workshop, the following working hypotheses developed which guide the proposed research and intervention projects:

(1) Increased intake of ASF will improve treatment outcomes of HIV-infected Kenyan women, particularly if pregnant, and will improve the growth and overall health of their children through decreased infections, improved micronutrient and macronutrient intakes and status, and improved lean body mass. This hypothesis is supported in theory because ASF provide nutrients that are required for optimal immune status and for maintaining muscle mass; vitamin B12 and conjugated linoleic acid are only available through ASF. ASF provide essential amino acids as well as amino acids considered as conditionally essential in HIV disease. Meat provides the most bio available source of iron and zinc; two nutrients needed for maintaining immune function and lean body mass. Therefore results may show the greatest impact when meat is included.

(2) Redesigned rural farming systems will help meet the medical and nutritional objectives of HIV-infected smallholder farmers. This hypothesis is supported in theory because HIV-infected farmers may need to change what they produce and grow for family use to achieve nutritional objectives. HIV -infected farmers may not be able to work as hard as HIV negative farmers, and so they may need to consider labor saving technologies and/or lower labor crop and livestock alternatives. If a cooperative or out-grower scheme is organized to provide food for urban HIV patients, this may open economic opportunities for HIV-infected farmers.

Progress. During the assessment team phase, the project was able to:

- Develop collaborative relationships between US and Kenyan Universities.
  - -- A Memorandum of Understanding was drafted between Moi University and Purdue University that recognizes collaborative research and teaching endeavors.
  - -- Team formation with faculty from Egerton University, Indiana University, Purdue University, Moi University and University of California, Los Angeles.
- Develop collaborative relationships within US and Kenyan Universities.

-- Team formation with faculty from the Faculty of Health Sciences and Agriculture at Moi University.
-- Team formation with faculty from Nutrition and Agriculture at Purdue University.

- Generate a defendable research question and draft the 10 page "sell the concept" proposal.
- Identify project team members in Kenya needed to facilitate the research.
- Identify other sources of leveraged funding.

We were not able to draft a full proposal to be submitted for leveraged funding, but this is our intention.

Gender

The population to be studied is HIV-infected women of reproductive age in Kenya and their children. Women and girls make up a growing proportion of those infected by HIV and AIDS. At the end of 2004, UNAIDS reported that women made up almost half of the 37.2 million adults (aged 15-49) living with HIV and AIDS worldwide. The hardest-hit regions are areas where heterosexual contact is the primary mode of transmission. This is most evident in sub-Saharan Africa, where close to 60% of adults living with HIV and AIDS are women. Seventy-five percent of the agriculture workforce in Kenya is women.[6-9]

Gender related activities during the planning phase focused on information gathering and proposal development:

- Workshop: The workshop that was held in Eldoret, Kenya in March, 2005 that focused on HIV, Nutrition & Agriculture included women as well as men. Both in planning and in attendance. The planning and implementation of the workshop was a joint effort with both men and women in leadership roles. Eighteen (44%) of the forty-one persons attending the workshop were women. Five women gave presentations as part of the workshop; one in animal science nutrition, the other four in human nutrition.
- Visit to Nutribusiness: In Sotik, Bomet District, we visited a solar drying nutribusiness site run by women. This cooperative was developed by rural Kenyan women, Penn State University, Tuskegee University and the University of Nairobi and has been operational since 1992 and produced a variety of Nutri-Mix Porridge made from vegetables and grains. There were plans to also solar dry meat, which is why we visited. For the past year it has not been operational due to the death of one of the founders who gave key support to the enterprise. If the results of our study prove positive, this type of enterprise can be reproduced as part of a sustainability strategy - involving women in the development and implementation.
- During both trips to Kenya, November, 2004 and February/March, 2005, visits with faculty and staff in the Nutrition and Agriculture Departments of Egerton and Moi Universities included both men and women. Women predominated in nutrition and men in Agriculture, however one male nutrition faculty at Egerton is pursuing a doctorate and of the faculty in Agriculture at Moi University, two are women. All had the opportunity to participate equally in discussions about the proposed project.
- Team formation and information gathering included input from senior faculty and project manager, all women, previously funded by GL-CRSP for nutrition focused projects in Kenya.

Policy

No contributions were made to policy as a result of the planning phase. Potentially the study findings may contribute to national nutrition guidelines for persons living with HIV & AIDS. The proposed research was presented to policy makers in Nairobi at the GL-CRSP CNP meeting.

Meetings were held with the following individuals during this planning phase and the proposed project was discussed with them.

- Janet Paz-Castillo, Chief, USAID Mission in Kenya. Office of Population Health & Nutrition and Dr. David B. Elkins, PEPFAR

Coordinator, USAID Kenya. Ms. Paz-Castillo requested that a draft of our proposal be sent to her office for consideration for FY 2006 PEPFAR funding.

- Dr. Peter T. Ewell, Regional Ag. Advisor, USAID/REDSO/ESA/Food Security and Nzuki Solomon Mwania, Regional Trade Policy Specialist, USAID/REDSO/ESA/Food Security. Ewell said that he would like to be kept informed of the developments on the HIV, Nutrition and Agriculture Initiative. He suggested that our group contact the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), the Harvest + Initiative of the Consultative Group for International Agricultural Research (CGIAR) and Winrock.

Outreach

Given that this project is only in the planning phase, we have not accomplished any specific outreach activities other than the workshop held in Eldoret.

Developmental Impact

Environmental impact and relevance. The AMPATH program at this time addresses the nutritional needs of only 20% of patients who are the sickest and the most food insecure by giving them food. Body mass index (BMI) is calculated for all patients and is the only nutrition assessment measure used at this time. The proposed project incorporates more sensitive indicators of nutrition assessment and body composition that may be determined as critical measures to predict treatment response. AMPATH is recognized as the leader in training for health care provided to PLWHA in western Kenya. If determined to be useful, these nutrition assessment and health indicators could be implemented as part of the overall care and potentially improve management and health outcomes for a large number of patients in Kenya.

Agricultural sustainability. The proposed research identifies three agricultural activities to be implemented that will lay the foundation for understanding constraints to increasing cost effective production of ASF in Kenya:

1) determine nutrient profiles of ASF and other dietary staples linked to improved immune function,
2) describe current ASF production systems, including production calendars and enterprise budgets for nutritionally suitable foods,
3) identify the key constraints to increased production of ASF and
4) initiate on-farm demonstrations of ASF production technologies designed to address key constraints.

ASF production solutions identified by agriculture scientists will be tested on the AMPATH demonstration sites and on patient farms. Marketing options will be developed to allow urban HIV positive people access to the food and provide improved livelihoods for the farmers affected.

Contributions to U.S. agriculture. Two Purdue agriculture graduate students per year will travel to Kenya and assist in the development and demonstration of alternative ASF technologies on the AMPATH farms. They will learn from this international experience and share what they learned with their US colleagues.

Contributions to host country. Contribution of this proposed project within the country of Kenya include:

- Increased infrastructure within the academic departments of Moi and Egerton Universities that are involved in the research.
- Opportunities for academic training of Kenyan scientists.
- Opportunities for collaborative research for Kenyan faculty and staff from Moi and Egerton Universities, governmental and non-governmental organizations that are involved in the proposed project.
- More in-depth nutrition assessment of HIV-infected women and their children living in rural western Kenya. The results of this proposed research may provide basis for nutrition intake and assessment guidelines

for those living with or affected by HIV and AIDS, particularly in sub-Saharan Africa.
- Development of a strategy for sustainable production of ASF in rural Kenya.
- The findings of this project will be the first step in the formulation of a novel and replicable transportable HIV and AIDS nutrition and agriculture model for implementation in resource poor areas that includes guidelines and interventions that prevent and limit health deterioration and increase food security within families and communities.

Linkages and networking. Nutrition scientists will use the nutrient profiles of foods identified initially and focus on biochemical assessments of micronutrients (iron, zinc, selenium, vitamin B12, magnesium) and protein in HIV-infected women and their children in addition to indices of immune function as outcomes to the various nutrition interventions. The laboratory methodology, equipment and trained personnel costs for these analyses are beyond the capacity of the GL-CRSP funding and will require leveraged funding. Collaborators have been identified [Lindsay Allen (vitamin B12), UC Davis, Tom Hongo (selenium), Kenyatta University, Julia Otaya (zinc), Kenyatta University and David Mwaniki (iron), KEMRI]. David Mwaniki who is the Assistant Director, Kenya Medical Research Institute (KEMRI) and Director, Center for Public Health Research is interested in the design that we propose so that they can use a similar design with a study that will be initiated in a HIV-infected population that will use a multimix corn soy blend as a nutrition intervention. They are interested in our design so that we will be able to compare data. Grace Ettyang, Moi University will represent our proposed design at their upcoming project design meeting.

Dr. Barry Colley, Director, Enterprise Development and Global HIV Support for Heifer International is interested in receiving our proposal and participating at some point.

Thomas Fitz Randolph, PhD, Agricultural Economist for the International Livestock Research Institute (ILRI) is very interested in our proposed research and is developing a concept paper related to the importance of ASF in the diets of HIV-infected individuals. He will be forwarding the paper to us for review.

Collaboration with international research centers (IARCS) and other CRSPs. This project is building upon the knowledge gained from the GL-CRSP CNP related to the effect of ASF on lean body mass accretion in school-age children in Embu District, Kenya. Two senior researchers from the CNP are collaborators with this proposed project.

The research team will interface with staff at the Kenya Agriculture Research Institute (KARI) at the Naivasha Station for the analysis of key nutrients known to support and improve immune function from foods produced by local farmers and purchased at local markets.

This implementation plan is for an initial three-year "proof of concept" study. If the three year initial stage is successful, realization of overall project goals will require: verification of the value of meat in relation to milk/eggs and legumes in a broader population is planned and can involve collaboration with the Bean/Cowpea CRSP and the Beans for Health Alliance.

Other Contributions

Support for free markets and broad-based economic growth. Nothing related to support for free markets and broad-based economic growth has transpired at this early stage of the project, however contact was made with the solar drying Nutri Business enterprise in Sotik, Bomet District described in the gender section. Another like enterprise is located in Marengo, Kenya. They resulted from work led by Audrey Maretzki, Penn State University and with faculty from Tuskegee University and the University of Nairobi who trained local women to start and maintain a business that can also improve nutritional resources for families throughout the areas. The cooperatives, involving nearly 2,500 women, were established to manufacture and market locally produced, culturally appropriate, nutritious and affordable food mixes for toddlers, while the women shareholders gained new, socially suitable opportunities for self-employment and income generation. Additional information can

be found at: http://www.outreach.psu.edu/news/magazine/Vol_4.2/award.html. If we find from the proposed research that meat proves beneficial in the diets of HIV-infected women and their families, we will investigate collaborative efforts with these cooperatives as a strategy for dried meat production and sustainability.

Contributions to and compliance with mission objectives. One of the mission objectives of the USAID/Kenya's health program is to provide care and support for those already infected. Being a focus country within the President's Emergency Plan for AIDS Relief (PEPFAR) the country team is planning a major expansion of HIV/AIDS programs, with special attention to care and treatment. Nutrition assessment and food-based interventions that may impact HIV disease progression have not been applied to the problem in Kenya. Our proposed project will provide new information that may have wide application for treatment and care of PLWHA.

Another mission objective of USAID is to support several projects to identify and establish sustainable strategies to enable communities to cope with the needs of HIV-positive children and those orphaned by AIDS. Our project includes providing food to families and measuring the impact of ASF not only on the health of the HIV-infected women but also of one target child in the household. These children are viewed as vulnerable and our findings can be applied at the community level in the development of sustainable initiatives for children.

Another mission objective is to reduce the impact of infectious diseases; focused primarily on strategies to prevent malaria and TB. The underlying science that supports this research question relates to maintaining immune function. Thus the knowledge gained can be translated directly to the non HIV-infected population who live in environments that place them at high risk for contracting infectious diseases.

Concern for individuals. The project is focused to benefit the population at highest risk for HIV-infection in Kenya, women of reproductive age and their children. What is learned will be extrapolated to benefit other populations as well in Kenya and throughout areas with high HIV prevalence.

Support for democracy. The project is focused to benefit HIV-infected persons in Kenya and their families. This population suffers from stigma and food/nutrition insecurity. What is learned will be disseminated to policy makers in the local, national and international communities and sustainable strategies will be developed.

Humanitarian assistance. Currently, a significant percentage, (20-50%), of those infected with HIV in rural Kenya are food insecure. About 20% of patients enrolled in the AMPATH program receive food aid. The project that is proposed will initially focus on the impact of a food-based nutrition intervention for those individuals enrolled in the AMPATH program for HIV care, and however are not receiving any food aid from AMPATH. Study participants will be provided additional food for themselves and their families. It is currently unknown what the nutritional needs are for HIV-infected individuals.

Leveraged Funds and Linked Projects

We are planning to submit proposals for leveraged funding to the National Institute of Child Health and Human Development (NICHD), Robert Thrasher Foundation, Cattleman's Association, Heifer International and PEPFAR USAID Kenya Mission.

Training

Short term

Attended Kenya Coalition for Action in Nutrition (KCAN) Inaugural National Nutrition Congress (INNC) entitled Food and Nutrition Security for Health and Development (Feb 21-23, 2005) in Nairobi, Kenya

Attended the GL-CRSP Child Nutrition Project meeting with policy makers in Nairobi, Kenya. Made a short presentation related to the proposed HIV, Nutrition & Agriculture project in development.

Workshop in Eldoret – HIV, Nutrition &

Agriculture in Western Kenya. Led the 2 1/2 day workshop with ~ 40 faculty and professionals with expertise in nutrition, agriculture, education and social science from US and Kenyan universities, NGOs and governmental organizations participated.

Collaborating Personnel

United States

Todd Applegate, Ph.D., Dept. of Animal Sciences, Purdue University, poultry nutrition and management.

Carol Boushey, Ph. D., RD., Dept. of Foods and Nutrition, Purdue University, nutritional epidemiology and dietary assessment.

Shawn S. Donkin, Ph.D., Dept.of Animal Sciences, Purdue University, Expertise in dairy cattle nutrition and management.

Judith A. Ernst, DMSc, RD, Dept. of Nutrition and Dietetics, Indiana University, nutrition assessment as it relates to children and HIV infection.

Jess Lowenberg-DeBoer, PhD, Dept. of Ag Economics, Purdue University, economics of agricultural technology, including impact assessment

George McCabe, PhD, Dept. of Statistics, Purdue University

Suzanne Murphy, PhD, RD, University of Hawaii, diet analysis and nutrient data bases

Charlotte Neumann, MD, University of California Los Angeles, child development and cognitive assessment

John Sidle, MD, Indiana University (Pediatrician) Liaison to AMPATH

Tony Vyn, Ph.D., Department of Agronomy, Purdue University, USA. Expertise in cropping systems and nutrient availability.

Kara Wool-Koulstain, MD, Indiana University (Infectious Disease) Liaison to AMPATH

Kenya

David Ayuku, PhD. Clinical Psychologist, Dept. of Behavioral Sciences, Moi University, nutrition in relation to child development and cognitive assessment

Grace Keverenge-Ettyang, PhD, Dept. of Epidemiology and Nutrition, School of Public Health, Moi University, maternal micronutrient malnutrition and body composition assessment

Abdi Yakub Guliye, PhD., Dept. of Animal Science, Egerton University, ruminant nutrition and management

John Kariuki, PhD., National Animal Husbandry Research Center, animal nutrition

Solome Korir, MSc., Dept. of Epidemiology and Nutrition, School of Public Health, Human Nutrition, Moi University, food security, dietary intake, maternal and child nutrition

Peninah Masibo, MPH, (Human Nutrition) Dept. of Epidemiology and Nutrition, School of Public Health, Moi University, maternal and young children nutritional status and dietary intake

Patrick W. Mathenge, PhD., Dept. of Crop Science and Seed Technology, Moi University, crop physiology

Margaret Ngigi, PhD., Dept. of Agricultural Economics, Egerton University, agricultural marketing and agricultural policy

Winstone Nyandiko, MD, Pediatrician, Dept. of Child Health & Pediatrics, Moi University, mother to child transmission (MTCT) of HIV and pediatric HIV care specialist

Caleb O. Othieno, PhD. Dept. of Soil Science, Moi University, soil scientist

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Collaborating Institutions

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Abstracts and Presentations

Ernst, JA - presented briefly proposed idea: "Increasing Animal Source Foods in Diets of HIV-infected Kenyan Women and Their Children: Can Treatment Outcomes be Enhanced?" at the GL-CRSP CNP meeting with policy makers, February 28, 2005, Nairobi, Kenya.

Ernst, JA - presented proposal: "Increasing Animal Source Foods in Diets of HIV-infected Kenyan Women and Their Children: Can Treatment Outcomes be Enhanced?" at the GL-CRSP biennial meeting, June 24, 2005, Dublin, Ireland.

Footnotes and References

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7. Gittinger JP, Chernich S, Hornstein NR, Saito K. Household food security and the role of women. Washington, DC. 1990.

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