

INCREASING ANIMAL SOURCE FOODS IN DIETS OF HIV-INFECTED KENYAN WOMEN AND THEIR CHILDREN

NARRATIVE SUMMARY

Animal source foods (ASF) such as meat, milk and eggs have been identified as key components in diets that build and maintain immune function and lean body mass and micronutrient status. Preliminary evidence suggests that improved nutrition for those infected with human immunodeficiency virus (HIV) early in the disease course, may delay progression to acquired immune deficiency syndrome (AIDS) and improve the effectiveness of anti-retroviral treatment.¹⁻⁴ Our long-range goal is to improve survival and enhance the quality of daily living for HIV and AIDS infected and affected people in Kenya as well as the growth and development of their children using food based solutions. The objectives of this research are (1) to demonstrate our ability to conduct a nutrition intervention trial in rural Kenyan HIV and AIDS clinics and (2) to evaluate the affect of ASF on disease progression of HIV-infected Kenyan women and the health and cognitive development of their children. The central hypothesis of the research is that a sustained intervention of this kind will result in maintained or improved nutrition and immune status, muscle strength, and lean body mass in HIV-infected Kenyan women and support the normal growth and development of their children. The rationale that underlies the investigation is that a diet with added ASF will provide the vitamin B-12 and lysine to maintain or significantly improve nutritional and medical status. Diets with added meat may show more favorable impact than those with added soy and those with no added protein due to the higher bio-availability of iron and zinc. This research is of interest to health professionals, agricultural research and extension personnel and policymakers worldwide.

Methods. Drug naïve, HIV-infected Kenyan

women (N=180) and one of their children will be followed for 12 months. The women will be recruited from the population already enrolled in the treatment clinic in the Turbo Division, Uasin Gishu District in Kenya that is managed by clinicians who are part of the Academic Model for the Prevention and Treatment of HIV (AMPATH).⁵ The women and their families will be randomly placed to either receive 1) meat biscuit, 2) soy biscuit or 3) no intervention food. It is yet to be determined if all families will receive supplemental staple foods during the 12 months of study. Assessments of nutrient intake and opportunistic illness will be monthly. Anthropometric, body composition, strength and quality of life assessments will be summarized every three months and biochemical measures obtained every six months.

RESEARCH

Problem Statement and Approach. 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 especially in sub-Saharan Africa 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. The 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. The first step in this process is to determine if the daily addition of protein and energy to the typical plant based diet of HIV-infected rural Kenyan women and their children will prove beneficial. The addition of meat may prove more beneficial than soy due to the presence of vitamin B-12, bio-available iron and zinc and essential and conditionally essential amino acids. Those who maintain their muscle mass, near normal or slightly reduced cell-mediated immunity, and without the additional stress of infections, may respond more favorably to consistent and aggressive nutrition support and be better able to maintain health and quality of life, and to delay disease progression keeping them independent for as long as possible, at home able to care for and to teach their children^{1, 2, 6-8} and carry on activities of daily living. The rationale for including children in the study is based on the knowledge that those who are not HIV-infected are certainly affected when one or more of their parents are infected with HIV. These affected children are classified in the social sense as vulnerable for delayed development, dropping out of school, and stressed with becoming providers in the household; mainly for food. We hope to see if the physical growth and mental development and health of children (reduction of morbidity and if micro nutrient status and hemoglobin) can be improved or normalized. Previous work^{9, 10} shows that non-HIV-infected Kenyan children are at risk for delayed development and nutrient inadequacies that develop from inadequate energy and animal source foods (inadequate growth, iron and vitamin B-12 deficiencies). We will study the impact of adequate food in the household and further, the quality of the protein, on child growth and development. We will primarily focus on the development of children that are not HIV-infected; however will also follow siblings who are HIV-infected.

We intend the project to roll out in three phases:

Phase I will include a preliminary data collection to determine food availability over a 12 month calendar for a sub-group of 20 families in households similar, but not the same households as those that will be enrolled in the full 12 month protein

intervention study. This information is needed to determine if adequate food for energy is sufficient in these households and if not, to help determine if staple foods need to be provided to all participating households at any time throughout the 12 months of study. For example it may be determined that staple foods will only be required during the dry season. Other documents requiring institutional approval will be created during Phase I and will be submitted when completed through the Amendment process. Also during Phase I, the nutrient analysis of the protein intervention biscuits will occur, and staff will be hired and trained in measurement and assessment procedures for the various outcome variables.

Phase II will include a preliminary trial of all procedures with the approved data collection tools and trained staff in a population living in a different area than Turbo. These trial families (N=12) will not be eligible for inclusion in the 12 month protein intervention study population. Modifications to approved tools may be needed and changes will be made and forwarded for further institutional board approval via the Amendment process.

Phase III will be the full protein intervention trial that will include drug naïve, HIV-infected Kenyan women (N=180) and one of their children (N=180) who will be followed for 12 months. The proposed investigation is a 12 month randomized prospective study that will evaluate the effects of providing additional protein (meat or soy) and energy for 5 days each week in the diets of drug naïve and asymptomatic HIV-infected Kenyan women. The effect of the same intervention in the diets of one child in each of the families will also be assessed over the same time period. Randomization to a treatment cluster at baseline will designate one of three treatments to the HIV-infected woman and her designated child: (1) additional meat protein for 5 days each week over 12 months, (2) additional soy protein for 5 days each week over 12 months, (3) no additional protein supplement. At least 180 woman/child pairs (360 people) will participate in the study; 60 pairs in each of three group clusters (G). Each group will be managed with a different dietary supplement intervention as follows: (MG) added meat intervention, (SG) added soy intervention, (CG) control; no added intervention.

The protein intervention food will be delivered daily to the woman and her child by directly observed treatment (DOT) outreach worker. Any leftovers will be returned to a central location by the DOT worker and quantified. For 5 days each week, women will receive the equivalent of 21 grams of protein/day from either dried meat or heated soy powder and their designated child will receive the equivalent of 14 grams of protein/day from either dried meat or soy powder. The dried meat or soy powder are ingredients in biscuits that are standardized for quality and nutrient density. The biscuits will be baked from standardized recipes at a local bakery in Eldoret, Kenya, individually sealed and frozen in a commercial freezer. The dried meat will be manufactured and purchased from Farmer's Choice Butcheries based in Nairobi.¹¹ Farmer's Choice is a well known and reputable supplier of commercial meat products in Kenya. Food analysis of the products for macro and select micronutrients will be ongoing twice each year both in Kenya and in United States food analysis laboratories for quality and quantitative internal control purposes. Outreach enumerators will be specifically trained and will obtain baseline assessments and then longitudinal assessments of all the following methods. Nutrient intake and opportunistic illness will be obtained monthly. Anthropometric, body composition, strength and quality of life assessments and time allocation studies will be conducted every three months and biochemical measures obtained every six months. All participating families will receive donated treated bed nets at the beginning of the study and may receive staple foods on a weekly basis throughout the 12 month study depending on the results of the initial food security assessments. Women and designated children in all cluster groups will receive prophylactic treatment for helminthic parasites at baseline and every 6 months. All participating families will receive a pure bred dairy goat upon completion of the study.

To commence the research activities during FY 2006-2007, our focus during FY 2005-2006 was intended to establish project offices, hire key staff, and address any protocol design or assessment tool issues identified from a preliminary trial. Specific planned activities included: (1) Hiring and training field staff

in intervention and data collection methodologies, with standardization and quality control procedures (2) Submitting and receiving approval for any needed amendments to the institutional approval at Indiana, UCLA and Moi Universities, (3) Participation in required AMPATH HIV week of training for field staff, (4) Continued development and testing of intervention foods utilizing input from consultants, (5) Conducting a preliminary assessment of food availability and energy intake in a sub population, (6) Enrolling subjects for the preliminary trial and conducting the trial (7) Editing data collection and data entry forms per assessment from the preliminary trial, (8) Continuing to submit proposals for leveraged funding, (9) Purchasing the remainder of the equipment needed for the project implementation and transporting the equipment earmarked for Kenya, and (10) GPS mapping of the location of potential study families, recruitment and enrollment of identified eligible AMPATH families into the main nutrition intervention study and study roll out, and finalizing protocols, data capture forms and manuals for the definitive study.

Progress. The most important accomplishment of this first project year included modifications in the proposal design that reflect better control for the intervention and the establishment of project offices and the hiring of core staff. The project design now includes the treatment extended to provide the intervention food to women and children and possibly staple food for families for 12 months with the use of a directly observed treatment methodology to assure compliance with the intervention. The changes were critical, however the budget almost doubled to accommodate them. The current GL-CRSP project budget reflects costs for building infrastructure at Moi University, the intervention product development, the assessment equipment, a trial intervention, and the main nutrition intervention study and assessments for the first 120 women. The proposal was left intact to reflect the number (n=180) that is needed for statistical power. Leveraged funding sources will be sought for the remaining numbers of women needed, for the treatment and assessments of the target children, and for the biochemical analyses for nutritional

status and micronutrients for women and children, development assessments of the children and time allocation studies of the women.

Notification that the project was funded was communicated in February, 2006. Charlotte Neumann and Judith Ernst traveled to Kenya (Feb/March, 2006), to meet with collaborators to address the proposal modifications identified by the reviewers as needing modification. This trip was viewed as an extension of the planning grant phase and proved very helpful. Areas that were addressed include:

- Length of treatment – It was decided that the length of treatment should be 12 instead of 6 months to capture effects of the dry season on food availability for all participants.
- Assuring adherence – It was decided that the directly observational treatment (DOT) methodology that is successfully implemented in the treatment of tuberculosis, be employed to assure that intervention participants receive the intervention on a daily basis and that any uneaten intervention food can be quantified.
- Assuring uniformity of all groups with regards to the availability of food – It was decided that all study families, even those in the control group, receive the same amount of staple foods. The amount will be determined after a preliminary analysis of food availability in a sub-sample of families. It is important to make sure that the families have enough food available to them to provide enough energy so that the full effect of the intervention is captured.

Significant delay in executing the award to Indiana University (June, 2006) and subcontracts to Moi University and UCLA (August, 2006) prevented the ability to accomplish some of the planned activities in FY 06. We were able to:

- Set up temporary project offices and hire key field staff.
- The IU office was set up and a Research Grant Coordinator hired – Mrs. Wambui Mwangi.
- Two key staff at Moi University were hired.
- Logistics Project Coordinator – Mr. Z. Akula.
- Field Research Project Coordinator – Ms. Elizabeth Buluku.
- Some office furniture was purchased for the

project office at Moi.

- Submit the proposal to the institutional review boards at Indiana, Moi and UCLA and are awaiting approval from the institutions.
- Continue the development and testing of intervention foods.
- The meat biscuit recipe was developed and tested for nutritional value at Covance Laboratories, Madison, WI and acceptability with people in Kenya.
- The dried meat and soy flour were analyzed for nutritional value at Covance.
- The soy biscuit recipe was initiated and continues to be in development.
- Identify organizations where we will seek leveraged funding and are in communication with the grant organizations and for some of the organizations we have concept papers developed.
- A concept paper was submitted to the Nestlé Foundation and a proposal was invited. The submitted proposal for \$100,000 was rejected because the review board could not justify funding a comparison of meat with a superior protein source like soy protein. They could not discern that any difference would be detected but indicated that they would consider an alternative idea if we still used a food based approach.
- A proposal entitled “Impact of Animal Source Foods versus Plant Source Foods Feeding Interventions on Activities of Daily Living, Childcare, and Physical Work of HIV Positive Drug Naïve Kenyan Women: Time Allocation Studies” was submitted to the UCLA Globalization Research Center-Africa and funded at \$10,578.
- Purchase all the equipment needed for the project implementation and these were taken to Kenya by the PI and by the Co-PI during the August/September visit. Also equipment including quantitative food weighing scales, a length measuring board, skinfold calipers all valued ~\$1000 were donated to the project by the former Child Nutrition Project (GLCRSP-funded) that was carried out previously in Embu, Kenya.

The reality on the ground was different from what we had anticipated. Therefore, due to unforeseen circumstances, eg AMPATH and Moi University policies on hiring, and delays by the Institutional Review Boards (IRB), we were not able to achieve the following in the first year. However, plans are at an advanced stage to implement the activities within the first two quarters of the second year.

- Set up the Kenya office as earlier planned.
- Conduct a preliminary assessment of food availability and energy intake in a sub population.
- Enroll subjects for the preliminary trial and conducting the trial.
- Edit data collection and data entry forms per assessment from the preliminary trial.
- Submit research grant proposals to the Thrasher Research Fund, Cattleman Association and National Institute of Health.
- Conduct AMPATH training in HIV for research field staff
- Began initial training of Field Research Coordinator by former GL-CRSP CNP Coordinator Susan Nyerere.

GENDER

Study Population. In 2006, the Joint United Nations Program on HIV and AIDS (UNAIDS) reported that almost half of the adults living with HIV and AIDS today are women. Furthermore, the number of women and girls infected with HIV has increased in every region of the world and is on the rise.¹² This is most evident in sub-Saharan Africa, where close to 60% of adults living with HIV and AIDS are women. Our research project focuses on HIV-infected women of reproductive age in Kenya and their children. Reproductive age women and their young children are the most vulnerable population for malnutrition, HIV transmission, disease progression to AIDS and death in eastern and Southern Africa.^{13,14} Because of social, cultural and economic conditions, women's choice in sexual partners and protective practices are limited. Mother-to-child transmission is responsible for 90% of HIV infections among children under 15 years of age.

Improved nutritional status of reproductive aged women will impact infant morbidity and mortality. This project focuses on improving the quality and length of life of this most vulnerable population.

Solutions to the problems of poverty and hunger will be most effective and long lasting if the role of women in developing countries is addressed. Women play a vital role in the nutrition of developing countries and of their nation's people, producing much of the world's food. In eastern and Southern Africa about 75% of the labor for agricultural production is provided by women. If women are malnourished themselves or unable to feed their families because of inadequate resources or being too ill to buy food, the well-being of many others is jeopardized. If nutritional intervention can be shown effective in reproductive age women and their young children, the way is opened for further research to better identify and satisfy the nutritional needs of other HIV positive groups, e.g. older children, postmenopausal women, and men.

Research and field project staff. Of our two core project staff, one is male, Mr. Z. Akula (Logistics Project Coordinator), and the other is female, Ms. Elizabeth Buluku, MS (Field research Project Coordinator). The job descriptions for the other positions will not specify a particular gender as a requirement, and selections will be made based on qualifications of the applicants, not based on gender. We anticipate that we will have a mix of male and female applicants for the various staff positions that will need to be filled. We will be accepting applications from individuals who are graduate students and from those with at least a high school education. The two principal investigators (IU and Moi), the co-principal investigator, and the two consultants are all women. The two co-principal investigators (Moi) are men. Other Moi University faculty who are consulted on this project are the food technologist, a female, and the psychologist, a man.

POLICY

No contributions were made to policy as a result of the activities of year 2006.

Potentially the results of the proposed project

will begin to define more specific nutrition guidelines for HIV-infected and affected individuals because the research question is defensible. If this research shows or even suggests a positive impact on lean mass and/or immune function in HIV-infected Kenyan women and their children, the information can be the basis for policies that focus on adequate nutrition for women and orphaned and vulnerable children in Kenya. The existing draft of national nutrition guidelines for Kenya will probably not be implemented because the research background is not sufficiently well developed. AMPATH is represented in the National ART Task Force, a think tank composed of various stakeholders in the country. The Task Force is hosted by the National AIDS and STI Control Program (NAS COP - This is a Government body), and updates of the AMPATH program's activities are shared at each of the meetings. The Director of Kenya's National AIDS Control Program is on the AMPATH Advisory Board, specifically to enhance the policy implications of AMPATH's discoveries for all of Kenya, in addition to allowing the NACP to communicate directly with AMPATH's leadership. Therefore, AMPATH is represented in the National AIDS Control Council (NACC-the leading organization for combating HIV in Kenya) research committee, and may serve as a forum for dissemination of the study findings. Publication in peer reviewed journals will be the most powerful means of communication to both local and international policy makers.

OUTREACH

Given that this project is only in its initial phase, we have not accomplished any specific outreach activities. However, we will be carrying out focus group discussions in the community, and we will utilize community leaders to mobilize the community in participating.

DEVELOPMENTAL IMPACT

Environmental impact and relevance. Africa is the only continent in the world where per capita food production has declined during the last forty years, thereby resulting in a net loss in food self-sufficiency

ration from 98% in the 1960's to only 86% in the mid-1980's).¹⁵ Even if countries in Africa were food self-sufficient, national food self-sufficiency does not readily translate to micro-level food security.^{16, 17} In other words, even though a country may be able to import or produce enough food, accessibility at the local level may be difficult. It also does not guarantee food security at the household level.¹⁵ Women and children are prey to inequitable distribution of food within the household thereby making them particularly vulnerable to nutritional wasting and disease susceptibility.^{18, 19} Kenya is one of nine African countries hit hardest by HIV infection and AIDS. Because 75-80% of the labor force of Kenya is employed in agriculture, the pandemic has devastating economic and social implications leading to even greater food insecurity. In rural areas, the premature death of one or both parents results in decreased ability to purchase food, lost generational transfer of food production practices, and further malnutrition.²⁰⁻²⁴

This project targets the highest risk populations for nutrition inadequacy, women of child bearing age and children. John Owour, Head of the Food and Nutrition Unit of Kenya's Ministry of Finance and Planning, stated at the GL-CRSP conference in Nairobi, Feb 28, 2005 that nutrition is in the development agenda because the consequences of inadequate nutrition on productivity in Kenya are great. Fifty percent of people live below poverty; on less than \$1 per day and 80% percent of the population is dependent on agriculture. According to Owour, decreased access to food is one reason for increased mortality.

Protein energy malnutrition is the single cause of child mortality and 22% of children in Kenya under 5 years, are underweight. Murphy et al found the diets of 96% of children in Embu to be deficient in zinc, 90% in Vitamin B-12, 88% in calcium, greater than 50% in vitamin A, and greater than 30% in iron.²⁵ These nutrients are all provided from ASF. The GL-CRSP Child Nutrition Project showed that the only dietary measure that predicted performance was ASF, particularly meat.¹⁰ Stunting at 2 years is related to decreased cognitive development, which translates into productivity losses. The prevalence of anemia in women is 60% in pregnancy and 45%

in non pregnant women. Stunting, iodine deficiency and anemia translate to 61 billion Ksh in total productivity losses.

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.

Nutrition adequacy is both an input and outcome of development. Nutrition is the foundation on which the present generation secures a future for both itself and the next generation.²⁶ People who are well-nourished are more productive, are sick less often, and earn higher incomes. Nutritionally compromised people are less productive in their jobs and homes and in furthering their education. For this reason, the inclusion of nutrition objectives in growth and development policies holds the promise of potentially increasing the productivity and earning power of people world-wide.²⁷

Agricultural sustainability. The findings of this project will be the first step in the formulation of a novel, replicable, and transportable HIV and AIDS nutrition and agriculture model (see Heifer Project below) for implementation in resource poor areas, and that includes guidelines and interventions that prevent and limit health deterioration and increase food security within families and communities. Potential outcomes of this research will be improved health status for HIV-infected women and decreased numbers of orphaned and vulnerable children.

Heifer International will provide the in-country staff resources needed to provide training and animal distribution for this project. In the long term, they can assist in providing meat and other ASF through their Nairobi headquarters and field

offices in Western Kenya. They can mobilize livestock producers and related stakeholders and provide supply logistics, animal health and animal food resources and assist with the creation of market opportunities with farmers to support the project and build support at the community level for the objectives and adoption of best practices and sharing lessons learned that result from the knowledge gained.

Contributions to U.S. agriculture. At this time, the project offers no direct contribution to US Agriculture; however, it has potential to provide research opportunities for graduate students in the sciences. The knowledge gained related to the importance of meat as a necessary component to diets for HIV-infected individuals, will positively impact meat providers in the US as well as everywhere in the world.

Contributions to host country. The research project will contribute significantly to the country of Kenya:

- Increased infrastructure within the academic departments of Moi University that are involved in the research.
- Opportunities for academic training of Kenyan scientists.
- Opportunities for collaborative research for Kenyan faculty and staff from Moi University, governmental and non-governmental organizations that are involved in the research 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..
- Practice-research collaboration in the areas of HIV and AIDS nutrition and market development for ASF among US and Kenyan Universities and a non-profit development agency like Heifer International. Effectiveness will be measured that documents assistance to women and children that results in improved

health, growth and development

- 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.
- Moi university will own the patent of the intervention biscuits-Meat and Soy biscuits.

Linkages and networking.

- Collaboration with Moi University School of Agriculture & Biotechnology. Charlotte Serem, BED, MSc who is a faculty member in the Department of Family & Consumer Sciences in the School of Agriculture & Biotechnology, has proceeded with the development and testing of the recipes for the meat and soy intervention foods.
- Farmer's Choice Butcheries will be supplying the dried meat that will be incorporated into the intervention biscuits.
- Geoffrey Karanja, PhD from the School of Natural Resource Management, Moi University is assisting in the mapping of GPS points used for the randomization scheme and location of study participants.

Collaboration with international research centers (IARCS) and other CRSPs. This research project interfaces with one of the clinic populations that is managed by the AMPATH program and therefore is represented and included in the weekly agenda of the AMPATH research working group teleconferences between US collaborators and Moi University researchers. AMPATH is one of the care initiatives established since 2002 with USAID funds earmarked to provide antiretroviral drug therapy (ARVs) to HIV-infected persons in Kenya. Clinicians learned quickly that the nutritional status of HIV infected patients and food insecurity had significant implications for treatment response. AMPATH developed as part of the 15 year relationship between the medical schools of Indiana University and Moi University in Eldoret, Kenya, Uasin Gishu District (Rift Valley Province). Funding for AMPATH from the Gates and Rockefeller

Foundations and USAID President's Emergency Plan for AIDS Relief (PEPFAR) supports HIV and AIDS care clinics throughout Western Kenya with the goal of treating as many as 100,000 patients in the next few years. Presently over 30,000 patients are enrolled at clinics established in 15 clinic areas within 200 km of Eldoret, with approximately 800 new patients enrolling monthly. Approximately 50% of enrolled AMPATH patients receive ARVs as part of their treatment. The government of Kenya designated AMPATH as Kenya's primary training site for all of western Kenya.

OTHER CONTRIBUTIONS

Support for free markets and broad-based economic growth. 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 the solar drying Nutribusiness enterprise in Sotik, Bomet District that we visited during the planning grant phase as a strategy for dried meat production and sustainability. Another like enterprise is located in Majengo, Kenya. These cooperatives resulted from work led by Audrey Maretzki, Penn State University and with faculty from 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.^{28, 29} 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.

Contributions to and compliance with Mission objectives. 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. This is in direct alignment with USAID/Kenya health program mission objectives which focus on the provision of care and support for those already infected with HIV. Being a focus country within PEPFAR, the Kenya

country team is supporting a major expansion of HIV and AIDS programs, with special attention to care and treatment. A positive impact of the meat intervention in the short term will be interpreted if estimates of lean body mass, strength, indices of nutrition status, incidence of infection, measures of activity and CD4 are maintained or improved by the meat intervention in both women and their children.

Another mission objective of USAID is 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 the provision of food to HIV affected families with outcome measures that will assess the impact of ASF not only on the health of the HIV-infected women but also of one target child in the household. Our findings that relate to the orphaned and vulnerable children can be applied 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 are 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 promotion of democracy is exemplified in the focus of this project. The project is focused to benefit HIV-infected persons and their families. This population suffers from stigma and food/nutrition insecurity. What is learned will be disseminated to policymakers in the local, national and international communities and sustainable strategies will be developed. These strategies could be utilized as well in the US.

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, however are not receiving any food aid from AMPATH. All participating families will receive donated treated bed nets at the beginning of the study and may receive staple foods on a weekly basis throughout the 12 month study depending on the results of the initial food security assessments. Women and designated children in all cluster groups will receive prophylactic treatment for parasites at baseline and every six months. All participating families will receive a pure bred dairy goat upon completion of the study. If a participant who is randomized to the control group becomes eligible for food assistance, she will remain in the study and she and her family will receive the AMPATH standard of care food supplement and food intake will be assessed.

LEVERAGED FUNDS AND LINKED PROJECTS

Efforts to improve nutritional status in HIV-infected populations is a priority for the emerging Heifer Global HIV Strategy.³⁰ In return for their participation with the “Passing on the Gift” of pure bred dairy goats,³¹ Heifer International will enhance their understanding of the impact of meat and document to their board of directors and donors, reliability in the use of funds. This nutrition intervention study with meat will enable Heifer to adopt a more clinical approach with staff and partners in monitoring and measuring the potential benefit of meat in preventing disease progression.

- A grant from the UCLA Globalization Research Center in an amount of \$10,578 was awarded to support the time allocation studies of the HIV-infected women who will participate in the study.
- Faculty time spent on the project reported as in-kind as it is not supported in the project budget or in the cost share.

For Judith Ernst: \$20,490

October 1, 2005 - May 31, 2006 (25% time) = \$16,259

August 1, 2006 - September 30, 2006 (25% time) = \$4,231

For Charlotte Neumann: \$7,972

October 1, 2005 – June 30, 2006 (2.5% time) = \$2,314

Feb – March, 2006 in Kenya for 2 weeks at 100% = \$5,658

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

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

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

TRAINING

No degree training was initiated during this first phase of the project.

Short term: workshops, short courses

- Judith Ernst and Charlotte Neumann attended the Experimental Biology Advancing the Biomedical Frontier, April 1-5, 2006, San Francisco, CA.
- Judith Ernst and Charlotte Neumann attended the Moi University 2nd Annual International Conference Science and Socio-Economics for Sustainable Development: Challenges and Opportunities in the 21st Century (August 30 – September 2, 2006) Eldoret, Kenya and Dr. Neumann presented a paper from the Child Nutrition Embu project which was funded by GLCRSP.

COLLABORATING PERSONNEL

United States

Barry Colley, PhD, Director of Enterprise Development & Global HIV Support, Heifer Project International

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

Audrey Maretzki, PhD Dept. of Food Science and Nutrition, Pennsylvania State University, dried food technology in Kenya

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

Kenya

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

Geoffrey Karanja, PhD, School of Natural Resource Management, Moi University, GPS mapping

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

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

Ann Mwangi, MSc, AMPATH, Moi University, Biostatistics

Duncan Ngare, PhD, Dept. of Behavioral Sciences, Moi University

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

Joseph Rotich, PhD School of Public Health, Moi University, statistician

Charlotte Serem, BED, MSc Department of Family & Consumer Sciences, School of Agriculture & Biotechnology., Moi University, food technologist

Abraham Siika, MBChB, MMed Department of Medicine, Moi University, adult medicine/HIV. Director of AMPATH training

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ABSTRACTS AND PRESENTATIONS

Experimental Biology Advancing the Biomedical
Frontier, April 1-5, 2006, San Francisco, CA.

Abstract

Gewa CA, Murphy SP and Neumann CG. Out-of-home reported foods in rural Kenya: a comparison of children's and mother's recall. April 2, 2006

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Papers

Neumann CG, Murphy SP, Gewa C and Bwibo NO. Meat supplementation improves micronutrient nutrition, growth, cognitive and behavioral outcomes in Kenyan children. April 3, 2006.

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Neumann CG, Bwibo N, Grillenberger M, Gewa C. Meat Supplementation Increases Arm Muscle Area and Physical Activity Levels in Kenyan Children. August 31, 2006.

FOOTNOTES

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