Nutrition and HIV – Scientific update and research gaps

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Overriding Principles for Evidence-Based Guidelines re: Nutrition for PLWHA

- Antiretroviral drugs (ARV) are essential to prolong lives and halt the spread of HIV/AIDS
- Food is essential to life for all people
- Challenge: how to apply sound principles of clinical care and nutrition science to the safe and efficacious implementation of ARV's and long-term care for PLWHA

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Nutrition, HIV and the MDG's

"For many developing countries the incidence of HIV/AIDS and malnutrition is impeding progress towards achieving the UN millennium development goals." (Colecraft, E. Proc Nutr Soc. 2008)

Poverty, malnutrition, HIV and the MDG's

- The complex and devastating interaction among food security, malnutrition, disease and a country's ability to achieve the MDG's is graphically portrayed in the paper by Anyangwe SC et al. (Int J Environ Res Public Health. 2006) who reported that:

"…Zambia's MDG progress reports of 2003 and 2005 show that despite laudable political commitment and some advances made towards achieving universal primary education, gender equality, improvement of child health and management of the HIV/AIDS epidemic, it is not likely that Zambia will achieve even half of the goals. "

A complex world: HIV on top of…

- Food insecurity : role in disease progression, response and adherence to treatment and risk
- Under-nutrition
- “Dual burden” of under and over-nutrition
- Burden of infectious diseases: TB, malaria, diarrheal diseases et al.
- Burden of food borne illness (climate change)
- Increasing burden of non-communicable diseases (NCD) including the metabolic syndrome

Maternal and Child Under-nutrition Lancet series (2008): Research Needs

- Development of methods to assess nutritional status and its determinants
- Prevalence of deficiencies of vitamin A, zinc, iron, and iodine within sub-national populations
- Consequences of nutritional deficiencies for mortality from HIV/AIDS, malaria, and other important infectious diseases
- Consequences of nutritional deficiencies for immune competence, brain development, cognitive ability, and other possible effects
- Overlap of micronutrients and their joint effects on mortality and morbidity
- Development of international fetal and newborn growth standards

Black et al., Lancet, 2008

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Nutrition & Immune function: Where does Malnutrition end and HIV/AIDS begin?

PEM HIV

CD4 T-lymphocyte cell number
Delayed hypersensitivity
to recall and new antigens
B-cell responses
Production of IL-1, IL-2, TNF-alpha
Bacteria killing

Beisel, J Nutr, 1996

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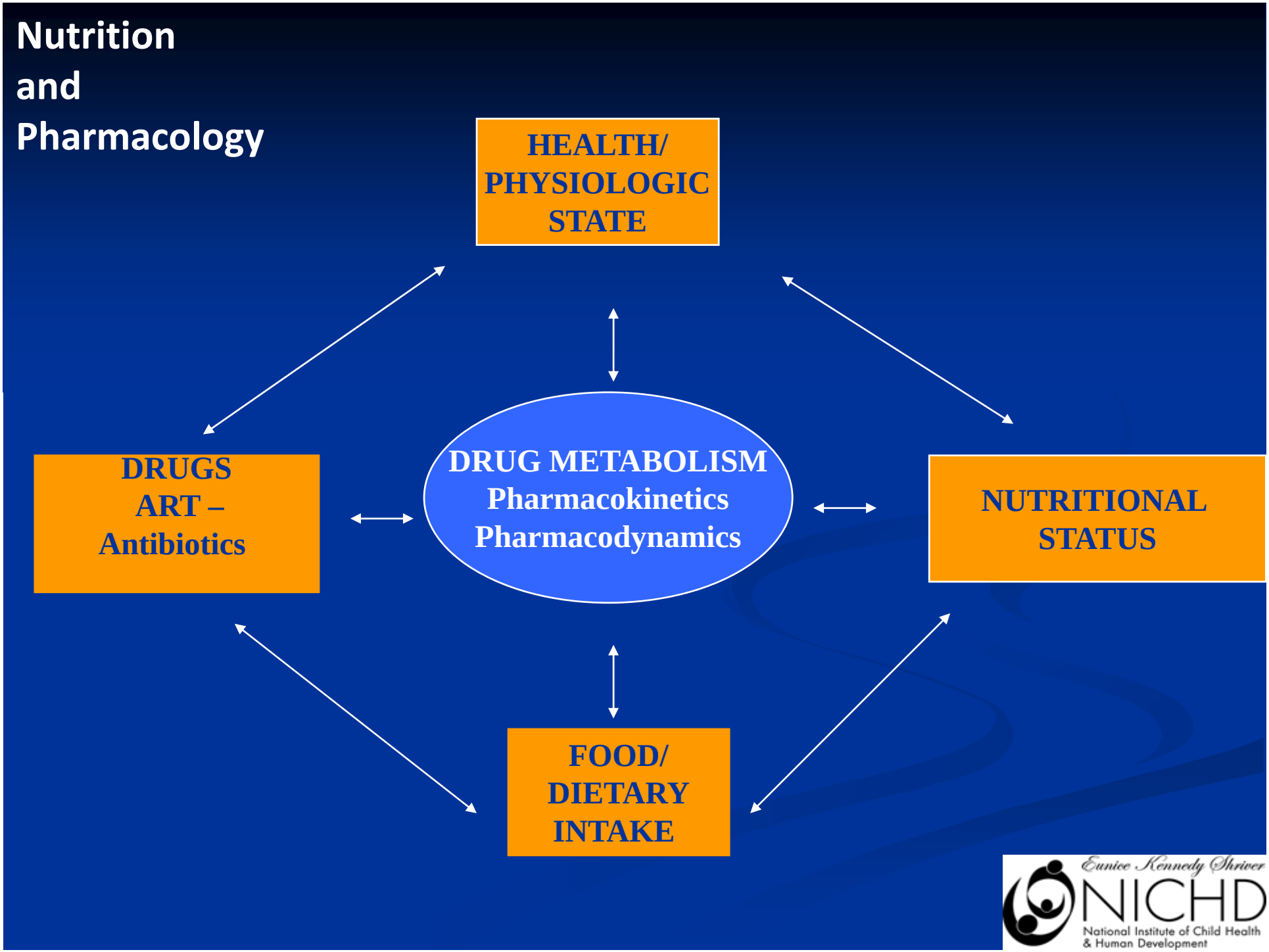
Nutrition and Pharmacology



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Food Security and HIV

- In his recent review of these relationships Dr. Rollins observed that these studies, "…remind us that recognizing and reporting the obvious is not always commonplace. Ignoring such basic issues as food or hunger could be a major stumbling block to HIV prevention strategies." (Rollins, 2007).

Food Security and ART

- People who are food insecure, underweight, and on HAART were 2 times more likely to die than those who were not (Weiser et al.2009)
- Amelioration of food insecurity, i.e., provision of food, can improve adherence to and outcomes of ART. (Byron E et al. Food Nutr Bull. 2008; Cantrell JA et al., JAIDS 2008).
- It's not limited to the developing world:

  Food insecurity associated with poorer viral suppression in food insecure HIV infected patients in San Francisco (Weiser et al. 2009)

  Notwithstanding ethical and practical issues re use of food specifically for HIV in food insecure settings, these finding support the critical importance of food. However for our purposes here it still begs the question…

In resource-limited settings where food insecurity/malnutrition and HIV co-exist…

What is the role of diet/nutrition in HIV/AIDS and related conditions that would require special consideration above and beyond provision of food to ensure a well balanced diet?

1) How might the potential bi-directional relationship between nutrition and pharmacology be played out with specific reference to the use of ART?

Clinical Goal: Define the evidence to support the best intervention, (food/diet) to ensure optimal nutritional status and health of PLWHA before and/or during ART

Nutrition-specific decision making process: What should we ask?

- ARE YOU HUNGRY?!!
- Does the patient's current condition interfere with the ability to obtain an adequate/nutritious diet (e.g., economic status, appetite, oral lesions etc.)?
- Does the patient have any illnesses (e.g., TB, diarrhea) or other conditions (e.g., pregnancy, diabetes, metabolic disorders) that might directly impact on nutritional status?
- Refer to current guidelines for nutrient intake to insure that patients are meeting minimum requirements, e.g., DRI's/WHO

Nutrition and ARV review: Findings

- Certain foods affect the bioavailability of ARV medications (e.g., garlic; Piscitelli et al., 2002; African potato, Mills et al., 2005).
- Use of "traditional medicines" may also affect ARV use (adherence, effectiveness of ART protocols) and efficacy.
- A substantial body of evidence exists with regard to the impact of ART on metabolism of adults and children, which have dietary and nutritional implications.

Metabolic Consequences of ARV Use: Nutritional Implications

- "ART Metabolic syndrome": derangements in lipid storage resulting in changes in body composition and dyslipidemias, (indicative of high CVD risk), insulin resistance/impaired glucose tolerance (possible role for dietary management)
- Bone Related Problems: Derangements include osteopenia and osteoporosis (possible role for Vitamin D)
- Lactic acidemia; generally associated with the class of ARV (NRTI) (possible role of specific micronutrients in either etiology and/or treatment)
- These problems are seen in adults and children. They are most often, but not exclusively, seen in patients taking HAART. The role of HIV versus ART in their etiology is being studied.

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Questions Regarding Treatment of Metabolic Consequence of ARV: Case management issues

- Do risk factors for chronic diseases observed in PLWHA warrant same response as in non-infected adults and children? If not, why not? The statin story
- Does being chronically malnourished present different conditions for care? For example, can we utilize current care recommendations for lowering CVD risk in pop at risk for severe caloric deprivation?
- Where does HIV end and ARV effects begin?
- How can we manage complications to avoid impact on compliance?

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BMI/malnutrition predicts HIV outcomes and response to treatment

- **Paton, NI et al., 2006.** The impact of malnutrition on survival and the CD4 count response in HIV-infected patients starting antiretroviral therapy. HIV Medicine 7, 323–330

  "Malnutrition at the time of starting ART was significantly associated with decreased survival, but the effect appeared not to be mediated by impaired immune reconstitution."

- **Zachariah R, et al. 2006.** Risk factors for high early mortality in patients on antiretroviral treatment in a rural district of Malawi. AIDS. 20(18):2355-60.

  A linear trend in mortality was observed with increasing grades of malnutrition and decreasing CD4 cell counts. **Individuals who were severely malnourished with body mass index (BMI)<16.0 kg/m2] had a six times higher risk of dying in the first 3 months than those with a normal nutritional status.**

Conclusions: Nutrition and HIV

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Overarching Conclusions: Nutrition, Care and Treatment of HIV/AIDS

- Food and adequate dietary intake are essential to achieve optimal nutrition and health for people before and during treatment for HIV and/or co-morbidities.
- HIV-infected adults and children being considered for ART should be screened for nutritional problems.
- The extent of such screening will depend on the technical capacity and level of support at the clinical care setting.

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Continuing and New Priorities

- Nutrition and ART
  - Role of nutrition in progression to ART
  - Impact of nutrition on ART safety and/or effectiveness
  - ART and infant feeding
  - Metabolic effects of ART
- Micronutrients:
  - iron,
  - vitamin D
- Nutrition and susceptibility to, care and treatment of co-morbidities: malaria, TB etc.

Challenges to Research and Care

- The “triangulation” of malnutrition, ART and treatments for OI’s.
- The interface between ART implementation and programs aimed at addressing food insecurity or malnutrition at a macro-level.
- Prophylaxis versus care: assessment needs and site-specific guidelines.
- Customizing guidelines based on indigenous conditions.
- Capacity needs to implement clinical guidelines