

Nutrition & HIV

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Nutrition and HIV/AIDS

Nutrition Problems Affect:

- HIV+ Men, Women and Children
- Quality of Life
- Survival



Topics

- Link between HIV/AIDS and nutrition
- Effects of HIV/AIDS on nutritional status
- Effects of nutrition (macronutrients, micronutrients and existing nutritional status) on HIV/AIDS

SLIM Disease



AIDS-Related Wasting Syndrome

- 10% weight loss in a 6 mo. Period with diarrhea or fever >30 days without a known cause (CDC)
- Even more complicated in the era of HAART

Pathogenesis of Malnutrition in HIV Infection



IMPACT OF HIV/AIDS ON NUTRITIONAL STATUS

- **Depressed appetite**
- **Malabsorption**
- **Metabolic disturbances**
- **Muscle and tissue catabolism**
- **Fever, nausea, vomiting, and diarrhea**
- **Depression**

Potential Mechanisms of AIDS Wasting

- 1) Increased energy expenditure**
- 2) Decreased energy intake**
- 3) Altered metabolism**
- 4) Hormonal Alterations**

Altered Metabolism

- Infection increases energy (10%-15%) and protein (50% or more) requirements
- Infection increases demand for and utilization of antioxidant vitamins (E, C, beta-carotene) and minerals (zinc, selenium, iron)
- Insufficient antioxidants from increased utilization causes oxidative stress
 - Increases HIV replication
 - Leads to higher viral loads

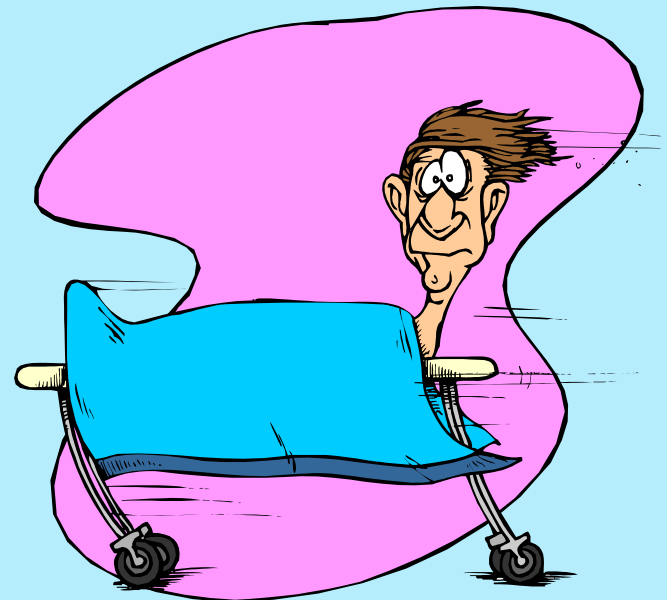
Poor Nutrient Absorption

- Poor absorption of fats and carbohydrates at all stages of HIV infection because of
 - HIV infection of intestinal cells
 - Frequent diarrhea and vomiting
 - Opportunistic infections
- May affect use of fat-soluble vitamins

Nutrition in the HAART Era

Pharmacotherapy Challenges

1. Potential Interactions with Food
2. Body Metabolism
3. Side Effects



Medication Side Effects

- **Anorexia**
- **Sore/dry/painful mouth**
- **Swallowing difficulties**
- **Constipation/Diarrhea**
- **Nausea/Vomiting/Altered Taste**
- **Depression/Tiredness/Lethargy**

HIV Drug Treatments & Nutrition

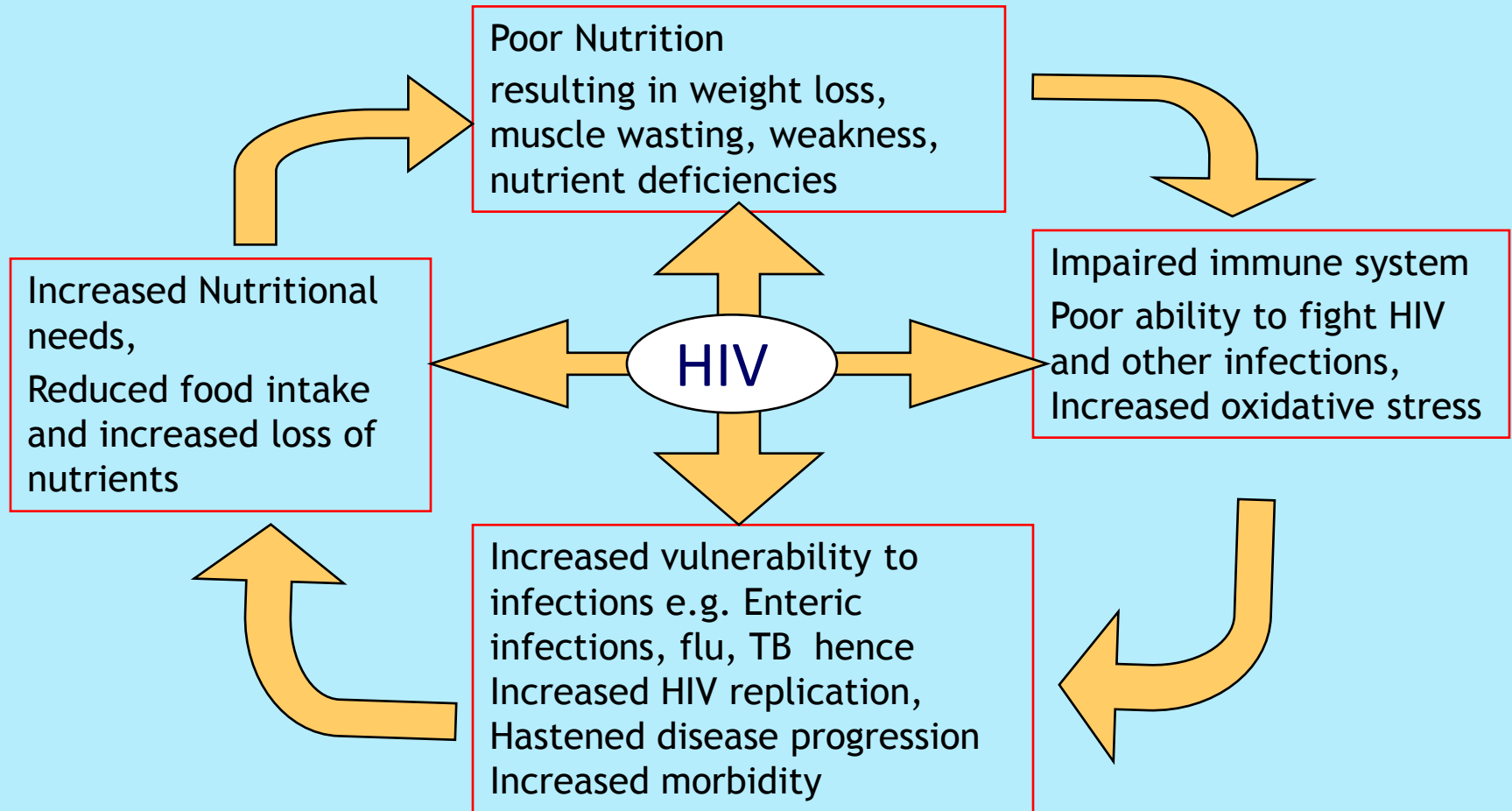
GENERIC NAME	<i>WITHOUT FOOD</i>	WITH FOOD	WITH NON-FAT FOOD	WITH HIGH-FAT FOOD
Abacavir	√	√		
Amprenavir	√		√	
Delavirdine		√		
Didanosine	√			
Efavirenz	√	√	√	
Indinavir	√			
Lopinavir/Ritonavir		√		
Lamivudine	√			
Nelfinavir		√		
Nevirapine	√	√		
Ritonavir				
Saquinavir		√		
Saquinavir Mesylate		√		√
Stavudine	√			
Zalcitabine	√	√		
Zidovudine		√	√	

Impact of Malnutrition on Disease Status

Malnutrition CAN

- **Contribute to impaired immune response, increase frequency and severity of infections**
- **Result in more rapid disease progression & shortened survival**
- **Result in fatigue, loss of appetite, sense of taste and smell, and decreased quality of life**
- **Decrease tolerance to therapy and lessen medication efficacy**

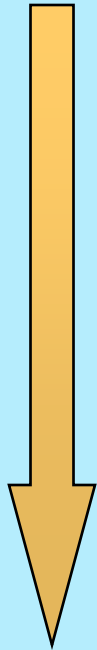
Vicious Cycle of Malnutrition and HIV



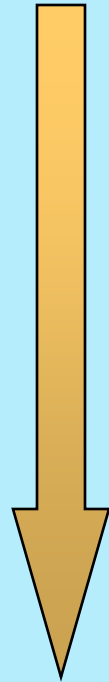
Effects of Malnutrition and HIV on the Immune System

Malnutrition

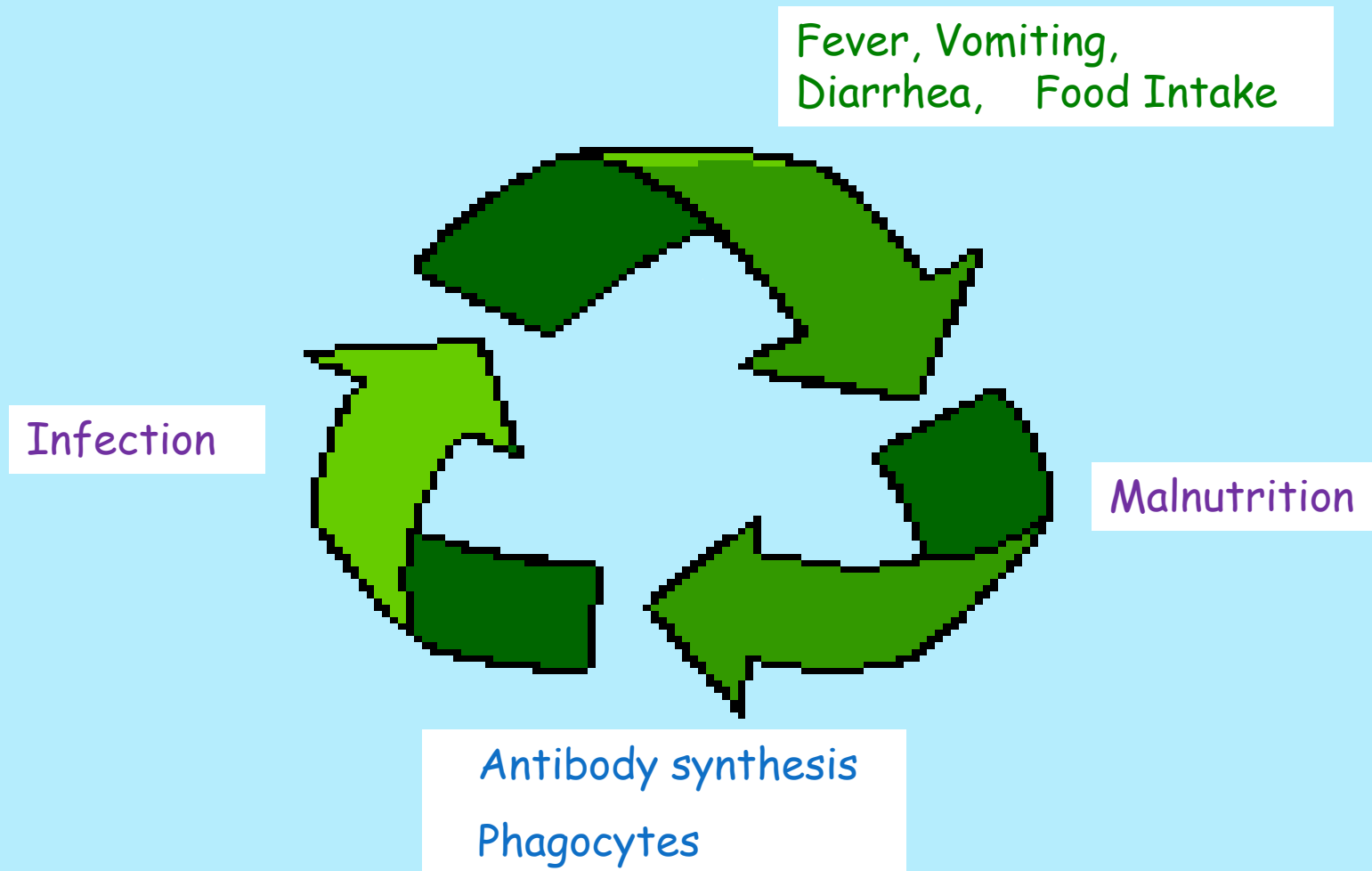
HIV



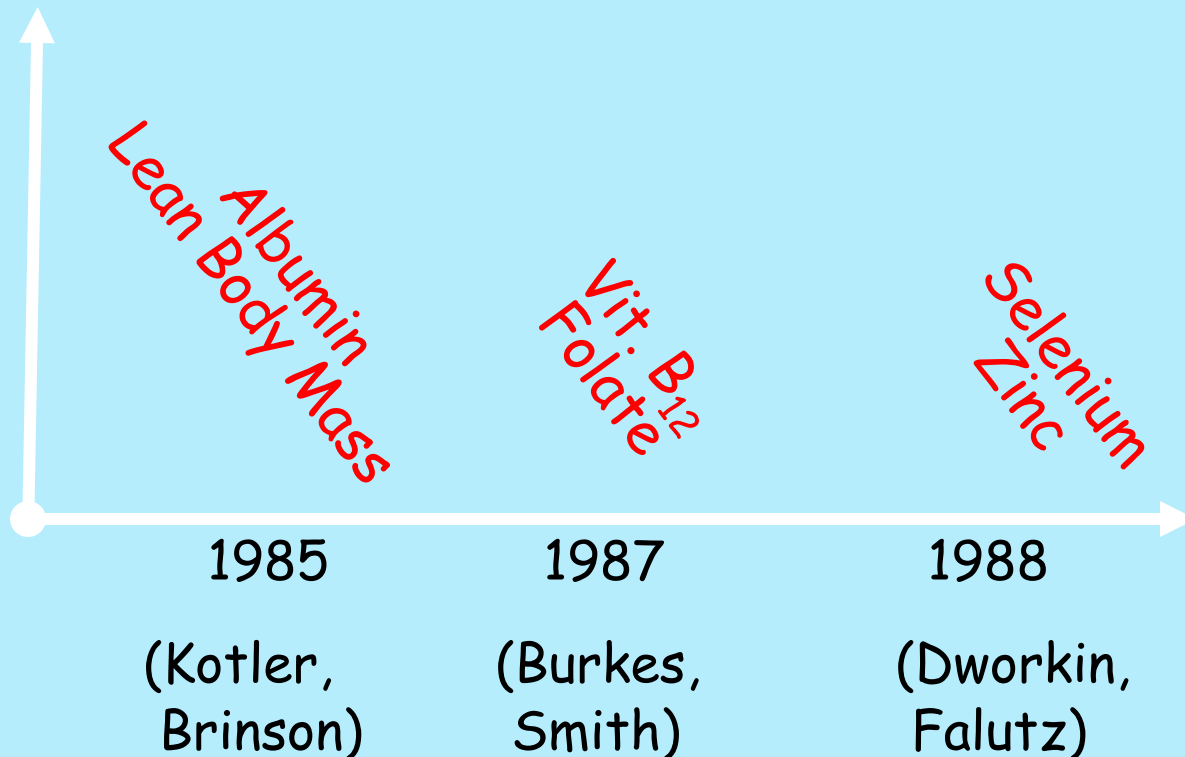
CD4 T-lymphocyte number
CD8 T-lymphocyte number
Delayed cutaneous hypersensitivity
CD4/CD8 ratio
Serologic response after immunizations
Bacteria killing



Malnutrition and Infection A Devastating Synergy



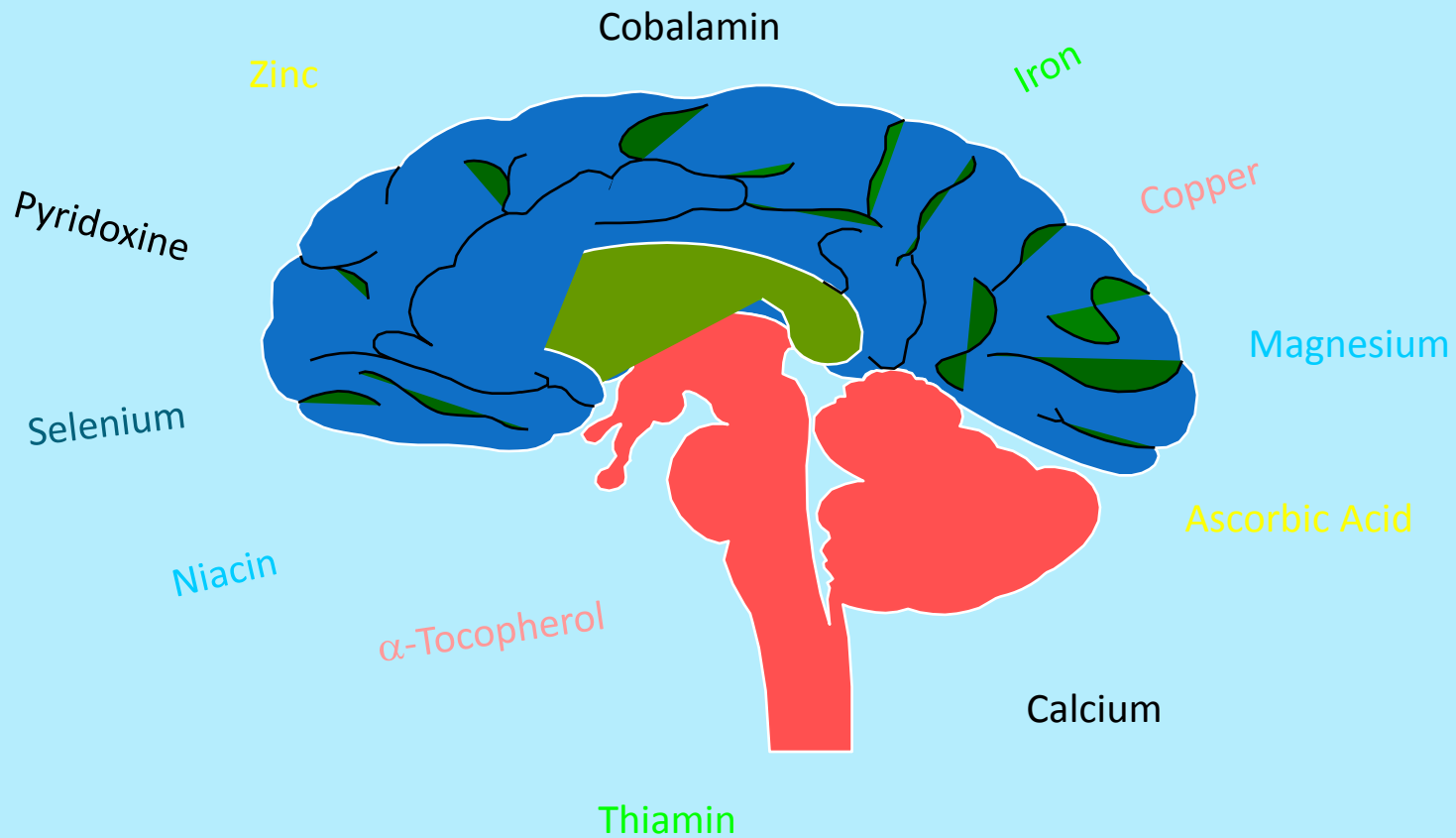
Nutritional Abnormalities in HIV/AIDS



Role of Micronutrients

- **Immune Processes**
- **Antioxidant Defense**
- **Brain Function**

The Brain



Specific Nutritional Deficiency and HIV-Related Mortality

NUTRITIONAL DEFICIENCY	RISK RATIO (95% C.I.)	P-VALUE
Prealbumin	4.01 (1.46-11.0)	0.007
Vitamin A	3.23 (1.10-9.48)	0.03
Vitamin B ₆	2.35 (0.74-7.43)	0.14
Vitamin B ₁₂	8.33 (1.69-41.1)	0.009
Vitamin E	0.44 (0.15-1.30)	0.14
Zinc	2.91 (1.04-8.18)	0.04
<u>Selenium</u>	19.9 (5.52-71.9)	<0.0001

Nutritional Status and HIV/AIDS: Observational Studies

- Weight loss associated with HIV infection, disease progression, and mortality
- Some nutrient deficiencies (vitamins A, B₁₂, and E, selenium and zinc) associated with HIV transmission, disease progression, and mortality

Observational studies do not tell us whether these conditions caused or resulted from more rapid progression.

Micronutrient Needs In HIV/AIDS To Supplement or Not to Supplement???



- Requirements Unknown
- No official Guidelines
- Few Clinical Trials
- Data Contradictory

“Do No Harm”

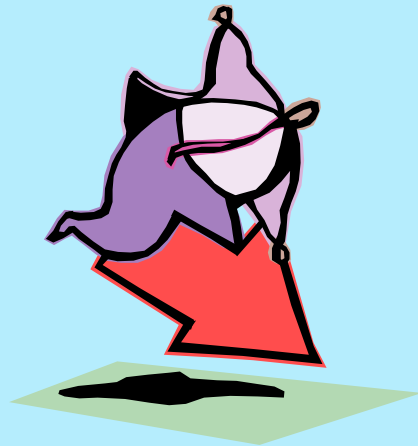
Selenium Therapy Trial

- **259 HIV+ Drug Users**
- **200 $\mu\text{g}/\text{day}$ Se or placebo**

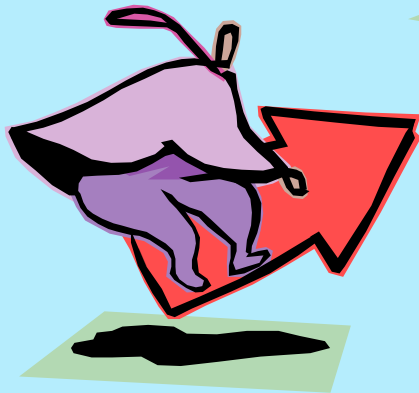


Selenium Therapy Trial Findings

Se-Treated vs. Placebo



Mycobacterial infections
Hospitalizations
Anxiety
Viral Load Suppression



Quality of life (health)

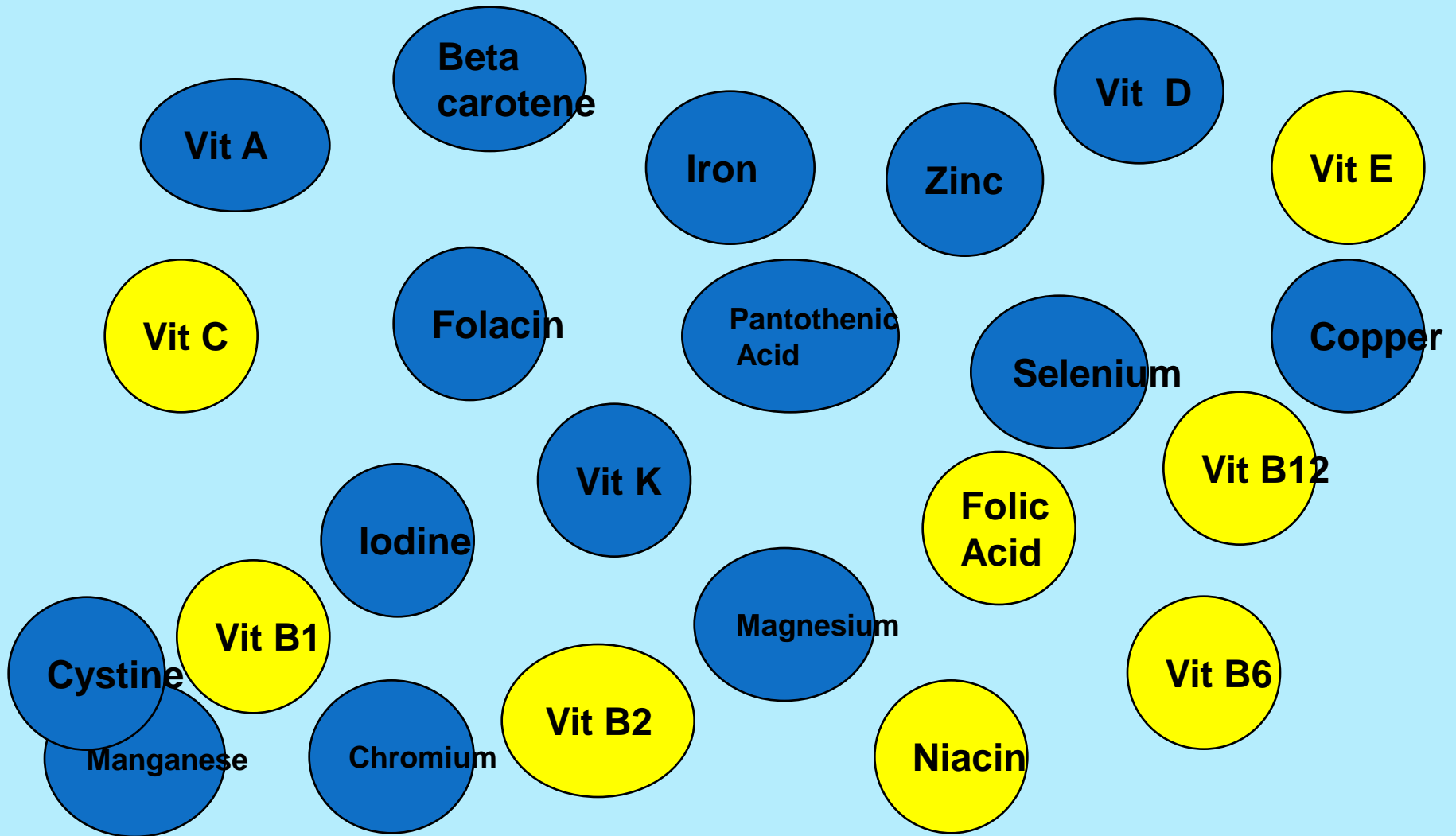
Multiple micronutrients and HIV infection

Intervention trial

- ❖ Randomised trial in Thailand
 - ❖ 481 HIV+ adults
 - ❖ Multimicronutrient or placebo for 48 wks
 - ❖ minerals: zinc 30 mg, iron 10 mg, selenium 0.4 mg, copper 3 mg, iodine 0.3 mg, chromium 0.15 mg, manganese 8 mg, magnesium 80 mg
 - ❖ vitamins A, B-complex, C, D, E, K
 - ❖ Mortality reduced
 - ❖ No effects on HIV load and CD4 cell counts

(Jiamton S, 2003)

Micronutrient Formulation in Tanzania Trial



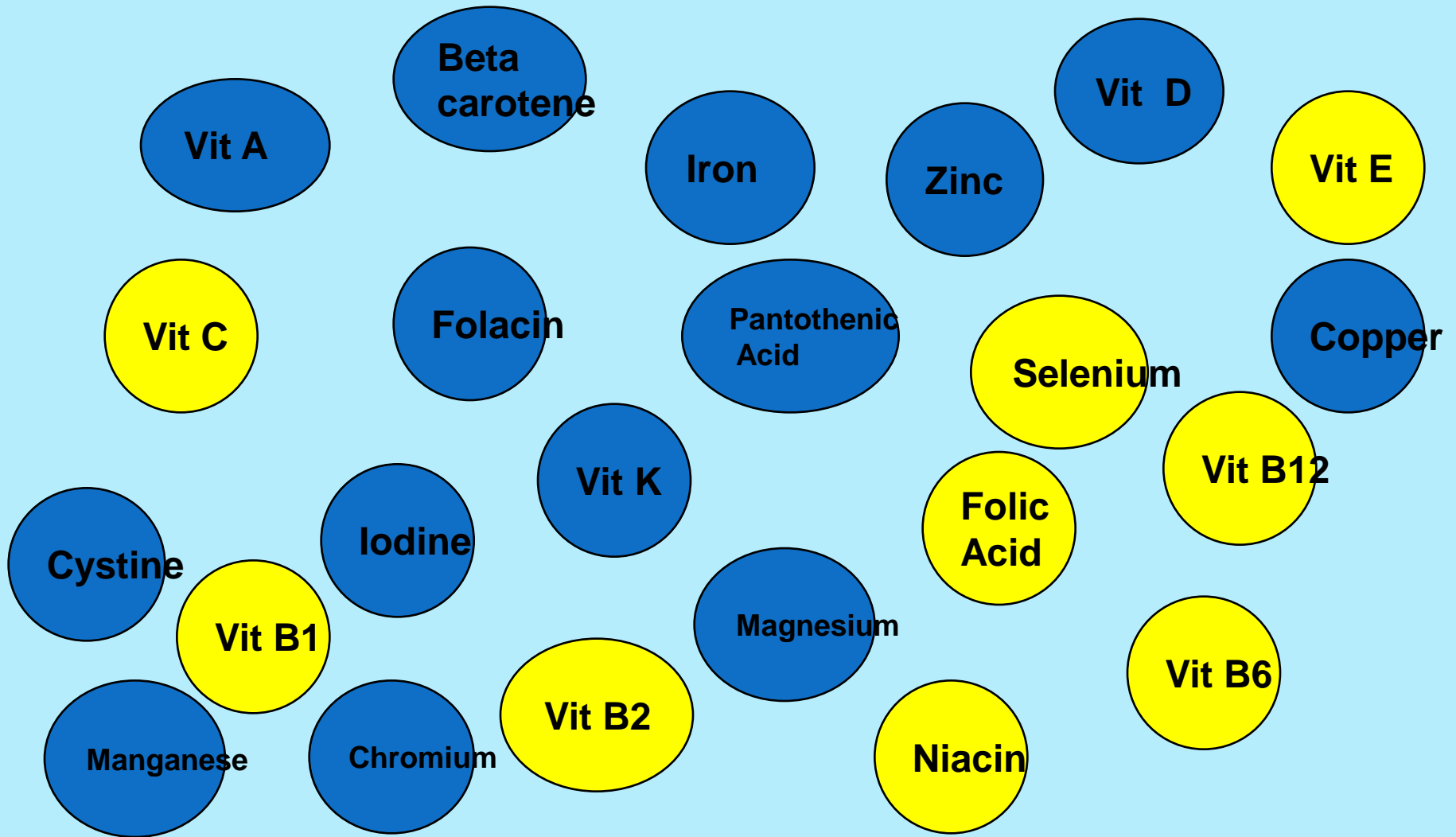
Tanzanian mothers receiving daily high dose MV (B, C, E) were less likely to experience HIV-related disease progression or death during follow up

MV (n=271) vs. placebo (n=268)

	Relative Risk	95% CI	P-value
AIDS related death	0.73	0.51-0.94	0.09
Progression to stage 4	0.50	0.28-0.90	0.02
Progression to stage 3	0.72	0.58-0.90	0.003
≥ 2 stage increases	0.66	0.52-0.84	<0.001

Mean diff in viral load = -0.18 log – or est. 30% increase in survival time

Micronutrients used in Kenya HIV shedding of the reproductive tract study - ADVERSE EFFECT



Micronutrients (TZ vitamins + Se) increased vaginal tract shedding of HIV-1 in Kenya (McClelland et al, JAIDS, 2004)

- 400 non-pregnant HIV+ women randomized to receive:
 - MN (20 mg B₁, 20 mg B₂, 25 mg B₆, 100 mg niacin, 50µg B₁₂, 500 mg Vitamin C, 30 mg Vit. E, 0.8 mg folic acid, 200 µg selenium
 - or placebo
- Follow up 6 wks later

Findings:

- **MN women were 2.5 times more likely to have vaginal HIV-shedding (p=0.001), and higher vaginal RNA levels (p=0.004)**
- **MNS increased likelihood of HIV shedding in women who had no detectable HIV at baseline – “increase infectivity”**
- Interaction w/ baseline Se status – if not deficient, then adverse impact, but no effect of MN supplements if Se deficient (< 85µg/L)
- No other interactions

MN may still play a role in the era of HAART

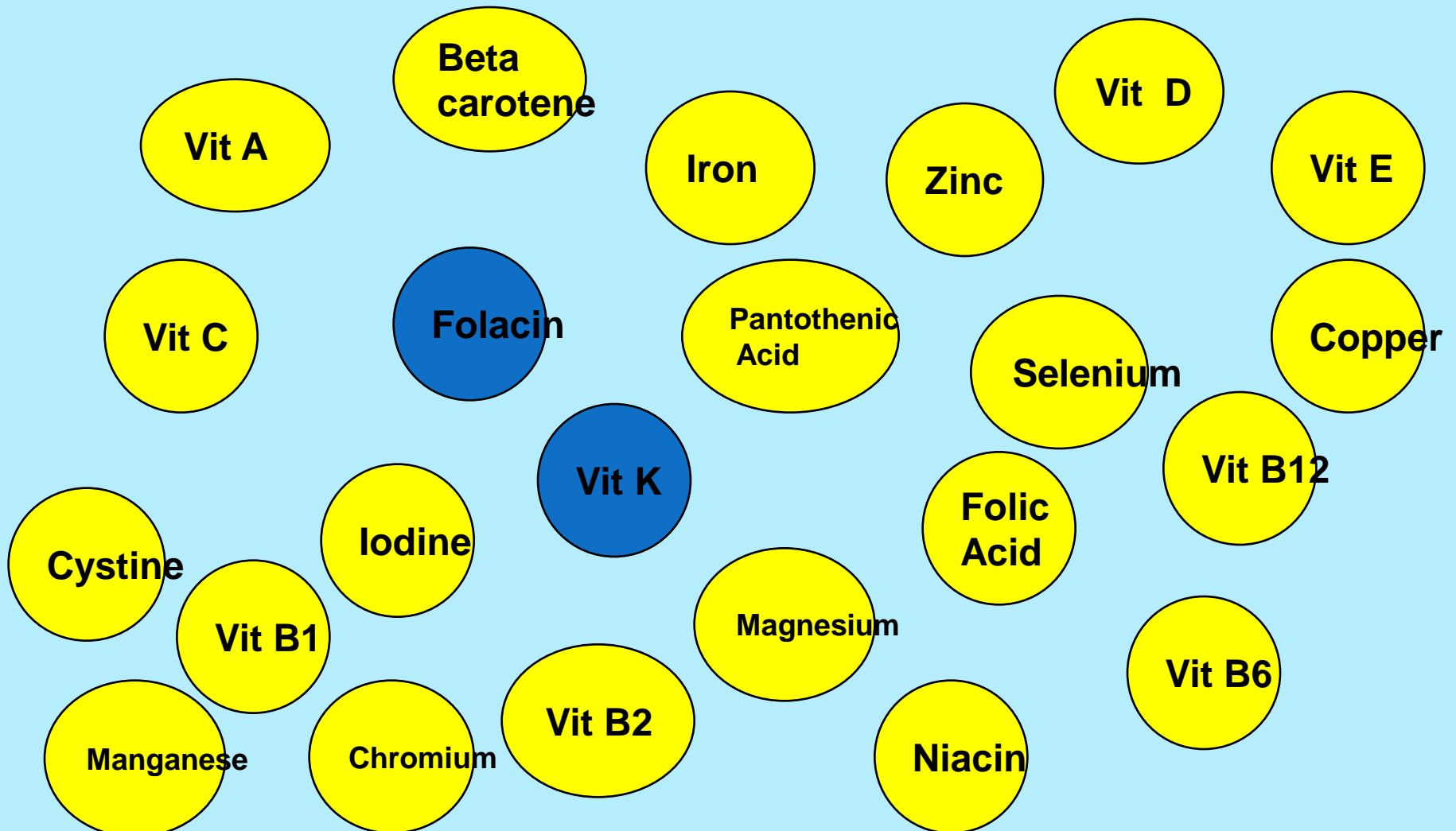
(Tang et al, AIDS, 2005)

- Metabolic syndrome may be associated with oxidative stress
 - “lipodystrophy”, insulin resistance/glucose intolerance
- Some ARV drugs may induce oxidative stress, increasing demand for anti-oxidant nutrients
- These conditions increase the risk of CVD – possible role for MN (anti-oxidants) for patients on ART

MN supplementation increased CD4 count in patients on HAART

Kaiser et al, JAIDS, August, 2006

These nutrients + others were contained in the supplement



Daily selenium supplementation (200 mg/day) improved CD4 cell response in HIV+ Nigerian adults on HAART (d4T/3TC/NVP)

(Odonukwe et al. IAS, MoAb0403, 2006)

- Randomized trial (n=170 per group) Patients were followed for 72 weeks.
- Median time for undetectable viral load was similar in the two groups (p = 0.2),
- Patients in HAART + selenium group had:
 - Improved CD4 recovery from B/l to 72 wks (+120 cells/mm³ versus +50 cells/mm³)
 - Reduced OI incidence & hospitalizations
 - Increased WT gain (p=0.004)
 - Increased Hb response (+30g/l versus +10g/l).

“Selenium might be a useful complement to HAART in the management of people with HIV with severe immune-suppression”

WHO Technical Review

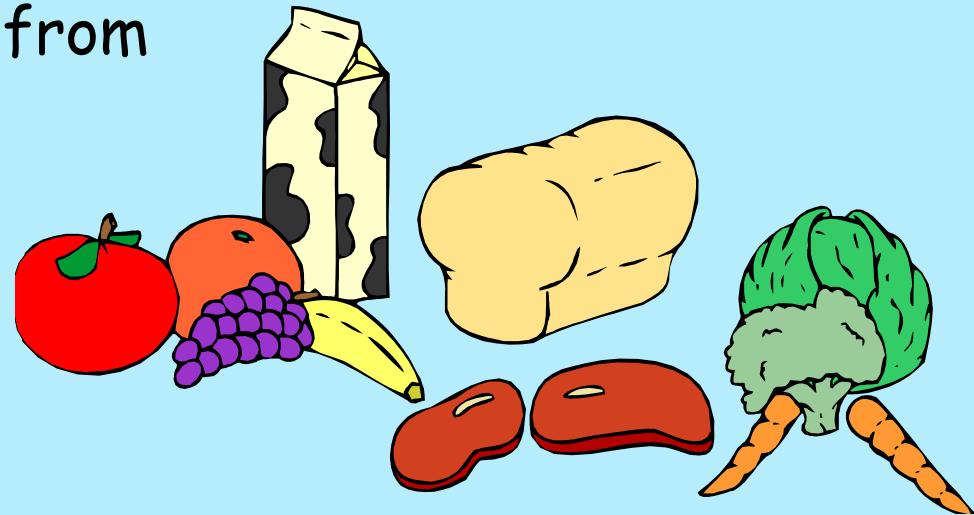
Micronutrients and HIV

- Studies have shown that some micronutrient supplements may prevent HIV disease progression and adverse pregnancy outcomes
- Micronutrients are not an alternative to comprehensive HIV treatment including ARV therapy

Food For Thought

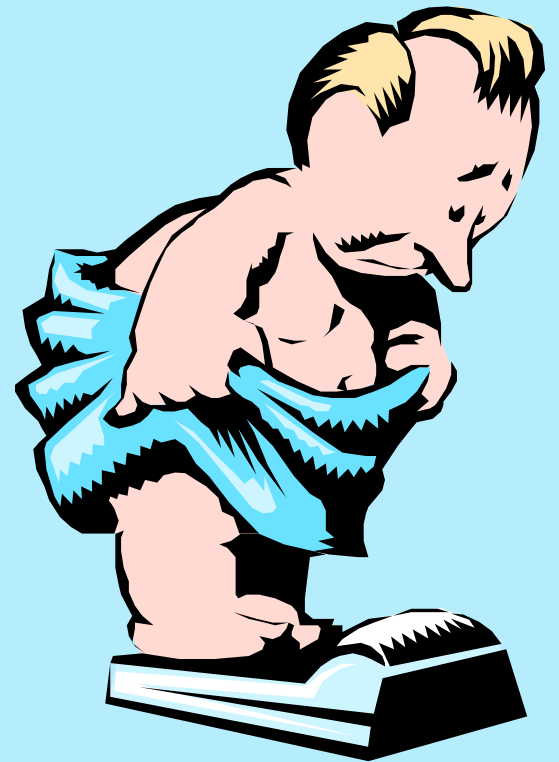
GOALS OF NUTRITION INTERVENTION:

- Help delay progression to AIDS
- Help immune system function
- Reduce infections
- Achieve maximum benefit from drug therapies
- Improve quality of life



Nutritional Evaluation

- **Biochemical Assessment – Proteins, Vitamins, Trace Elements**
- **Dietary Assessment – FFQ, Food Patterns and 24-Hour Recall**
- **Anthropometric Measurements**
- **Clinical Assessment – Signs and Symptoms**



Promote a Healthy Diet

- Promote a diet adequate in energy, protein, fat, and other essential nutrients
- Even asymptomatic HIV-infected persons may have increased body metabolism, which increases their daily energy, protein and micronutrient requirements
- Therefore, a person with HIV requires 10% to 15% more energy and 50% to 100% more protein a day.

TO YOUR HEALTH

- a healthy diet should contain a balance of:
- carbohydrates and fats to produce energy and growth: (rice, maize/millet porridge, barley, oats, wheat, bread, cassava, plantain, bananas, yams, potatoes, etc)



- proteins to build and repair tissue: (meat, chicken, liver, fish, eggs, milk, beans, soybeans, groundnuts, etc.)



TO YOUR HEALTH

vitamins and minerals

to protect against opportunistic infections by ensuring that the lining of skin, lungs and gut remain healthy and that the immune system functions properly



Antioxidants: Eat your colors

Blue... very powerful!



Green and **Orange**... contain Lutein



Red... high in antioxidants!

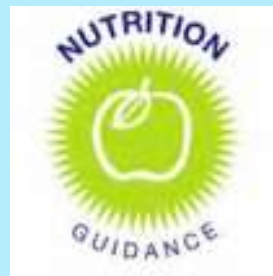


Gold
curry power



Food as Medicine

Eat well...Be well!



Acknowledgements

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