

ELUCIDATING THE LINK BETWEEN ENVIRONMENT, NUTRITION, AIDS AND CANCER AS INFORMED BY SELECTED STUDIES IN KENYA AND BEYOND

By

Charles FL Mbakaya, PhD

Affiliations

Head, Public Health and Health Systems Research Programme & Principal Research Officer and Ag. Director of the Centre for Public Health Research, Kenya Medical Research Institute, P. O. Box 20752, Nairobi-00202, Kenya
Unit Lecturer Environmental, Occupational & Industrial Health, COHES
E-mail: cmbakaya@kemri.org, cmbakaya@hotmail.com,



What are great scientists saying???

From the Food Technology -2014 Website, I found the following Quotes exciting and thought provoking:

- 1) Research means to investigate something you do not know or understand (Neil Armstrong).
- 2) Research is what I'm doing when I don't know what I'm doing (Wernher von Braun).
- 3) The way to do research is to attack the facts at the point of greatest astonishment (Celia Green).



HIV and AIDS Controversies

- The hypothesis that HIV is the cause of AIDS was propounded by Prof. Gallo in 1981 , following correlation between HIV antibodies and AIDS. This became the cornerstone of HIV interventions to-date.
- However, Prof. Duesberg did not agree and went on to say that AIDS is not caused by HIV but by drugs, malnutrition and chemicals.
- Duesberg and colleagues, including Nobel Lauretes are branded AIDS denialists for over 30 years, today!!!!
- To me, though I stand to be corrected, the two groups are looking at a coin from different sides (genetics and epigenetics) and should both be given a standing ovation, not condemned.
- Know what, a “Las Vegas approach” like in Heavy Weight Boxing would have produced a winner, years ago.

HIV and AIDS Controversies Cont..

- The two, have attracted highly emotive followers on both sides of the scientific divide for the better part of the tail-end of the 20th Century; eliciting a heated and protracted debate for decades.
- Realizing the scientific fecundity of this astonishing facts, Dr. Koech, Prof Obel, Mr. Mbeki and Dr. Mbakaya and others from Africa said, “you know what? Two elitist American scientists cannot simply argue over nothing. There must be something here, folks!!!!
- Adding spanners to the works, a British scientist observed that zinc deficiency was a problem in the UK, the problem might be worse in Africa, yet micronutrient zinc had useful antiviral, antibacterial and anticancer properties and that zinc deficiency symptoms and those of AIDS were similar (Bryce-Smith, 1989).
- In America, HIV-free AIDS has since been reported (Browne *et al.*, 2012)

Local researcher says zinc-laden tablet key to HIV management

Kenyan claims success in search of Aids drug

FIRST there was Dr Davy Koech of the Kenya Medical Research Institute (Kemri) and the discovery of Kemron as an Aids drug in 1989. It is no longer heard of.

Then came Prof Arthur Obel a decade later. Some say he was designated Chief Government Scientist and his Aids drug was called Pearl Omega.

Apart from flouting established scientific research procedures in announcing the drug's advent, Pearl Omega, too, is rarely heard of these days.

But now, there is a new kid on the block with a different approach to the search for an Aids management formula.

He is not saying his is the alpha and omega to the Aids pandemic, but like South Africa's President Thabo Mbeki, he says that Aids is not all about sex. There is the nutrition angle to think about.

It was when reading a copy of the *British Journal* some 15 years ago, a Kenyan scientist, Charles Mbakaya, made a note that still torments him to this day.

The journal reported that HIV positive people depicted symptoms similar to those in people with a deficiency of zinc in their systems.

Even more important, was the journal's suggestion that the

Kenya Medical Research Institute's Charles Mbakaya, like President Thabo Mbeki, writes Victor Buire, believes there is a nutrition angle to the Aids pandemic and that is what is guiding his research.



Koech



Obel



Mbakaya



Mbeki

Additionally, the HIV antibodies of the patients almost doubled up within the 24 months of follow-up. This is an indication that their acquired immunity against HIV had been stimulated.

Visible changes start being observed after 7 days of use and in three months of uninterrupted use opportunistic infections disappear.

In 52 per cent of the patients, their viral load reduced by 50 per cent within the study period, with 19 per cent attaining undetectable viral load levels.

Clinically, the VIUSID has no marked side effects. All the patients showed normal liver functions, an indication that it had no toxic effects on the patients.

Mbakaya says that from that, it was clear that it could be used for an extended period of time. "Our study then confirms

Man at the centre of HIV research in Kenya

WEDNESDAY, 18 APRIL 2012 23:53 BY OKWIRI AMBOOKA

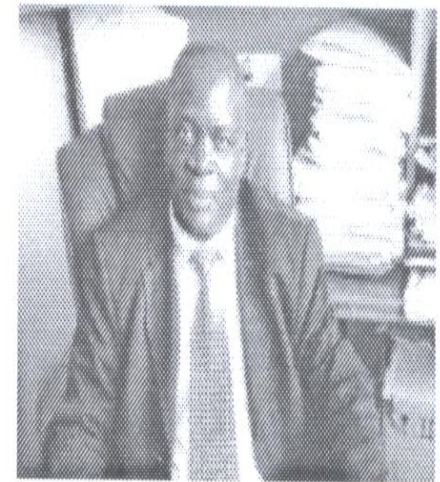


Share / Save    

As the global community grapples with the magnitude of devastations wrought by HIV/Aids pandemic, immense efforts have been dispensed in trying to get the cure for the dreaded disease but only minimal headway has been achieved. HIV/Aids continue with its relentless march, leaving in its wake a catastrophe in terms of death, suffering and despair.

The call to rise up and reverse the cruel march of the Aids pestilence has resonated powerfully of late and medical fraternity is today spending sleepless nights researching on a cure for the modern day plague.

With discovery of anti-retroviral drugs that help tame the viciousness of HIV/Aids, the world can cheer



Dr Mbakaya

The Fundamentals

Environmental factors causing disease and their modifiers (Source: WHO)

Fig. 9.1. Environmental factors that may affect health

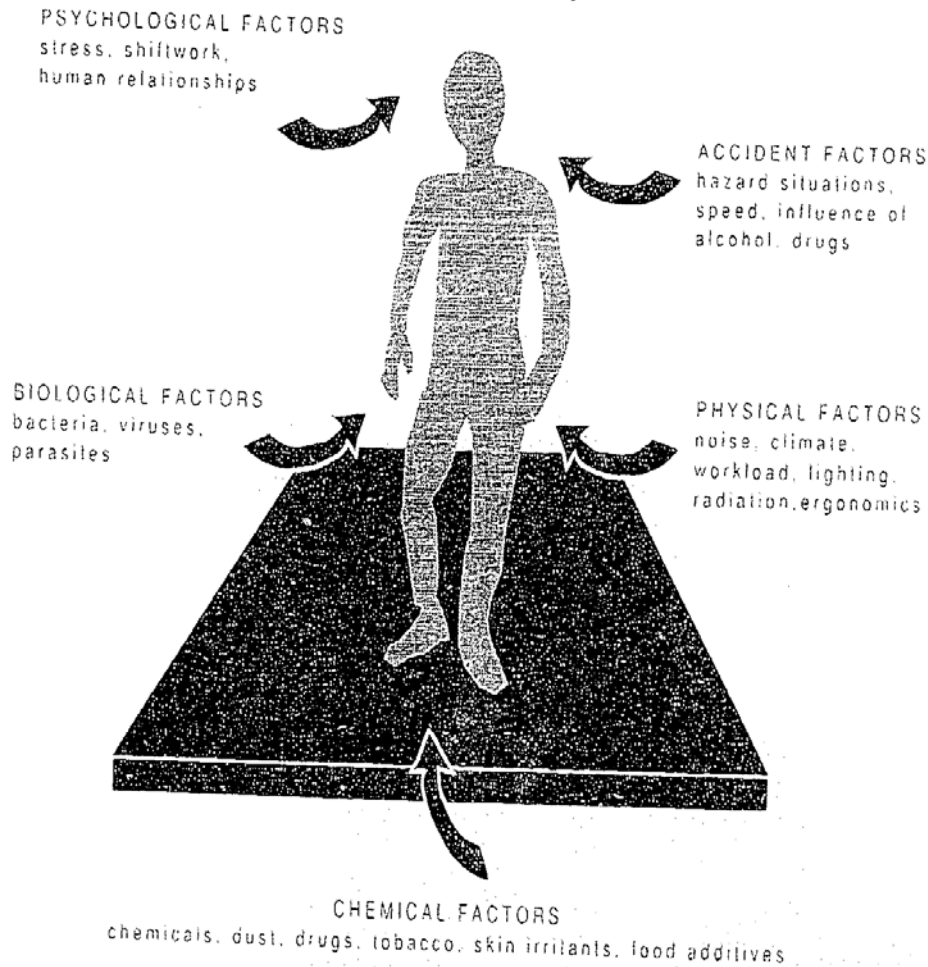
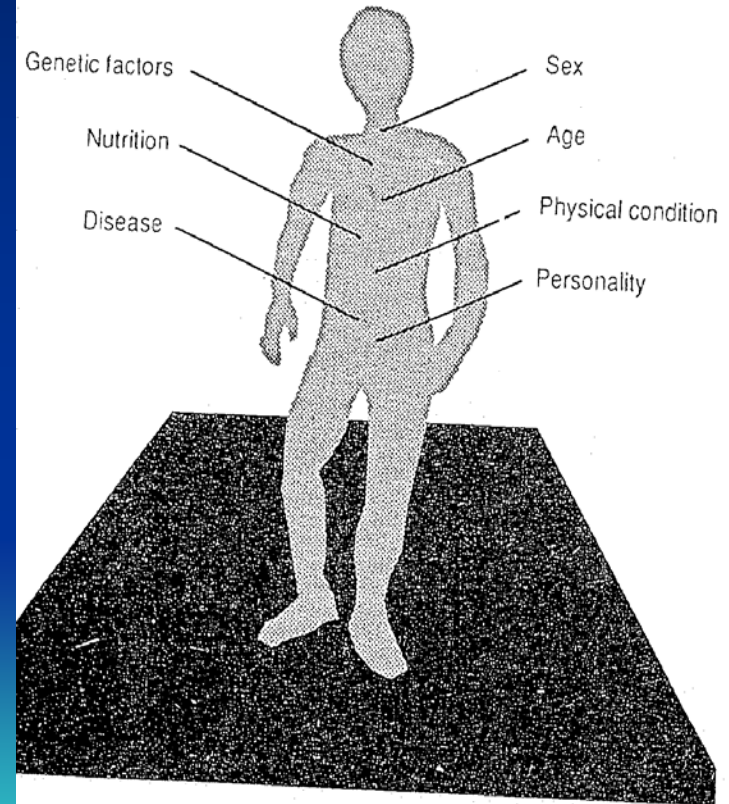


Fig. 9.2. Individual characteristics that modify the effect of environmental factors



Fundamentals Cont...

Role of nutrition

- When God created man and placed him in a garden, so as to part take of its produce, He also classified the foods as follows:
 - 1) **Carbohydrates and fats** – for energy and warmth
 - 2) **Proteins** –for body building and repair
 - 3) **Vitamins and minerals** – for protection and to fight disease



The literature on Nutrition, HIV & AIDS and Cancer

HIV and AIDS comprises several related disease conditions e.g. TB, Pneumonia and cancers (CDC, WHO).

Micronutrient supplements can delay HIV disease progression and reduce mortality (Drain *et al.*, 2007).

While at Bristol, I learned that for reasons unknown then, zinc is antiviral, antibacterial and anti-cancer and AIDS symptoms resemble those of zinc deficiency and that zinc is needed in protein biosynthesis and making interferons alpha and Gamma and needed in > 200 enzymes (Bryce-Smith, 1989).



The Literature Cont...

There are reports American researchers that HIV- free AIDS patients don't make interferon gamma (Browne *et al.*, 2012), this agreeing with earlier reports by a British researcher (Bryce Smith, 1989).

Deficiency in zinc leads to transition from the efficient Th-1 dependent cellular anti-viral immune function to the less efficient Th-2 immunity (Sprietsma *et al.*, 1999).

There are reports that two kinases (IKKε and Tank-binding kinase 1 (TBK1) flip the “on” switch in a viral host's innate immunity by activating two interferon regulatory factors (TenOever, 2007).



The literature Cont..

1KKE acts like a switch to turn on a second line defense against viral infection if the first wave of innate immune sentinels activated by TBK1 cannot stop the infection (Grens & TenOever, 2014).

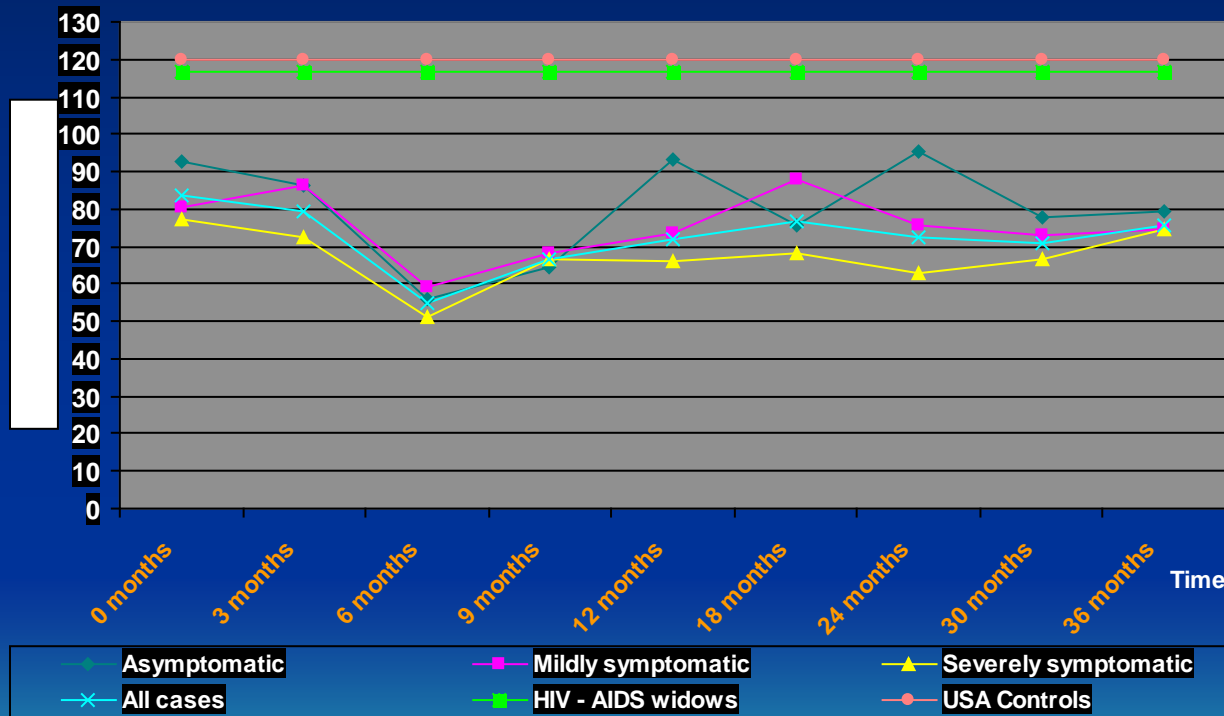
A study in Iran found that serum zinc and selenium in human immunodeficiency virus infected subjects were significantly low compared to controls ($p = 0.01$ and $p = 0.02$ respectively) (Khalili *et al.*, 2008).

Though crucial in human immunity, zinc works in concert with other micronutrients, but really plays the role of big brother!!!

From a study here in the US, key nutrients identified as playing a key role in the HIV disease are zinc, selenium, vitamin A, C, E & B-12 (Baum *et al.*, 1998).

Some Local Data.....

Mean serum zinc of HIV & AIDS subjects in An RDA compliant supplement (Mbakaya *et al.*, 2003)



Local Data Cont...

Prevalence of HIV/AIDS related Clinical Signs/Symptoms/Illnesses Before and Post Dietary Supplementation (Mbakaya et al., 2011)

Parameters	Arm 1 (n=30)- RDA Zinc			Arm 2 (n=33) – Mega Dose Zinc		
	0 weeks number (%)	12 weeks number (%)	P-Value	0 weeks number (%)	12 weeks number (%)	P-Value
Headache	20(54.1)	8(32.0)	0.146	26(61.9)	12(34.3)	0.049
Skin rash	18(48.6)	3(12.0)	0.012	19(45.2)	7(20.0)	0.012
Diarrhoea	9(24.3)	2(8.0)	0.688	11(26.2)	6(17.1)	0.508
Cough	16(43.2)	11(44.0)	0.688	14(33.3)	9(25.1)	1.000
Fever	15(40.5)	4(16.0)	0.267	16(38.1)	5(14.3)	0.267
Oral thrush	10(27.0)	5(20.0)	1.00	12(28.6)	8(22.9)	1.000
Loss of appetite	15(40.5)	8(32.0)	0.754	17(38.1)	8(22.9)	0.549
Fatigue	18(48.6)	8(32.0)	1.000	24(57.1)	11(31.4)	0.092
Pneumonia	5(13.5)	1(4.0)	0.375	14(33.3)	1(2.9)	0.004
Boils	7(18.9)	3(12.0)	1.000	9(21.4)	1(2.9)	0.039
Itchy genitals	13(35.1)	4(16.0)	0.109	14(33.3)	4(11.4)	0.180
Pallor	2(5.7)	5(20.8)	0.125	14(10.5)	9(25.7)	0.016
Loss of weight	20(54.1)	6(24.0)	0.344	23(54.8)	5(14.3)	0.002
Treated for malaria	4(12.1)	7(28.0)	0.219	15(40.5)	12(34.3)	0.454



Local Data Cont...

Zinc/Haemoglobin trends among HIV-seronegative and HIV-seropositives on mega zinc supplementation in Western Kenya (Mbakaya *et al*, 2008)

Fig. 1: Trends in mean haemoglobin and mean serum zinc levels in HIV seronegative subjects during 12 weeks of dietary supplementation with zinc

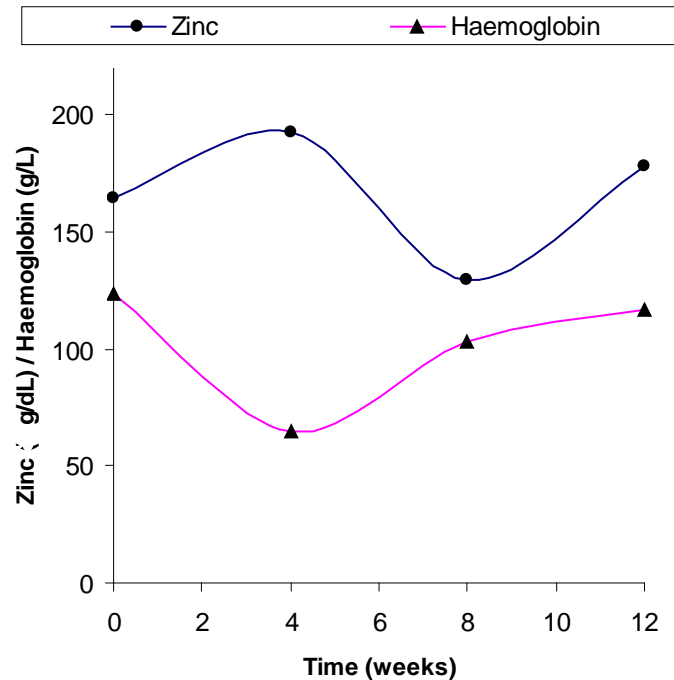
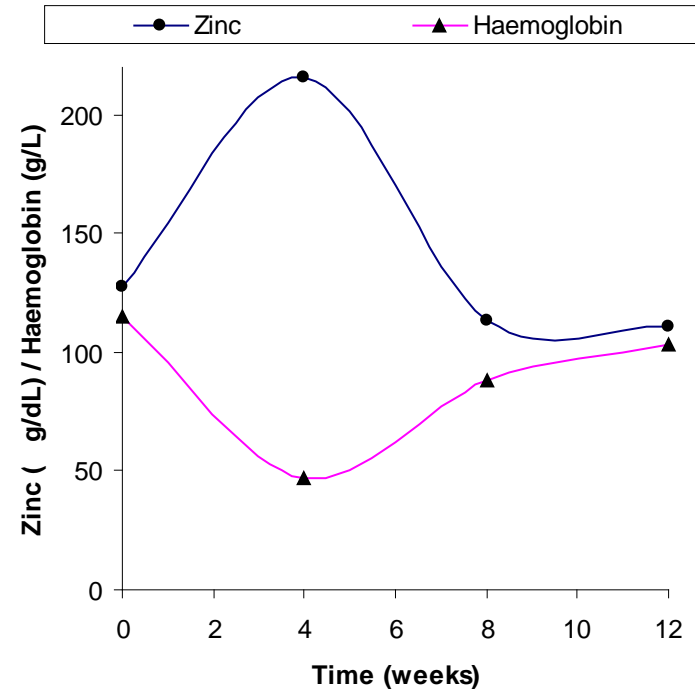


Fig. 2: Trends in mean haemoglobin and mean serum zinc levels in HIV seropositive subjects during 12 weeks of dietary supplementation with zinc



Local Data Cont...

Zinc levels by HIV-serostatus and time of supplementation

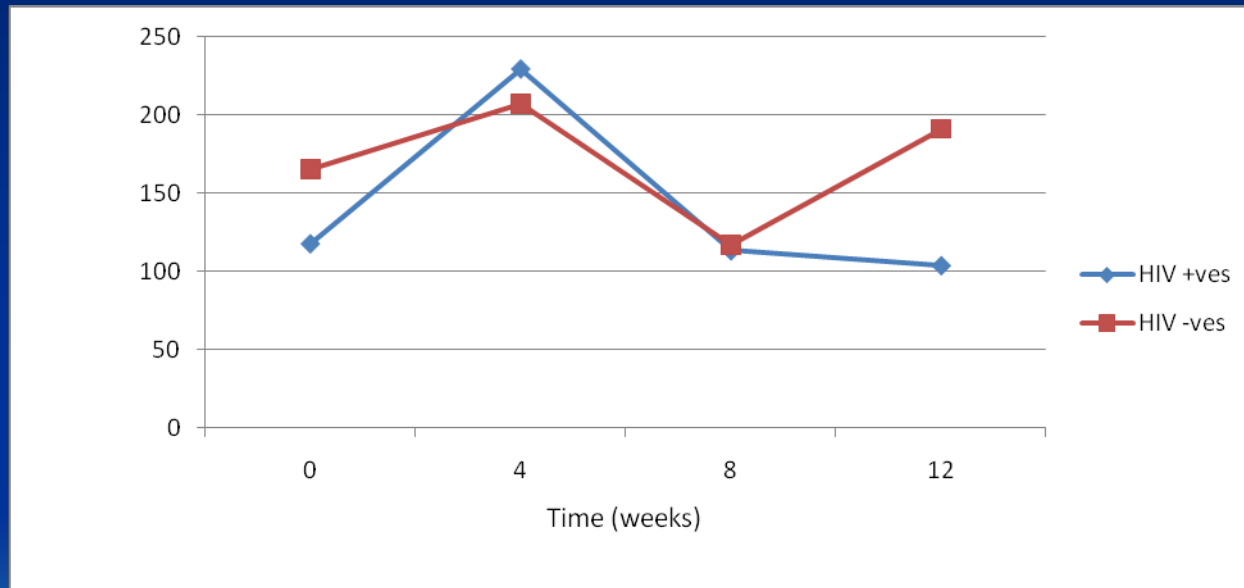
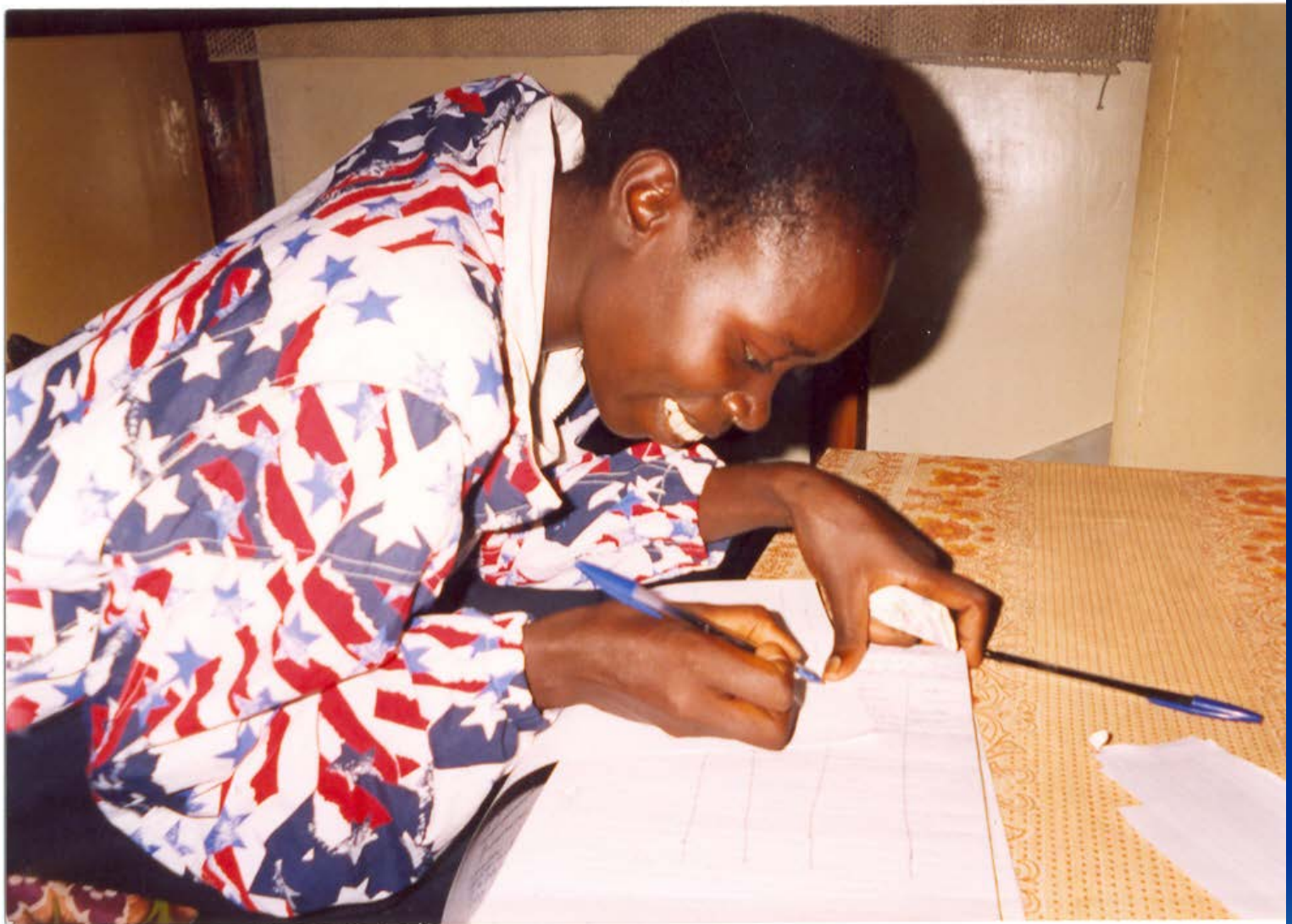




Photo 1: Client at baseline



Photo2: Client on fortified supplements two weeks later



Client on supplements 12 weeks later, signing consent for use of pictures for education.

Local Data Cont...

Selected Median Immune Parameters for Arm 1 and Arm 2 Subjects at Baseline and Post Dietary Intervention (Mbakaya et al.2011)

Parameters	Arm 1- Low Dose Zinc (n=30)			Arm 2- Mega Dose Zinc (n=33)		
	0 weeks	12 weeks	P-Value	0 weeks	12 weeks	P-Value
Hb (g/dL)	11.2	10.4	0.046	11.6	10.0	0.0001
Rbc (x 10 ¹² /L)	4.40	3.83	0.003	4.23	3.54	0.0001
WBC (x 10 ⁹ /L)	4.40	4.20	0.929	4.25	4.7	0.061
Zinc (µg/dL)	115	104	0.081	125	101	0.147
Retinol (µmol/L)	0.920	0.970	0.042	1.005	0.865	0.062
Total Lymph (x 10 ⁶ /L)	1773	1584	0.713	1848	2083	0.016
CD4 Counts (x 10 ⁶ /L)	290	271	0.722	290	380	0.007
CD8 Counts (x 10 ⁶ /L)	892	780	0.751	838	1097	0.007
ESR (mm/Hr)	44.0	38.0	0.216	50.5	48.0	0.068
NK counts (x 10 ⁶ /L)	321	245	0.055	289	253	0.702
Viral load (Log ₁₀ copies/mL)	4.79	4.09	0.030	5.11	4.43	0.104
Resp rate (breathes/min)	20	20	0.705	20	20	0.098
Pulse rate (beats/min)	80	80	0.714	80	72	0.003
Temp (°C)	36.0	36.5	0.324	36.0	36.2	0.039

Local Data Cont..

Factors associated with high HIV antibodies at baseline and after 12 weeks of mega dose Micronutrient Supplementation (Mbakaya, 2011)

Parameters	High HIV antibodies at Week 0 (n=90)		High HIV antibodies at Week 12 (n=74)	
	Correlation Coefficients	P-Value	Correlation Coefficient	P-Value
High BMI at wk 0	0.291	0.012	0.098	0.407
Skin rash at wk 0	0.334	0.004	0.296	0.011
HIV-seropositivity	0.641	0.0001	0.313	0.007
High WHO classification at wk0	0.247	0.035	0.451	0.0001
Low serum zinc at wk0	0.157	0.195	0.367	0.002
Low serum zinc at wk12	0.223	0.062	0.313	0.007
Low serum retinol at wk0	0.040	0.739	0.107	0.366
Low serum retinol at wk12	0.021	0.864	0.014	0.906
Low CD4/8 ratio at wk0	0.344	0.004	0.290	0.016
Low CD4/8 ratio at wk12	0.448	0.0001	0.235	0.044
Significant viral reduction wk12	0.282	0.016	0.290	0.013
High viral load at week wk0	0.446	0.0001	0.209	0.090

Local Data Cont...

Factors associated with advanced WHO disease staging for HIV-seropositive subjects at baseline

- Advanced disease correlated with low BMI at baseline ($p = 0.0001$), high optical density of HIV antibodies by the 12th week ($p = 0.004$), history of TB at baseline ($p = 0.001$), low CD4/CD8 ratio at baseline ($p = 0.0001$) and low serum zinc levels at baseline ($p = 0.024$).
- It would appear, HIV disease progresses as serum zinc levels are continually lowered to enhance antibody production (Mbakaya *et al.*, 2008c). This is consistent with findings that 1KKE turns on a second line against viral infection if the first wave of innate immune sentinels activated by TBK1 cannot stop the infection (Grens & TenOever, 2014) and constitutes an area of robust research.



Brief Discussions

- Malaria parasitaemia without clinical malaria correlated with with high CD4 cell count ($p = 0.019$), HIV-seronegativity ($p = 0.002$), low WHO clinical staging of AIDS ($p = 0.024$) and high serum zinc levels ($p = 0.054$), suggesting a robust Th-1 system.
- Acquisition of immunity to biological and chemical agents involves complex evolutionary dynamics via reduction of serum zinc levels so as to produce antibodies to the offending agents, yet this is a double jeopardy as the process reduces cellular immunity that is up-regulated by micronutrient zinc and that is needed to combat cellular pathogens/conditions such as HIV, pneumonia and TB and even cancer which we know flare up in HIV & AIDS subjects in advanced stages of disease (Mbakaya *et al.*, 2011).



Discussions Cont...

- Consequently, we have hypothesized/speculated that :
“**AIDS is caused by many factors, primarily including zinc deficiency as a result of malnutrition and/or evolutionary dynamics that shift human immunological responses from predominantly Th-1 To Th-2 to tackle/adapt to offending pathogens (e.g. viruses, bacteria, parasites, semen in the rectum and vagina etc.) and chemicals (e.g. pesticides, dioxins, dibenzofurans, contraceptives etc.) and other environmental exposures and not only HIV alone as has been believed by majority of scientists since the 1980s” (Mbakaya et al. 2011).**
- This view is supported by US scientists when they recently reported AIDS in HIV – free individuals and suspected genetic and environmental factors (Browne *et al.* 2012).

Discussions Cont..

- Reports associate consumption of foods contaminated with mycotoxins with increased risk of HIV infection, while others are now showing that use of contraceptives increases the risk of HIV infection and cervical cancer, via a mechanism we have recently elucidated to include serum zinc and innate immunity depletion and that might shed light on the phenomenon of malaria, TB, HIV, pneumonia and cancer co-infections, especially in Sub-Saharan Africa (Mbakaya et al., 2010; Mbakaya et al., 2011). Scheter *et al.* previously reported that dioxins activated HIV multiplication.
- Given the foregoing, the role of environmental health and host nutrition and immunity as a factor in communicable and non-communicable disease causation may have been underestimated and may be key in healthcare delivery in this 21st century.

Conclusions and Recommendations

- 1) Tentative as it may be, this presentation gives fresh insights/ opportunity to explore new directions in research and in multi-disciplinary teams with a view to innovatively containing our public health challenges, including HIV and AIDS and related opportunistic infections, including TB, malaria, pneumonia and cancer, among others in this 21st Century.
- 2) The meeting here in Las Vegas should now be that the role of food in disease prevention and management has been underplayed and should never be in this 21st Century. We need to see more collaborations in Research in line with North – South and South – South collaboration. This could lead to a vibrant nutraceutical industry that aims to fill the void witnessed in the 20th Century. Consequently, such products will contribute immensely to improved malaria, TB, pneumonia, cancer and stunting prevention and management in Kenya, Africa, America and the rest of the World.

Acknowledgements

Distinguished Guests ladies and gentlemen attending and presenting at this conference,

Organizing Committee of the 3rd Food Technology -2014 Conference,

The OMICs Group and collaborating Universities and Institutions,

Political Leaders of the, USA, Las Vegas City and the State of Nevada,

- The Director of the Kenya Medical Research Institute, where I work,

Co-workers: Prof. Hudson Nyambaka, Prof. Judith Waudu and Prof. Isaiah Ndiege of KU, Prof. Solomon Mpoke, Dr. Patrick Orege, Mr. Wilfred Kisingu, Dr. Davy Koech, Dr. Peter Wanzala, Erastus Muniu,

Other Colleagues: Dr. Yeri Kombe, Ms. Celestine Ufeli, Santa Marta A, Gonzalo C, Decaux J, Adungo N, Vulule J, Genga I, Wafula K, Mwangi M, Kisingu W, Mrs. Waiharo G, Omondi J, Kinyanjui M, Kanyara L, Mr. Rotich P and the late Acom B.

Asanteni Sana!

