Participants:

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·   Chair: Vishnu Swaminathan and Al Hammond

1.   *Buddy Ratner, University of Washington, US*

How do we define nutrition/ nourishment?

The issue is what we want to analyse. We are not sure, but we want to build analytical platform to measure nutrition.

How to measure?

Folic Acid only?

Incomplete Folic Acid?

Pesticides?

The idea of measurement is very flexible. You can't manage what you can't measure - George Soros.

To measure is to know – Lord Kalvin

How do we analyse today? Complex machines that look at the chemicals, vitamins, etc. But we need a tool for tomorrow.

There are five key nutrients:

Vit A

Iodine

Iron

Folic Acid

Zinc

We are looking for a low cost, durable and accurate tool. The technology is a plasma pencil atmospheric mass spectrometry. This device plug on a smart phone could provide a complete analytical tool in the future.

The concept of the plasma pencil – very hard science

There 3 elements to it:

·   The Plasma pencil: plasmas (studied in physics with implications in interstellar space and the universe). Pencil at the end a little glow that is the plasma.

·   Mass Spectrometry: Take blood as the basic tester. Make sense of the complexity of blood, hair, skin, etc. Use the Mass Spec to take all the chemical components of the tested blood and break it down into its components.

The Mass Spec is very sensitive and analyse the components of the blood.

· Chemometrics – Multivariate Data Analysis (Nobel price of 1981 maths to extract info from data set – Econometrics, here it is the medical equivalent).

We use this method to identify specific parameters in a group of people. Chemist approach, this method is use to analyse the data that comes out of the mass spec. Without this method, you need a very advanced knowledge in chemistry to make sense of the mass Spec.

With the pencil and the mass spec you get a spectrum by molecule. The computer does the work. We use blood to detect the micro nutrients. Low and High blood concentration to compare and separate the different components. We can do it for 4 micro nutrients now (5th on the process, almost). This is still under development. We can do that analysis in 3 min.

We also look at the water standards. Use the plasma pencil on a glass of water and using the standards of the water of Seattle we could separate out the components.

Toy safety and plastic: analyse the surface of rubber duck and we could find BPA and led.

Conclusions: PPAMS + Chemometrics are a powerful analytical tool. Hypothesis generator and testing. We would like to it more rapid, smaller, field implementable and we hope very low costs soon.

Application: Blood, milk, soil, drug, hair, pesticides, etc.

Q&A: This technology loves data. We are interested in the information, for that we need a lot of data. We develop the model in the lab, once it is done, it can be used in 3 minutes.

The goal is to develop something small, affordable, exportable for people to use every day. Pencil is easy to develop, but we need improvement in the mass spec. Now we can do it as light as 4kg. We need mass production to develop this.

A system like this is useful for lab – could be an analytical solution for lab and could be 'more affordable' than other machines in lab, but still won't empower people. So we would like to create something that is very affordable to people as well. For lab, doctors, the blood test could be done anyone and saving lots of costs.

2.   Basil – E'Pap: Nutrient Status Measurement

Our food chain is compromised. There is up to 76% drop of nutrient density. We are all dealing with that and we need to focus on the problem: micro nutrients more than feeding. We have to fix the future but for that we need to measure it.

The consequences of Hidden Hunger: drug resistance and TB crisis – in Africa. The key issue is nutrition. TB comes out when our level of nutrition drops. The other huge challenge is early childhood development. Children are born malnourished which impacts their brain development from birth. We need to find a solution to eradicate poverty, we need to start there.

· We need to fix the food chain – takes time

· Replace the nutrients in the same form the body requires in order to achieve a condition of nutrient repleteness.

Nutrient Repleteness: body optimal nutritional condition. What does that mean? The common approach

on the ground is to measure nutrition with the body mass index. But it doesn't give you information on the nutrient status. Physiological functionality for people will tackle a wide spectrum of issues at once. The body will perform better.

It offers a solution to:

· Unaffordable health and pandemics

· TB, Malaria out of control, better manage obesity, old age and psychiatric settings.

· Get back to basics also addresses poverty, child development (damage in first 1000 days), and rural development.

· Education.

It cannot be achieved by part solutions. If nutrients are not well absorbed we won't achieve nutrients repletness. Nutrients taken every day are not well absorbed, they block each other and only a small amount (2%) get absorb while the rest builds up as a toxic element in our body. With food State micronutrients you get all of the impact of the nutrients. Understanding bioavailability and absorption are essential issues.

Our understanding: Not what is added to food, but rather what gets absorb in the body. Nutrients play a major role in achieving nutrients repliteness, but current measurement techniques like BMI to outcomes are not relevant.

New measurement is required to measure the impact of the forms of elements absorb to the body. What do we need to measure? Early childhood development to measure the nutrients absorb in the skin, hair, etc to tell us what works and doesn't. That will give us the tool to manage huge challenges that we are facing. How do you measure the evolution nutrients intake has on people? How the skin, the blood, etc causes the change in the human condition?

Q&A: With only $0.15 per day, we can create a solution to this crisis. Feed a mother when she is pregnant or breast feeding, her milk quality will go up very quickly. E'pap provides a Food state nutrients pack fortified with nutrients that helps our body absorb better and faster.

3. *Greg Garrett – Gain – Food fortification*

We see food fortification to eradicate some deficiencies in the West, less in other continents. There is a cost effective issue. To reach people in African countries for examples: how do you reach populations quickly and cheaply? We reach lots of people, but we don't have data for impact.

The 1,000 days window in women pregnancy is a good start, but not enough. We need 10,000 to ensure women are healthy before they conceive.

Problem: little data on the assumption, old. We need standards from products to be able to know how to measure it on people. Bioavailability as well too. Large scale food fortification: spread but not rolled out accordingly because they don't use the relevant data. Big need to get better information about what works.

We need better quality assurance and control of fortified food. We are working on this. Along the value

chain we are trying to make quality and nutrient valued.

Gain works with lots of organisations on several programmes. You need food industries in the discussion as well, you can't blame them for everything because they are also a big part of the solution. We work with the food industry. Food authorities, we tried but they don't have the time to listen so we provide guidelines manuals, training, etc. We do both industry and food authorities, but it's not really working. So now we look at consumer groups to represent the consumers so they know what they buy when they get a tomato. Start naming, shaming, encouraging and praising industries doing it. Also go to the government so they can incentivise the good industries (tax breaks, etc).

Q&A: Surveys are quite good, but they don't talk to each other really. They could take other surveys more into account. Data is available but we are not taping that accordingly. We need better data and analytics along the value chain. Better mobile solutions to send data solutions to remote places. The results would be: better academic, health and economic impact.

4. *Al Hammond- epigenetics*

The epigenetics is looking at the parts of the genes that are not the genes. It has been found to have very powerful ability to respond to the environment and turn on or off the impact of some genes. Gates Study: before agriculture, human being were living in an uncertain food environment so we develop strategies. A child had more fat cells to survive in a food scarce world. If there is enough food it flips into the other model. Now people live past 40, so we run into other problems: cardio, obesity, etc. Women malnourished, his child has more chances to be predestined to have diseases and problems for his entire life. We need to get it right for the soon to be a mother. There is evidence that you set up a pattern that continues to the next generation. Studying different groups born under different nutrition conditions had an impact on the life expectancy. It is also governed by the micro bacteria inside your body that you get from mothers, fathers, medicines, life experiences, etc. That will impact the way we interact with food as well. We are condemning a generation of bad health outcomes if we get it wrong. We need to think in terms of a nutrients value chain so we stop screwing up the food chain system. There are more epigenetics evidence that there are impacts on the future of children.

It is so important to develop a range of measurement. We need sophisticated and simple, inexpensive tools to build share data systems. Randomised Control Trials are too long and time/money consuming. We need quick and easy data using modern IT systems.

Q&A – how are we not more advanced in these studies of micro nutrients? We need hard data to measure everything we are doing – the foundations of a nutrient economy.