“What Is Health and What Are Health Benefits and What Are They Not?? ”

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Definition of Health

General condition in terms mental and physical wellness!

WHO Definition : A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.
International Covenant on Economic, Social and Cultural Rights

Article 12

The States Parties to the present Covenant recognize the right of everyone to the enjoyment of the highest attainable standard of physical and mental health.

http://www2.ohchr.org/english/law/cescr.htm

16 December 1966
How Do We Assess??
WHO International Classification of Diseases (ICD)

The ICD is the international standard diagnostic classification for all general epidemiological, many health management purposes and clinical use. These include the analysis of the general health situation of population groups and monitoring of the incidence and prevalence of diseases and other health problems in relation to other variables such as the characteristics and circumstances of the individuals affected, reimbursement, resource allocation, quality and guidelines.

http://www.who.int/classifications/icd/en/
Other Assessments

International Classification of Functioning, Disability and Health (ICF)
Subcategories: body functions, body structures, activities and participation, and environmental factors.

International Classification of Health Interventions (ICHI)
http://www.who.int/classifications/ichi/en/
In 2010, cancer will become the world’s leading cause of death. Do we have the infrastructure in place to deal with these global health problems???
Increase largely due to aging & growing society!

Do we have the infrastructure in place to deal with this crises?!
What dietary change is best?
Who will benefit and will anyone will be placed at risk??

Dr. Lee Jong-wook, Director General WHO
This report highlights the immediate opportunities for tackling the epidemic in all settings through a broad focus on NCD surveillance, population-based prevention, strengthening health care and the capacities of countries to respond to the epidemic. The increase in cancer, diabetes, and heart and lung diseases are due to the following factors: unhealthy diets, raised blood pressure, harmful use of alcohol, insufficient physical activity, tobacco use, obesity, raised cholesterol levels, and cancer-associated infections.
Early Death are a Significant Issue

Cancer, diabetes, heart disease and lung disease kill 36 million people every year, making up 63% of global deaths.

Mr. Nassir Abdulaziz Al-Nasser President UN General Assembly Opening Remarks 19 Sept 2011
The Concept of Positive Health

- Positive health requires a knowledge of man’s \textit{human} primary constitution \textit{(genetics)} and of the powers of various foods, both those natural to them and those resulting from human skill \textit{(processed food)}. But eating alone is not enough for health. There must also be exercise, of which the effects must likewise be known. The combination of these two things makes regimen, when proper attention is given to the season of the year, the changes of the winds, the age of the individual and the situation of his \textit{(her/his)} home. If there is any deficiency in food or exercise the body will fall sick.

Hippocrates
Three Types Biomarkers Needed To Determine Response to Foods/components Responders (Both Positive and Negative)

Dietary Exposure → Absorbed Dose → Inactive Metabolite → Biologically Effective Dose → Molecular Target

Susceptibility Factors

Health Effects + and - → Altered Structure/Function → Early Biologic Effect
Always Questions About How Much Is Needed!

As progress the response gets better and better, with no end in sight (real life is seldom, if ever, like this. People often assume that if X is good, then 10X is better.

More

As increase the effect reaches a plateau, becoming no better with higher doses. This is common with many nutrients. Any excess is not absorbed and excreted (expensive urine / feces)

More

As increase effect reaches optimum At some dose it declines, showing that more is better up to a point and then harmful. Applies to some nutrients, e.g. Na⁺ high blood pressure, Fe, Se.

More

B. Halliwell (Personal Communication)
Hunger and Loss of Health

Poverty at household level

Globalization
Urbanization
Population ageing

Populations in low- and middle-income countries

Increased exposure to common modifiable risk factors:
- Unhealthy diets
- Physical inactivity
- Tobacco use
- Harmful use of alcohol

Noncommunicable diseases:
- Cardiovascular diseases
- Cancers
- Diabetes
- Chronic respiratory diseases

Loss of household income from unhealthy behaviours

Loss of household income from poor physical status and premature death

Limited access to effective and equitable health-care services which respond to the needs of people with noncommunicable diseases

Loss of household income from high cost of health care

WHO Report 2010
At least 80% of premature heart disease, stroke and type 2 diabetes, and 40% of cancer could be prevented through a lifestyle change including a healthy diet, regular physical exercise and avoiding tobacco products.

In the South-East Asia Region, a 2% annual reduction in deaths due to chronic disease could save over 8 million lives in the next 10 years. In India, for example, a similar reduction would also result in an economic gain of USD 15 billion over the next 10 years.

WHO South-East Asia Report (Oct 2005)
Recent Cost Analysis Are More Concerning

Unless current health trends are reversed the five common, non-infectious diseases -- cancer, diabetes, heart disease, lung disease and mental health problems -- will cost the world $47 trillion in treatment costs and lost wages over the next 20 years.

World Economic Forum and Harvard University
2011
How Much Does It Cost Industry to Modify Foods

Not clear since records not always available.

If spending on taking items out of the diet are there funds to consider what should be added for health promotion/wellness?
Cost Effectiveness of Salt Reduction

The United Kingdom salt reduction programme, begun in 2003, has involved working with industry to reduce levels of salt in food, raise consumer awareness and improve food labeling.

Levels of salt in foods have been reduced in some products by up to 55%, with significant reductions in those food categories contributing most salt to the diet.

Consumer awareness of the 6g/day message (had been average over 9g) increased tenfold, and the number of people who say they make a special effort to reduce their intake has doubled.

By 2008, average intake declined by 0.9g to 8.6g/day, which is estimated to prevent more than 6000 premature deaths and save £1.5 billion every year in health care and
Must Realize That All Individuals Do Not Respond the Same: Comparing Populations Is a Little Like Comparing Apples and Oranges!
Variation in the RESPONSE to foods and components is commonplace.


<table>
<thead>
<tr>
<th>Study</th>
<th>Relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bostick et al., 1994</td>
<td>1.04 (0.62-1.76)</td>
</tr>
<tr>
<td>Kato et al., 1997</td>
<td>1.23 (0.68-2.22)</td>
</tr>
<tr>
<td>Chen et al., 1998</td>
<td>1.17 (0.68-2.02)</td>
</tr>
<tr>
<td>Hsing et al., 1998</td>
<td>1.90 (0.90-4.30)</td>
</tr>
<tr>
<td>Singh et al., 1998</td>
<td>1.41 (0.90-2.21)</td>
</tr>
<tr>
<td>Pietinen et al., 1999</td>
<td>1.10 (0.70-1.70)</td>
</tr>
<tr>
<td>Järvinen et al., 2000</td>
<td>1.50 (0.77-2.94)</td>
</tr>
<tr>
<td>Tiemersma et al., 2002</td>
<td>1.60 (0.90-2.90)</td>
</tr>
<tr>
<td>Flood et al., 2003</td>
<td>1.10 (0.83-1.45)</td>
</tr>
<tr>
<td>Wei et al., 2004</td>
<td>1.21 (0.72-2.03)</td>
</tr>
<tr>
<td>Wei et al., 2004</td>
<td>1.24 (0.78-1.96)</td>
</tr>
<tr>
<td>English et al., 2004</td>
<td>1.40 (1.00-1.90)</td>
</tr>
<tr>
<td>Larsson et al., 2005</td>
<td>1.32 (1.03-1.68)</td>
</tr>
<tr>
<td>Chao et al., 2005</td>
<td>1.36 (0.93-2.00)</td>
</tr>
<tr>
<td>Norat et al., 2005</td>
<td>1.35 (0.96-1.88)</td>
</tr>
<tr>
<td><strong>Summary estimate</strong></td>
<td><strong>1.28 (1.15-1.42)</strong></td>
</tr>
</tbody>
</table>

Test for heterogeneity: $Q = 4.86; \ p\text{-value} = 0.99; \hat{\tau} = 0\%$
Not All Are Equally Susceptible


ATNC = apparent total nitroso compounds
Genotype Information May Help Identify Vulnerable Individuals and Point to Limited Concerns of Populations

France: 1,023 CRC cases and 1,121 controls


Odds Ratio: Colon Cancer

<table>
<thead>
<tr>
<th>Diet</th>
<th>SNP Inter + Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5 times/wk</td>
<td>Red Meat Intake</td>
</tr>
<tr>
<td></td>
<td>&lt; 5 Times/Wk</td>
</tr>
<tr>
<td></td>
<td>5 &gt; Times/Wk</td>
</tr>
</tbody>
</table>

Red Meat Intake

- Population 4.4%

Multi-CYP SNPs:
- CYP1A2 -163A>C
- 1548T>C
- CYP2E1 -1293G>C
- -1053C>T
- CYP1B1 1294C>G
- CYP2C9 430C>T

* P = 0.001
** P < 0.001
Relative Risk = 1.00000

Relative Risk = 1.18091

Relative Risk = 1.43735

Relative Risk = 2.55292
Ability of Foods to Influence Health Depends on Nutrigenomics and Beyond as well as Needs and Insults

“Nutritional Preemption”
Concept that bioactive food components can be introduced at points of initiation & progression for pathway leading to an unhealthy or lethal phenotype.
Credentialing is defined as “omic” changes that bring about a phenotypic change.
# How Best to Evaluate Changes In Diet Cost With Increased Nutrient Intake

King County, Washington, 2008–09

<table>
<thead>
<tr>
<th>Nutrient (unit increase in intake)</th>
<th>Change in cost/unit increase in nutrient intake ($/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium</td>
<td>0.52****</td>
</tr>
<tr>
<td>Fiber</td>
<td>0.15****</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>0.07****</td>
</tr>
<tr>
<td>Calcium</td>
<td>−0.02</td>
</tr>
<tr>
<td>Other nutrients (1% of calories)</td>
<td></td>
</tr>
<tr>
<td>Added sugar</td>
<td>−0.07****</td>
</tr>
<tr>
<td>Saturated fat</td>
<td>−0.28****</td>
</tr>
</tbody>
</table>

Monsivais et al. (2011) *Health Affairs, 30: 1471-1477*
Fundamental Questions “Is there ONE ideal diet?? “Is MORE always better? How MUCH is too little and too much??
Nutritional Assessment Challenging For Most Food Components! Interpretation of 25(OH) D

<table>
<thead>
<tr>
<th>Excess</th>
<th>Potentially toxic</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 200 ng/ml</td>
<td>Hypercalcemia</td>
</tr>
<tr>
<td>&gt; 500 nmol/L</td>
<td>Hyperphosphatemia</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>“Adequacy”</th>
<th>“Desirable”</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 30 ng/ml</td>
<td>No consensus</td>
</tr>
<tr>
<td>≥ 75 nmol/L</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>“Marginal”</th>
<th>“Inadequate”</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 15-20 ng/ml</td>
<td>Bone</td>
</tr>
<tr>
<td>&lt; 37.5-50 nmol/L</td>
<td>Overall health</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Deficiency</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 11 ng/ml</td>
<td>Rickets</td>
</tr>
<tr>
<td>&lt;27.5 nmol/L</td>
<td></td>
</tr>
</tbody>
</table>
Too Much of Anything Can Create Problems: How Does One Identify Vulnerable People?

Nested Case-Control Study in Nordic Men (622 cases and 1451 controls)

OR (Prostate Cancer) vs. 25(OH)D (nmole/L)

50 nM = 20 ng/ml

While I have raise lots of Concerns:
There Is Light At the End of the Tunnel!
Suspect Functional Foods With Likely Health Benefits

- Soy
- Tomatoes
- Spinach
- Mushrooms
- Broccoli
- Garlic
- Nuts
- Salmon
- Oats
- Blueberries
- Curcumin
- Green tea
- Red wine ??
How Best to Communicate the 4 Ps for Public Health Promotion

Predictive  (biomarkers)  Personalized  (Variability in Response)  Preemptive  (Timing/Amounts)

Participatory