Global Health Crisis Caused by the Collision of Biological and Cultural Evolution: Pre-Natal Influences on Acute and Chronic Diseases in Later Life

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Abstract – In the context of finite global resources for sustained healthy human survival, population explosion, increased environmental pollution, decreased clean air, water, food distribution, diminishing opportunities for human self-esteem, increased median life span, and interconnected causes of acute infectious and chronic diseases, the need to understand the factors leading to human diseases will be necessary for both the long term prevention and for managing short-term crises health problems. The transition of our pre-human nutritional requirements for survival to our current unequal and culturally-shaped diet has created a biologically mismatched human dietary experience. While genetic, gender, and developmental stage factors contribute to human diseases, various environmental and culturally-determined factors are now contributing to both acute and chronic diseases. The transition from the hunter-gatherer to an agricultural-dependent human being has brought about a global crisis in human health. Initially, early humans ate seasonally-dependent and calorically-restricted foods, during the day, in a “feast or famine” manner. Today, modern humans eat diets of caloric abundance, at all times of the day, with foods of all seasons and from all parts of the world, that have been processed and which have been contaminated by all kinds of factors. No longer can one view, as distinct, infectious agent–related human acute diseases from chronic diseases. Given the predicted increase in the number of new births before the end of this century, a serious effort must be made to provide a healthy in utero environment for the most vulnerable stage of human development in order to prevent alterations in organ-specific adult stem cell numbers and stem cell–based diseases later in life. This new concept provides a mechanistic explanation for how pre-natal maternal environmental or dietary exposures can now affect diseases later in life (Barker Hypothesis). This concept points to a moral imperative to provide new global strategies for better nutritional education and dietary opportunities for pregnant women in various cultures and economic circumstances.

Keywords – One Health; Barker hypothesis; prenatal development; "metabolic diseases"; biological evolution; cultural evolution; food safety; epigenetic toxicology

As we look out upon the world today, there is no excuse for optimism or no reason for despair. We have gone far in the wrong direction. We have recklessly squandered the wealth of the earth and the wealth of human nature. But we are learning what we have done. In that knowledge is the possibility of a better performance."(Otto, 1940, p. 192)

1. Background to the "sustainable One Health" concept

Currently, while many classic infectious diseases still plague the world’s 7 billion people, a major global health crisis is occurring, in that, obesity-related "metabolic diseases" (diabetes, cardiovascular and cancers) are starting to drain the world’s limited health care resources. One of the unifying concepts, that seems to link acute infectious diseases (viral, bacterial, and parasitic) with the chronic diseases (birth defects, diabetes, cancers, cardiovascular,
Alzheimer’s, Parkinson’s, cataracts, etc.), is the predomi-
nate role that chronic inflammation plays in either the
genesis or promulgation of these diseases. (Trosko and Tai,
2006) We should now view acute infectious diseases as be-
ing integrated with non-communicable chronic diseases via
the inflammatory responses.

However, before more detailed elaborations of how to
resolve this global health crisis, which includes how human
activity is impacting earth’s natural systems, on which all life, including human life, depends on for nor-
amal health (Myers et al., 2013), one needs to come to some
consensus on the definition of a “Sustainable One Health”
concept. The following assumptions must be made clear.
The first is that, usually, one must understand the cause
or causes of diseases, i.e. mechanisms, of an identifiable
problem before efficacious solutions can be implemented
to solve the problem. That is, one can’t apply a solu-
tion to a problem for which one has no idea what are
the critical components leading to the problem. In recent
years, the term, “One Health” has emerged in the litera-
ture (see: Nassiri, 2013), but no satisfying definition has
led to the fundamental identification of the complex com-
ponents that interact, which leads to the global health cri-
sis. It is reminiscent of a famous remark by Justice Pot-
er Stewart (1964), which he made during the classic search
for the definition of “obscenity”:

“I shall not today attempt further to define the
kinds of material I understand to be embraced
within that shorthand description; and per-
haps I could never succeed in intelligibly do-
ing so. But I know it when I see it, and the mo-
tion pictured in this case is not that.”

To date, especially at the recent “One Health-One
Planet” workshop [http://www.planet-risk.org], a
general conceptual Venn diagram, of the overlapping
of Ecological Health, Animal Health and Human Health
spheres of influence, led to the link between all three that
was accepted as the arena of “One Health”’. That was fine,
in the manner that “I know it when I see it”, but it pro-
vided little rational foundation as to what might be the
fundamental “primal force” or basic concept that might
give substance to finding solutions to prevent or treat the
root cause(s) of the “global health” crisis. Indeed, one
usually understands that when the ecological conditions
are depleted or polluted, plant, animal and human life are
jeopardized. While it has been pointed out that the term,
hence, concept of “One Health” has appeared in the recent
literature, the idea that all life’s existence depended on a
precarious dynamic of adapting to inevitable changes in
the total environment by both mutations and epigenetic
changes in the genome has been known for a long time.
Therefore, it would be hard to argue that Charles Darwin
and Alfred R. Wallace’s concept of biological evolution
do not need to be considered when considering the root
causes of current concept of One Health. Pushing it to
another extreme, the Eastern concept of the “Yin & Yang”
idea of health, as well as the Pythagorean view of the bal-
ance of “natural elements”, informs us that very early in-
sights of complex interactions determined health or dis-
eas. Thomas Mathus in his An Assay of the Principle
of Population, (Appleman, 1976) also knew “Sustainable
One Health” “when he saw it”.

2. The tragedy of the global “commons”: use of knowl-
edge without a global bioethic

In more contemporary literature, Rachel Carson’s book,
Silent Spring, (1962) illustrates how cultural evolution,
through the use of technologies, impacts the ecological
environment, which, in turn, impacts both animal and hu-
man health. Moreover, Garrett Hardin’s insight of “One
Health” in his “Tragedy of the Commons” (Hardin, 1968)
clearly shows that he “knew it when he saw it”. A re-
lated view was expressed by Van Rensselaer Potter: (Pot-
er, 1974)

“When I first read Hardin’s article [on the
tragedy of the commons], I wondered if the
users of the early English commons weren’t
prevented from committing the fatal error of
overgrazing by a kind of ‘bioethics’ enforced
by the moral pressure of their neighbors. In-
deed, the commons system operated success-
fully in England for several hundred years.
Now we read that, before the colonial era in
the Sahel, ‘over pasturage was avoided’ by
rules worked out by tribal chiefs. When deep
wells were drilled to obtain water ‘the bore-
holes threw into chaos the traditional system
of pasture use based on agreements among
tribal chieftains.’ Thus, we see the tragedy of
the commons not as a defect in the concept of
a ‘commons’ but as a result of the disastrous
transition period between the loss of an ef-
effective bioethic and its replacement by a new
bioethic that could once again bring biolog-
ical realities and human values into a viable
balance.”

In that tragedy, cultural traditions based on eons of
experience, allowed groups of people, their food source of
domesticated animals, when depended on scarce wa-
ter and vegetation, to exist. However, when a perceived
technological fix of providing new sources of water, un-
leashed new cultural behaviors, which trashed traditional
values and led to the devastation of that delicate balance
of water, vegetation, and human well-being. One might
even view the local “Tragedy of the Commons”, demon-
strated in the Sahara, is now being played out as a “Global
Tragedy of the Commons” because of a lack of a “Global
Circle: Nature, Man and Technology” (Commoner, 1971)
demonstrated that he saw how cultural evolution, as man-
ifested by unguided technology, could affect the domains
of ecological & animal health to affect human health.

When Rene Dubos, a Nobel Prize recipient, wrote his
book, So Human An Animal (Dubos, 1968, p. 148), he
also had a view of “Sustainable One Health”, which should
cause us to pause to consider his take on how biological
and cultural evolution contributes to our concept of “One Health”. In the book, he stated:

“On a hot and humid Friday during midsummer, I landed at Kennedy Airport early in the afternoon. The taxicab that was taking me home was soon caught in a traffic jam, which gave the driver an opportunity to express his views on the state of the world. Noting my foreign accent, he assumed that I was unacquainted with the United States and proceeded to enlighten me on the superiorities of the America life. “You probably are surprised by this heavy traffic so early on Friday afternoon”, he remarked, as the cab stood still in the sultry air saturated with gasoline fumes. “The reason there are so many people on the road at this time of hour is that we have plenty of leisure in this country and all of us can afford an automobile”. As we moved our coats and mopped our brows, he added forcefully, “In the United States we all live like kings”.

Later in his book, where he addressed the problem of global pollution and diseases and miserable survival (his view of one health), his greatest concern was not that the human species would die out, but we would LEARN TO ADAPT TO THIS GLOBAL POLLUTION PROBLEM! (emphasis added).

As insightful as to the role historical role of how cultural evolution impacted our biological evolution and its subsequent effect on One Health, the book, Guns, Germs, and Steel: The Fates of Human Societies, by Jared Diamond (1997) clearly demonstrates how the emergence of human culture has changed, and is shaping our “One Health” problem. One does not even need to elaborate on even more dramatic examples of how this inevitable dynamical interaction of our cultural evolution (especially, technological advances) is affecting the current “One Health” concerns, when the issues of “global warming”, of the increasing global “metabolic diseases” (Ray, 2009; Ezzati and Riboli, 2012), or of the Hiroshima/Nagasaki, Chelyabinsk, and Fukushima nuclear effects on One Health are now discussed.

3. Global Bioethic of “One Health”

While it might seem intuitively obvious that all living organisms (bacteria, butterflies, fish, birds, mammals, human beings) require energy for life through adequate, nutritious and safe, continuous supplies of foods, the situation on earth today has made the future for quality survival very precarious. This, then, provides the moral and ethical dimensions of cultural evolution come into our holistic understanding of “One Health”. The term, Bioethics was introduced by Van R. Potter, not as a subclass of medical ethics after new technologies give physicians choices that patients might make, but the broader view of ethics when humans make choices affecting the total human, animal and ecological spheres. (Potter, 1972; Potter, 1988) In his insights, he acknowledges the foundations of a “One Health” concept to Aldo Leopold (1948) To understand the fundamental implications of how human choices of how to create and then use or not use new ideas and technologies, one must first recognize that human choice involves not only “facts”, but “values” (Trosko, 2003) Since this raises the classic dilemma of the “Naturalistic Fallacy”, it must be made clear that Potter was not advocating that the “ought” (or “value”) can be derived directly from the “is” (“Fact”), but rather that no human value can be maintained in ignorance or defiance of the “is” or of the biological realities of human nature (Trosko, 1984). Max Otto, a philosopher, pointed this out nicely when he stated that:

“The universe is run by natural forces and laws, not by moral laws. However, human societies that live in the natural world must live by moral laws. If those moral laws contradict or ignore the nature laws, it will be the human societies, not the physical universe, which suffer the consequences of such defiance.” (Otto, 1940)

The real problem in this “fact” versus “value” dilemma is that, at best, all scientific facts are incomplete; at worse, they can be dead wrong. On the other hand, human values are not acquired without real life factual experiences; in other words, they are not independent of any “factual” components. The “Two Cultures” gap [between the sciences and the humanities] (Snow, 1959) is not really a gap between two distinctively and mutually exclusive domains of human experiences.

Part of trying to understand how to understand and to deal with the “One Health” concept, specifically within the reality of the biological evolutionary roots of all life, in their many local environments having to deal with inevitable physical/chemical evolution and now ever-laser-speed cultural evolutionary changes, one must recognize that all human beings are not “prisoners” of biological “instincts”, but as “victims” of their being “designing”, cultural beings. The Diaspora of these human beings caused them to adapt and survive in various different physical environments (arid, temperate, frigid), hunting, planting or domesticating foods, as well as symbiotically cultivating gut microbiomes (Sonnenburg, 2010; Claesson et al, 2012; Ezenwa et al, 2012; Tremaroli and Backhed, 2012; Yatsunenko et al, 2012). To help maintain those survival behaviors, human generated abstract world views, including views of human nature, life philosophies and religions. As a result, today, we live in a pluralistic world, with pre-scientific views of human nature, philosophies and 21 major formal religions. This seems to be an obvious source of identifying the problem that has contributed to the crises in the destruction of our ecological, animal and human health relationships.

In this pluralistic world, since humans do have a “nature” (Trosko, 1984; Trosko, 2003), who will determine what it is or whose religious or philosophical/political world view is the correct one? Can any view of human nature actually provide the principles to shape ethical be-
behavior to prevent further destruction of our environment and to help shape a future that will minimize human misery and lead to a more sustaining "One Health" global policy in a pluralistic and ever-changing world?

Obviously, current physical and chemical resources, which are needed to maintain all life on our earth, are finite or in fragile conditions, in local and global areas. Moreover, the qualitative and quantitative natures of those resources have changed from the first day of Earth's creation to the day life first appeared. The impact of non-human life on the ecosystem, on which all life depends, although not insignificant (i.e. role of phytoplankton's to shift our atmosphere from an non-oxygen atmosphere to an oxygenated atmosphere), has been minuscule, both with regard to scale and time, compared to that which has been altered by the appearance of Homo sapiens. While non-human living organisms leave behind their existence some detritus and ecosystem changes, their detritus has been basically bio-degradable and life was able to adapt to the changes. On the other hand, human existence creates a non-biodegradable detritus, such as "walls" (physical structures and abstract ideas). These "walls", then, create and force new human existence. (Flusserr, 1974)

It is difficult, today, to develop a personal or cultural view of the world, because of those rather indestructible "walls" of our ancestors who shaped our early socialization. There is no "universal" view of human nature, from which a new strategy for providing a "Global, Sustaining, One Health" policy can be generated. Since our current global survival is being jeopardized by an exploding human population, global pollution of air, water, limiting nutritional foods, miserable human existence for billions of human beings [Potter 1988], unrealistic or bankrupt ideologies, and conflicting philosophical/political theories and religious theologies [Sagan 1995; Trosko 1984; Trosko 2003], it seems that a universal or global "Sustaining One Health" strategy will not be developed or implemented. While attempts are being made (Pang et al, 2010; Chretien, 2011), the integrative foundation has yet to be used to formulate a meaningful strategy for global implementation. One needs only to examine the recent example of how the One Health Venn diagram of the complex interactions of ecological, animal and human health is being exacerbated by natural -and human- made disasters (recent tsunami/Fukushima nuclear accident in Japan). Given no international strategy to forge a new paradigm to prevent the serious threat to decent human existence in this case, it does not bode well for the future, as more of these events will occur with wider impacts.

Given various terms have been made to describe human survival ("mere", "miserable", "Idealistic", "irresponsible", and "acceptable"), Van R. Potter (Potter, 1995; Potter, 2003, p. 43.) proposed that the term, "acceptable survival," as a bioethical goal of global survival, instead of the term, "sustainable development", because, in most contexts, it is an economic concept with no moral or ethical constraints. On the other hand, "acceptable survival" means acceptable to a universal sense of what is morally right and good and what will continue in the long term. With the steady and uncontrolled human population growth (currently, 7 billion) and an increase to 10 billion by the end of this Century, providing adequate and safe supply of foods, grown in steadily deteriorating ecosystems, poses a major threat to meeting the need for nutritious diets for all stages of human development. Diets can influence the onset or prevention of all diseases, acute and chronic, as will be illustrated later. Both the quality and quantity of safe, nutritious foods are needed to reduce the risk to preventable diseases, in order to assure "acceptable" survival (Trosko, 2007a; Trosko, 2007b; Trosko, 2008).

4. Current global diseases due to the collision between biological and cultural evolution

Ironically, the biological evolution of the human species, together with the cultural evolution of technologies (use of tools and fire, domestication of animals, agriculture, technologies of mobilization, communication, energy production, sanitation, and scientific understanding, which has led to increasing the quality and quantity of life for the human species), has led to the crises that have challenged the quality of the global ecology (air, water, land use, global temperature, non-renewable resources, etc.), on which all life depends. (Trosko, 2007a; Trosko, 2008) This has come about because the short-term use of these technologies has contributed to inevitable changes in the very ecology that supports all life. It turns out the human species is biologically built to react to short term positive and negative feedback of its action-induced consequences. Although we have a limited capacity to use our intellect to predict some long term positive & negative consequences, our predictive certainty is not very good, and, even in the case where we can predict some negative consequences, we assume we will be able have technological fixe to deal with them, if and when they might come about.

Equally important in this current collision of biological evolution with cultural evolution and inevitable changes in the earth's environment is the fact that human population (currently 7 billion) will reach 10 billion by the end of this Century. Given the absolute requirement for adequate supplies of nutritious and safe foods, questions, related to the production of foods on/in safe environments (land, water), the quality of that food (non-contaminated with radioactive-, chemical- or biological-toxicants/toxins, etc.), must be made. Issues such as: (a) Will there be an adequate supply of enough & safe foods?; (b) How to provide a quality of life when most humans will be living in urban environments?; (c) How to provide enough and the right types of food when there will be fewer individual farmers will be supplying that food?; (d) How to deal with much of that food which will be subject to exposure to contaminants?; (e) What can be done when the foods available might not be adequate for nutrition requirements?; (f) Much more energy, including nuclear energy, will be needed to grow, process and transport the food; (g) Since foods are now realized to be a major contributor or protector of both acute and chronic diseases, how can they be utilized reduce the global burden of "metabolic diseases"?; and (f) If organ-specific adult hu-
man stem cells can be increased or decreased by nutrients during pregnancy. (Trosko, 2011; Trosko, 2014), which could lead to alteration of risks to chronic diseases later in life, i.e., The Barker hypothesis. (Barker. 2004; Hashmi et al, 2012; Barker et al, 2013)

The transition of our pre-human nutritional requirements for survival to our current unequal and culturally-shaped diet has created a biologically mismatched human dietary experience (Trosko, 2007a). While genetic (O’Rahilly, 2009)-, gender-, and developmental stage-factors contribute to human diseases, various environmental and culturally-determined factors are now contributing to both acute and chronic diseases. (Daar et al, 2007; Yach et al, 2005). The transition from the hunter-gatherer to an agricultural-dependent human being has brought about a global crisis in human health. (Milton, 2000; Kiple 2000; Teaford and Ungar, 2000; Mariani-Costantini, 2000; Cordain et al, 2000; McCully, 2001; Arjamaa and Vuorisalo, 2010; Wrangham, 2012; Wilking, M., et al, 2013) Initially, early humans ate seasonally-dependent and calorically-restricted foods, during the day, in a “feast or famine” manner. Today, modern humans eat diets of caloric abundance, at all times of the day, with foods of all seasons and from all parts of the world, that have been processed and which have been contaminated by all kinds of factors. (Trosko, 2007a; Trosko, 2007b; Trosko, 2008) Unsafe food can be a serious threat to human health and survival as a result of ignorance, economic profit-seeking, political and economic value decisions, a weapon of terrorism, as well as the consequence of global conflicts, as we are now witnessing.

In addition, no longer can one view, as a distinct form of disease, infectious agent-related human acute diseases from non-communicable chronic diseases. Given the predicted increase in the number of new births before the end of this century (3 billion), a serious effort must be made to provide a healthy in utero environment for the most vulnerable stage of human development, in order to prevent alterations in organ-specific adult stem cell numbers and stem cell-based diseases later in life. This new concept provides a mechanistic explanation for how pre-natal maternal environmental or dietary exposures can now affect diseases later in life [Barker Hypothesis].

To strengthen the notion that planning to have one focused strategy to contribute to a global "One Health" plan, by using the Barker Hypothesis as a hypothesis-driven initiative, one must have evidence that there might be a reasonable rationale for success. While there are many animal experiments and human epidemiological examples to support the Barker Hypothesis, only a few will be noted. Circumstances during the Second World War suggested that the starvation diets (low caloric intake and bad nutrition of the diets of pregnant women [Dutch famine of 1944]) dramatically influenced the health of their newborns. (Roseboom, et al., 2006)

Another dramatic illustration of a different kind of a better nutrient content of a severe low caloric diet comes from the atomic bomb survivors in Japan. Prenatal dietary exposure of the classic Japanese diet in the non-atomic bomb population provided the background control group for the survivors of the atomic bomb survivors in Hiroshima and Nagasaki. In the cancer studies, aside from leukemias found in children exposed to the bomb, an increase of breast cancer, attributed to the atomic bomb radiation, decades after exposure, were found in women who were exposed at a relatively young age. (Ron, 1998) One reason these breast cancers were attributed to the radiation exposure was because the background frequency was so low in the Japanese population not exposed to the atomic bombs. One explanation for this low background frequency was the traditional Japanese diet of a low caloric diet, soy products, raw fish, vegetables, green tea, little cigarette smoking, etc.). Further supporting this explanation comes from epidemiological findings of the Diaspora of Japanese to other countries (Hawaii, Brazil, United States), where the frequency of breast cancer of these Japanese women mimicked the frequency of non-Japanese women of these new countries. One potential dietary factor that might be responsible for the low breast cancer frequency in Japan at that period of history is the natural chemical compounds of soy products, including genistein [and also, Bowman-Birk inhibitor]. (Trosko, 2007a; Trosko and Suzuki, 2009)

A mechanistic explanation has been given to explain the role of these dietary factors on breast cancer, in that, based on the assumption that breast cancers arise from normal human adult breast stem cells [Tai et al, 2005], dietary soy products, during pregnancy, could decrease the adult breast stem cell pool of the developing female fetus. This hypothesis is based on the observation that normal human adult stem cells, when exposed to non-cytotoxic levels of genistein in vitro, differentiate. (Hsieh and Chang, 1999) Extrapolated to the new born female, she would be born with fewer adult breast stem cells, such that, at puberty, she would have few adult breast stem cells to (a) provide progenitor breast cells and therefore, to produce large breasts; and (b) be targets for breast cancers. Based on the observation that the bone seems to be a frequent metastatic site for breast cancer metastasis, it might suggest that the human breast "cancer stem cell" finds a favorable environment or "niche" in bone tissue. Furthermore, another observation of the traditional Japanese diet, during in utero development, might also cause bone adult stem cells to differentiate, thereby lowering the number of stem cells in the bone after birth, causing a small stature of the young Japanese at that era. In addition, the high frequency of osteoporosis in Japanese women of that era could be the consequence.

Today, the Japanese diet is being influenced by the Western diet, and therefore, breast cancer frequencies and the stature of the Japanese are increasing. If this hypothesis is true, then the Barker Hypothesis could be explained by many factors (Nutrition/diets; drugs, stress, environmental pollutants, etc.), by increasing adult, organ-specific stem cells, and altering their differentiation/apoptosis, can alter development and disease susceptibility/resistance later in life.

Another example of the role of nutrition/diet on early development, supporting the Barker hypothesis, is from the linkage of folate deficiency on severe birth defects in

human beings. [Mills and, Signore, 2004] Dietary supplements of folates clearly have been linked to a reduction of these birth defects.

Not only nutritional or dietary factors during pregnancy can be shown to be correlated with developmental alterations leading to birth defects or diseases later in life, but exposures to drugs and other environmental factors, support the Barker hypothesis. When the drug, thalidomide, was prescribed in the late 1950’s to treat anxiety, insomnia and morning sickness in pregnant women, it was shown that the in utero exposure, during a “critical window” of development, was associated with devastating birth defects in about 10,000 children. (Franks, M.E., et al., 2004)

As dramatic an example, another drug, DES (diethylstilbesterol), when given to pregnant women, lead to another classic demonstration that is consistent the Barker Hypothesis. (Cousins, 1980) In this case, when these pregnant women exposed their female fetuses to DES during a critical period of their development, the daughters were predisposed to a high risk of vaginal cancers when they reached puberty.

Although there are many newer epidemiological and animal experiments supporting the Barker hypothesis, recent demonstration, using experimental pregnant rats, suggested a global –distributed chemical, bis-phenol A, can give rise to males which are predisposed to prostate cancers later in life, even though these new borns were not exposed to bis-phenol A after birth. (Ho, et al, 2006) Most importantly, if the pregnant rats were exposed to both soy products and bis-phenol A, then these newborn rats had their risk to prostate cancers later in life reduced, even though, again, they were not exposed to soy products after they were born. This clearly indicates that the in utero exposures to both the environmental pollutant and dietary factors affected something during critical periods of embryonic/fetal development. In this case, these demonstrate that in utero exposures could influence cancer frequencies later in life. These experiments could support the explanation of the role of dietary factors in the Japanese survivors of the atomic bombs.

Finally, several implications can be drawn of these, and other Barker Hypothesis-related, studies. The first is that the mechanistic nature by which these dietary, drug, physiological or environmental pollutant chemicals work is via “epigenetic” action. Chemicals, such as thalidomide, DES, bis-phenol A, genistein, [others such as, TCDD, DDT, retinoids, alcohol, phenobarbital, etc.], are not “genotoxics”, able to damage genomic DNA to cause mutations. Epigenetic toxicants can, by altering gene expression in stem cells during in utero development, cause these organ-specific stem cells to increase or decrease their numbers by pre-mature differentiation or apoptosis, thereby, altering the growth/function of specific organs later in life. So the question is, “Could prenatal nutrition and dietary factors, including caloric restriction/caloric abuse, nutrient depletion/overexposure, dietary behavior(eating patterns/daytime/nighttime), whole foods/bioactive food component supplements, specific microbiome microenvironments of the pregnant mother, etc), be a major target for global ONE HEALTH’S strategy for intervention ?

5. Narrowed focus on meeting the goal of preventing prenatal-induced diseases later in life (Barker hypothesis): education and clinical intervention for prenatal and perinatal nutrition to lower risk of chronic inflammation

While trying to intervene, globally, to ensure a One Health strategy in the face of this inevitable collision of biological and cultural evolution, knowing the complexity of the problem, involves interactions that affect all levels of our biology and the ecosystem. All elements of our culture, social systems, pluralistic philosophies, religious, political systems and their associated economic systems, have become more global in nature. Clearly, to tackle the solution by a “systems” strategy would be like trying to synchronize the tentacles of an octopus or “herding cats”.

Fundamentally, finding a health plan for a global “ONE HEALTH” strategy, with limited physical and financial resources, as well as incomplete scientific knowledge of each of the interacting ecological, animal and human spheres and of competing cultural values, might be an impossible goal. It would entail understanding that all life (bacteria, plants, animals and human beings) depends on various forms of foods and nutrients, generated by inevitable changes in optimum global temperature, sufficient clean air, soil and water.

Indeed, we would need simultaneous policies to reduce pollution of the air, water and soils. We would need public policies to reduce risks to bad personal and public behavior. Economic policies would have to be institutionalized to prevent inequalities of opportunities, social policies to provide equal justice and less stress, etc. Yet each of these human social, economic, political policies interacts with each level of the ecological sphere, the animal and human health spheres. In reality, we are so far from integrating them into an adaptable One Health strategy. While not suggesting that specific intervention should not be attempted in each individual specific sphere (eradication of global viral infection, such as polio eradication; reduction of carbon dioxide emissions; reduction of land use for red meat production; better medical treatments for all chronic diseases, etc.), there could be choices that directly affect the most vulnerable of humans, namely, the up-coming 3 billion newborns. Therefore, trying to be realistic, in suggesting a rather “small” component of this complex, moving global crises, and in trying to reduce unnecessary and preventable suffering in those three million new babies, one might consider that a global objective might be to try to provide the best nutrition for all those young women who might become pregnant during this century, in order to implement knowledge gained by understanding the Barker hypothesis.

Consequently, while the overall objective to feed the current and future population with adequate and nutritious foods is so complex, in that it involves political/economic issues, new technologies, education, eco-toxicology and human toxicological understanding, engineering issues of energy production, water/air/soil qual-
ity assessment, long- and short range transportation of foods; food processing issues, and cultural/sociological sensitivities to foods, a more sharply focused objective will be needed to carve out a manageable project that could serve as an experimental model to tackle this interconnected and complex problem on a global scale. (McMichael, 2001; Rosset, 2011; Helbing, 2013; Enborg, 2009) To make the issue even more complex, because of the natural selection of genes needed to cope with local ecological food sources of each ethnic group (arid Mideast, tropical South America, frigid arctic region, temperate Europe, isolated sea-dependent islands), no universal nutritious diet can be made. Complicating this task of providing the best diet for each genetically different individual, gender, stage of development is the Diaspora of people from those genes needed for healthy development and the Diaspora of foods from all over the world. (MacPherson and Gushulak, 2001).

Whatever this One Health-One Planet Initiative Workshop decides to do to tackle this complex problem, it must be an integrated approach that can demonstrate, in a relatively short time, that it can generate solid scientific information on a quantitative basis (a “deliverable”) and that the approach can be scaled up to meet the global challenge. It is here that the ultimate goal is not only for human survival, it must be for “acceptable” human survival to provide only nutritious foods, safe foods, means for economic growth, reduction of political and ecological instabilities, but also to prevent those human diseases that are affected by foods. We know today that inadequate nutrition and over-abundant calories (as well as inadequate exercise) contribute to most of human acute and chronic diseases. One of the growing major global health problem today is excess calories and bad nutritious foods that can lead to the obesity-related “metabolic diseases” [diabetes, cardiovascular and cancer] (Swinburg, et al, 2011)). This is so well illustrated with the data on the incidences of human colon cancer in various countries with different and changing dietary habits of eating red meat over the last 30 years.

One of the proposed mechanisms involved is chronic inflammation. Both infectious agents (viruses, parasites, microbes) and physical and chemical agents, in and on foods, as well as over-abundance of calories, can interact to induce chronic inflammation. (Trosko and Tai, 2006) Nutritious foods have the potential to prevent chronic inflammation, the common link between infectious & non-communicable chronic diseases. Moreover, the real moral issue is that newborn children, who have neither control of their genes nor the in utero environment that their mothers provide them during development, can have their risks to preventable chronic diseases later in their life modified by better diets for their mothers. The scientific challenge is that there is no universal nutritional/dietary remedy for all genotypes, genders or stages of development. The psychological, social, cultural, economic and hence political challenges are to find the means to educate and to provide the individual and population nutritional/dietary needs without irreversibly disrupting the global ecosystem needed for the acceptable survival for all.

6. Conclusion

The identification of the problem to be solved by initiating a “Sustainable One Health” paradigm, fundamentally, involves insuring sufficient clean air, water and sufficient nutritious foods in an ever-changing physical, biological and cultural world. In this brief “Commentary”, one might come to a depressing conclusion that the number of interacting controllable and uncontrollable elements will be impossible to implement a systems and interdisciplinary intervention strategy at all levels (ecological, animal and human) within a framework of a global plural-
istic value systems and of the current economic and political/religious forces. It is exacerbated by what the R. Hutchins, President of the University of Chicago stated was the problem, namely the divorce of knowledge [or ‘wisdom’] from understanding:

The most characteristic feature of the modern world is bewilderment. Anyone who says he knows anything is at once suspected of affection or falsehood... We do not know where we are going, or why; we have almost given up the attempt to find out...Certainly we have more facts about the world, about ourselves, and the relations among ourselves than were available to any our ancestors... If, as we have been convinced since the Renaissance, the advance of the race is direct proportion to the volume of information it possesses, we should by now have reached every imaginable human goal. We have more information, more means of getting more information, and more means of distributing information than any time in history, nevertheless, we are bewildered. (Hutchins, 1936).

However, while President Hutchins was absolutely correct, (and parenthetically, his words are as relevant today as they were in 1936), our moral bioethical imperative is not to give up and do nothing, but to find some integrative ways to give meaning to the exploding amount of facts and technologies and to start using our current knowledge to prevent preventable human diseases, by preventing preventable irreversible destruction of the ecology and animal health, as well as using our knowledge better to treat the diseases to both humans and animals and the damage to the ecology.

References


Citation