Science-based Policy: Targeted Nutrition for All Ages and the Role of Bioactives

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ABSTRACT: Globally, there has been a marked increase in longevity, but it is also apparent that significant inequalities remain, especially the inequality related to insufficient 'health' to enjoy or at least survive those later years. The major causes include lack of access to proper nutrition and healthcare services, and often the basic information to make the personal decisions related to diet and healthcare options and opportunities.

Proper nutrition can be the best predictor of a long healthy life expectancy and, conversely, when inadequate and/or improper a prognosticator of a sharply curtailed expectancy. There is a dichotomy in both developed and developing countries as their populations are experiencing the phenomenon of being 'over fed and under nourished', i.e., caloric/energy excess and lack of essential nutrients, leading to health deficiencies, skyrocketing global obesity rates, excess chronic diseases, and premature mortality. There is need for new and/or innovative approaches to promoting health as individuals' age, and for public health programs to be a proactive blessing and not an archaic status quo 'eat your vegetables' mandate.

A framework for progress has been proposed and published by the World Health Organization in their Global Strategy and Action Plan on Ageing and Health. Couple this WHO mandate with current academic research into the processes of ageing, and the ingredients or regimens that have shown benefit and/or promise of such benefits. Now is the time for public health policy to

'not let the perfect be the enemy of the good,' but to progressively make health-promoting nutrition recommendations.

KEYWORDS: Ageing, Diet, Healthy-life-expectancy, Life-expectancy, Nutrients, Nutrition,

INTRODUCTION

As political, social, cultural, technological, and moral factors change and evolve, concepts and terms can be redefined to reflect the current understanding. "Health" is a term that policy-makers have had difficulty agreeing on its definition in the last century. In 1948, the World Health Organization formulated what seemed to be a ground-breaking definition of health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." In 2011, Huber et al. challenged this definition and proposed a new concept of health as "the ability to adapt and to self-manage, in the face of social, physical and emotional challenges. This newer definition is not without criticism and has also been challenged.

Regardless of how "health" is defined by policy-makers, today's consumers want to be empowered to manage their own health, and the increased focus on self-care is often exacerbated by current public health challenges, including non-communicable diseases and/or pandemic. Adoption of a healthy lifestyle, including dietary pattern and when appropriate, oral supplementation, is often included as part of the self-care and self-management tools and interventions to optimize health and nutritional status in individuals at different life stages and facing health challenges and goals.

As good nutrition is recognized as a key component of healthy development, well-being, and disease prevention, nutrition research from all sectors is in the quest of understanding what we need to eat to be healthy across the life course. With the advancement of scientific research and as new discoveries are made on the roles of essential nutrients and non-essential nutrients, including bioactives, a newer framework may need to be created and applied so that scientific research can be properly translated to help inform policy-makers to address public health concerns.

This paper is proceedings from the Council for Responsible Nutrition-International (CRN-I)'s 11th Scientific Symposium. The purpose of orchestrating and moderating these annual

symposia is to bring current scientific thoughts espoused by academic, industry and policy experts primarily to an audience made up of delegates to the annual Codex Alimentarius (Codex) Committee on Nutrition and Foods for Special Dietary Uses (CCNFSDU). In 2020, the CRN-I symposia occurred as a series of virtual webinars. Previous symposia have focused on optimal nutrition, healthy ageing, and health promotion. For this paper, academic researchers have presented on the need for adequate protein and amino acid consumption, and the debilitating problem of sarcopenia should adequate intake be compromised. Further, co-authors also consider the intake of other dietary constituents, i.e., omega-3 fatty acids and the pro-hormone, vitamin D and their demonstrated benefits in cognitive development and immunity support, respectively. Oxidative stress and inflammation are blamed for many of the age-related degenerative diseases and the putative role for antioxidant and polyphenolic nutrients to lessen their sequelae was posed. Finally, an end goal would be to propose that regulators consider possible public health objectives to prevent and alleviate the bane of chronic health crises, especially at the end of one's lifespan.

CONCLUSION

It is no surprise that the global population has and is increasing, now nearing 8 billion humans. Though the curve continues its upward path, there are projections that show by mid 21st Century, the global population will reach a peak and the transition will be to an older world, with the substantive increased proportion of older people, especially the 80+ subgroup, which is the fastest growing from 14 million in 1950 to 384 million now, and counting. For the most part, we are all living longer than our forebears…with many population subsets living 30-35 years longer than at the turn of the 20th Century. Unfortunately, as life expectancies have increased, a term referred to as the 'Longevity Revolution', there has not been a parallel increase in the 'healthy life expectancy' (defined as *the period of life spent in good health, free from the chronic diseases and disabilities of ageing*). As discussed in our opening section, 'population ageing', i.e., the phenomenon that many are living into their 9th and 10th decade of life, is now being observed in the developing world with serious and often heart-breaking consequences as personal and national economics, social services, public health measures, and familial and community support, are all deteriorating or non-existent. These inequalities are a

global concern, and the World Health Organization is capitalizing on the sustainable development goals to address these issues, including a shout to end hunger, and provide healthier nutritional options and opportunities.

One significant macronutrient category that is critical, though often overlooked as the person or population ages, is stressing the need for adequate protein and amino acid intake. Without sufficient protein intake, lean body mass decreases, as evidenced by decrements in muscle and bone mass. The term, 'sarcopenia', refers to this age-related phenomenon, and often is accompanied by a parallel increase in body fat mass, such that to the casual observer, weight and body morphology appear to be in stasis. Frailty is the logical consequence of the loss in musculature and the increase in bone fracture. Data demonstrating that there is an annual 3.6% reduction in muscle mass accompanied by a consequential lowing of habitual gait speed and decreased grip strength in men aged 83.4 ± 3.9 years. Addressing this issue, with appropriate nutritional strategies is important to allow a healthy life expectancy that can be a source of *joie* de *vivre* during whatever life expectancy we are able to achieve.

The bioactive constituent, omega-3 fatty acid can be obtained from the diet, but only if the consumer understands the sources and concentrations needed to achieve as robust a benefit as possible. Omega-3 fatty acids, primarily docosahexaenoic acid (DHA) is added to fortified foods, especially infant formulas, as studies demonstrated that without maternal milk DHA, the non-breast-fed infants had very little DHA in their frontal cortex, with plausible decrements to visual acuity and cognitive function. Subsequent randomized control trials have demonstrated benefits to DHA fortification and supplementation on not only cognitive function, but also term birth weights, body lean and fat mass ratios, blood pressure and body weight.

The pro-hormone vitamin D has a plethora of physiological activities, however, its role in immunity is of utmost interest, not only every day, but maybe more so during a global pandemic. WHO notes that there is a high prevalence of low vitamin D status globally, and in the US, the Dietary Guidelines for Americans (DGA) for 2015- 2020 indicates that people in the U.S. do not consume enough dietary fiber, vitamin D, calcium, and potassium. These under consumed nutrients, are considered nutrients of public health concern because low intakes are

associated with poor health outcome(s). One of the U.S. Government's most important responsibilities is to protect the health of the American public; and today, about half of all American adults—117 million people—have one or more preventable, chronic diseases, many of which are related to poor quality eating patterns and physical inactivity. Rates of these chronic, diet-related diseases continue to rise, and they come not only with increased health risks, but also at high cost. Vitamin D supplementation has been shown to decrease upper and acute respiratory tract infections, as well support immune function as suggested by incipient data within the context of the current SARS-CoV-2 virus infection.

As presented in this paper, inflammation and its sequelae are thought to play a decisive role in the onset and development of many degenerative diseases, such as atherosclerosis, cardiovascular disease, cancer, and neurodegeneration. Chronic low-grade inflammation, also termed 'inflammaging' is insidious and leads to cellular changes that become manifest in many of these diseases, often in old age, hence their effect on the quality and quantity of one's healthy life expectancy. There is possibly a bidirectional interchange between oxidative stress and inflammation, such that proven antioxidant and (poly)phenolic nutrients may play a role in lessening inflammation and inflammaging.

The end goal for this paper and the examples presented, is to establish or at least propose for regulatory consideration, public health goals to alleviate or at least ameliorate the scourges of debilitating health as one approaches the limit of our specie's lifespan. The recommended beneficial regimens, including increased protein and amino acids, omega-3 fatty acids, Vitamin D at doses above the RDA, and (poly)phenols/antioxidants, needs more research. Astute consumers could evaluate the personal advantages to adopting one or more of these academic recommendations, and the data would suggest a longer life in good health for that individual, though one would never know how many years of benefit were objectively added. On a population basis, true improvement could be quantitated if sufficient individuals were to truly adopt one or more of these proposals, but without governmental public health recommendations or ingraining these counsels into dietary guidelines, school lunch programs, social service feeding plans, etc., that population 'clinical trial' will not commence.

Society's response to population aging will require a vision to harness the years spent in 'good health' (e.g., the healthy life expectancy) to those hoped for extra years of life. In essence not only more years to life but also more life to years. A fundamental transformation in public policies and institutions is required to ensure a future that celebrates diversity yet narrows health inequities, within and across countries. "*Life should not be a journey to the grave with the intention of arriving safely in a pretty and well preserved body, but rather to skid in broadside in a cloud of smoke, thoroughly used up, totally worn out, and loudly proclaiming 'Wow! What a Ride*!'"