The present issue of the Asia Pacific Journal of Clinical Nutrition publishes the "Executive Summary" from the International Meat Nutrition Workshop¹, hosted in March 2003, in Auckland, New Zealand by the New Zealand Beef and Lamb Marketing Bureau. The summary is touted as "a scientifically-based and endorsed document for the meat industry to present with a united voice to the wider scientific community and to use, ultimately, in consumer marketing." It is a laudable and noble effort to base public policy on the latest consensus evidence derived from scientific inquiry, and in a spirit to provide information to the consuming public. However, the written summary derived from this deliberation in Auckland can only partly contribute to these goals. It combines three features: new news (truly newsworthy items); old news (facts known for decades); and non-news (misinformation and misguidance). Each of these facets merits commentary in both a wider and evolutionary context, and a specific bill of particulars (below).

Diet and human evolution

Among the most sage advice provided by the Executive Summary¹ is that attributed to Dr. Slattery that: "Lifestyle patterns give clues as to how factors work together and reflect how these factors occur in our lives, which is rarely in isolation. These associations are often complex and appear to be influenced by many inter-relating factors." Hence, a series of somewhat disjointed and isolated bullet-points in the Executive Summary, may not be the best way to communicate on an issue with the complexity and inter-relations as pertain to dietary patterns. In fact, one cannot understand the significance of consuming meat in the contemporary world without tracing the relationship of humans with their dietary heritage throughout the entire extent of our physical (genetic) and behavioural (cultural) evolution.

All species of organisms are the result of long cons of evolution both of the species itself and its earlier ancestors. The two most important imperatives for survival are those of nutrition (for the survival of the individual) and of reproduction (for the survival of the species), both in a hostile environment in which the "law of the jungle" is operative and "survival of the fittest" individuals promotes the genetic adaptation of the organism to its setting. For 90% of hominid evolution, during which our ancestors were exclusively hunter-gatherer, we adapted to the imperative of nourishing ourselves with the widest selection of edible items in our environment. This came from both the Animal Kingdom: swimming or settled in aquatic and marine waters; flying in the air; running, crawling or slithering on the ground, or borrowing into and under the ground; and from the Plant Kingdom in the forms of algae, fungi, petals, leaves, stalks, fruits, seeds, nuts, tubers, roots or sap.²³

So, through evolution, humans became both carnivores and herbivores, while dominating fire enabled the genus Homo to masticate flesh and sinews that would otherwise too tough and to digest starch that would be otherwise indigestible. It was on this diet of wild game, fowl, fish and mollusk, eggs, and forest and savannah plants, and even insects, rodents and reptiles, that is all edible flora and fauna, that the human species evolved.

The physical effort of hunting and gathering obligated a high average expenditure of energy, compensated by the energy and nutrients in the catch and the forage. Based on the species' survival imperative, whatever combination of foodstuffs that brought individuals to the reproductive age in a healthy state and supported the reproduction process was acceptable. Beyond the issues of diet and energy metabolism, tribal conflict, accidents, predation, disease and childbirth complications limited life-expectancy to slightly over three decades.¹

The process of "domestication" of nature began some 40,000 years ago (1600 generations) when the pastoralist life-style emerge.¹ Wild ungulates were domesticated to form permanent herds associated with their herders in the predecessors of the dairy animals: buffalo, cow, camel, llama, yak, reindeer, goats and sheep. The energy and protein from fresh and fermented milk and cheeses was the stable component of the pastoralist diet, but this was supplemented by the produce of foraging and hunting along the nomadic migrations. A mere 10,000 years or 400 generations ago, the domestication of the plant world commenced, with the formation of cereal and tuber crops such as wheat, rice and maize, and potatoes, yams and cassava. This was the dawn of the agriculturalist.⁶ Within this final revolution came all of the other horticultural, and orchard and fruto-cultural plant foods. Predation and conflict were lesser risks with pastoral and agrarian life-styles but accidents, maternal mortality and infectious diseases continued to severely limit longevity.

Truth and consequences

Now turning again to the particulars of the Executive Summary¹, in the "new" news department is the consideration that maintaining higher vitamin D status may be a factor in the prevention of cancer of the large bowel.⁷ Indeed, getting sufficient vitamin D from any diet is a formidable challenge. If it is confirmed that red meat is as rich in this vitamin, as implied in the Summary, the modest amount of meat in a prudent diet would be a contributory source. However, diverse and balanced sources of vitamin D would be required as neither excessive intake of dairy items¹ nor excess solar exposure are totally risk-free ways of enhancing nutriture of this vitamin.

Whatever be the fattiness or leanness of lamb or beef, its fat will be predominantly of the saturated variety. As
suggested in the summary, preference for leaner cuts of meat may reduce exposure to saturated fat, a strong risk factor for atherosclerosis. But those of us with the luxury of selecting such choice cuts constitute a privileged elite rather than representing the majority of potential meat consumers around the world. Not all regions and cultures have access to the trimmed and lean cuts, so fatty and marbled muscles are still the generalized norm in most settings. Additionally, although nutritionists may be clear in their distinction between red meat and meat products, many consumers (especially the young) still interpret "red meat" as products containing red meat such as sausages and burgers and other items often remarkably high in fat and easily recognized and promoted globally through international fast food restaurant chains.

In the old news department, we have a reaffirmation of the well-known truth that the bioavailability of iron from hemoglobin in organ meats and from myoglobin in flesh is more available than that in plants. Also, the uptake of iron from vegetal sources is enhanced in the presence of meat. A partially analogous situation exists for the dietary zinc supply insofar as animal tissues have a more easily absorbed zinc. The evidence for a "meat factor" for mobilizing is not so firm, and there is some evidence to the contrary.

It is clearly demonstrated that vegan and vegetarian populations in India have marginal vitamin B12 status; however, it is more the viscera organs of animals than the muscle flesh that are the concentrated sources of this complex vitamin. Occasional minimal quantities of cooked liver or paté would be more efficient in supporting vitamin B12 nutriture than large amounts of steaks, chops and roasts. It is also of course also recognized that a wide range of animal foods supply B12 and it has never been demonstrated that the non-vegan, non meat eaters who consume a varied diet are at risk of B12 deficiency.

In our introduction, we raised the specter of non-news or misinformation. Specifically the commentaries on high-protein diets for weight reduction and on red meat and cancer risk in the Executive Summary merit some clarification or rebuttal. The safety of low-carbohydrate, high-protein diets (LCHP) containing red meat has been largely questioned from the perspective of renal medicine. As commented by Reddy et al., as based on a short-term human trial: "Consumption of an LCHP diet for 6 weeks delivers a marked acid load to the kidney, increases the risk for stone formation, decreases estimated calcium balance, and may increase the risk for bone loss." Based on a cost-comparison analysis in the UK, there are also economic hardships for the weight-reducing subject within the high red meat approach; it proved to be by far the most expensive to maintain among four alternative weight-reduction regimens compared. Thus, the approach to weight-control, attributed to the late Dr. Robert Atkin, cited in the Executive Summary, has serious and enduring questions regarding its safety and innocuousness, despite the accolades laid on its effectiveness in taking off excess kilograms.

Furthermore, one can be dismissive of the relationship of red meat intake, e.g. "Reports relating to red meat are often inconsistent, whether in terms of amount, type of preparation of the meat, partially due to differing definition," but one takes this attitude at one's own peril. Despite some contradictory evidence, the vast predominance of published literature indeed confirms an apparently causal association between higher individual intakes of red meat and risk of colorectal neoplasms. Interpretation of evidence coming from randomised clinical trials should truly be taken to heart, but it is not the only repository of "proof" of causation. The degree of robustness of data underlying public policy should, therefore, not itself be misconstrued nor misinterpreted. The Expert Panel of the World Cancer Research Fund and the Consultancy of the World Health Organization on diet, nutrition and prevention of chronic diseases have argued for and adopted common-sense criteria for interpretation of epidemiological data (other than those from clinical trials) and their strengths, with the notion of seeking convergence and consensus of associative findings as the basis for worldwide prevention of non-transmissible diseases.

That we can attribute the association of colon cancer and red meat consumption as one of direct causality, moreover, derives from the plausibility of emerging mechanisms supporting a carcinogenic effect. Research from the Dunn Laboratory at Cambridge provides several solid mechanistic insights. In a simple -- but elegant -- dose-response study, 21 healthy volunteers were fed increasing ratios of red meat over blocks of time in a staggered dosage from zero to 420 grams per day. Quantitative measurement of the fecal output of total N-nitroso compounds, carcinogenic substances produced endogenously by large bowel bacteria from dietary amines and amides, were made. There was a stepwise progression of fecal carcinogen proportional to the red meat consumed. Importantly, on the two highest intake levels, namely 240 and 420g, meat from poultry (white meat) produced no increase the production of the endogenous carcinogens above basal levels. In further studies from the same series, the Cambridge researchers found that an 8-nmol supplement of haem iron also increased fecal NOC (P = 0.006) compared with the low meat diet, but 35mg of ferrous iron had no effect. Endogenous N-nitrosation, arising from ingestion of haem -- but not of inorganic iron or protein -- may account for the increased risk for colorectal cancer associated with red meat consumption.

When it comes to advising the public to change (reform) its eating habits, we can really get into a tug-of-war among advocates. An increased intake of one food-group and that of another can (literally) not simultaneously fill the same space -- neither physically (in the gastric cavity) nor energetically (within the individual's energy requirement to balance energy expenditures). One choice has to be taken only at the expense of the alternative. Hence, the statement attributed to Dr. Ashwell: "Eat more red meat is the strongest dietary message that can be given to all age groups." is actually in competition with calls from other sources of dietary guidance. In the UK, the Department of Health clearly recommend the opposite advising that "individuals consumption of red and processed meat should not rise" Internationally, the World Cancer Research Fund (WCRF) in its 1997 Expert Panel report for cancer prevention recommended explicitly that "if eaten at all, limit the intake
of red meat to less than 80 grams (3 ounces) daily, while its American counterpart, the American Institute for Cancer Research, considers that eating five servings of fruit and vegetables can effect a 20% reduction in all cancers. So, since one cannot (energetically) have it both ways, a serious weighing of the evidence -- not only for increasing risks, but also about behaviors that actively decrease risk of cancer and other chronic diseases -- must be mobilized in formulating advice to the public. The evidence in favor of protective effects from maximizing fruits and vegetables speaks loudly. From cancers to hypertension and stroke to cardiovascular diseases, those who consume higher amounts of fruits and vegetables acquire a protection from risk of the respective conditions.

Environmental issues and the way we eat

The final considerations in the balance of animal-derived versus plant-derived foods surround some of the environmental issues in their respective modes of production. In terms of land use, it is only one-sixth as efficient for human protein requirements to be satisfied by the tissues of animals fed grains, than by consuming those cereal proteins primarily. Disposing of animal waste, including the methane gas produced by ruminants, is an another increasing environmental concern.

Animal-to-animal communicable diseases, such as scrapie, the prion-based malady of in ovine species, or hoof-and-mouth disease, to which all ungulates are susceptible, are cases in point. Both are disruptive of livestock husbandry and of international commerce in live animals and animal meat and by-products. Transmission to humans of these two conditions is rare, but suspected to have occurred.

Zoonotic diseases, those directly and readily transmissible from animal to humans, are increasingly concerning worldwide public health authorities. Whether it be apes and HIV, civet cats and SARS, or poultry and bird influenza, human contact with animals or consumption of their meat is at the root of epidemic diseases. Most notable within the red meat concern is bovine spongiform encephalopathy (BSE or "mad cow" disease), as reflected in the genesis of variant Creutzfeldt-Jakob disease in humans; a North American penetration of BSE in late 2003 refocused the world's attention on the particulars of mad cow disease and on the larger consequences of zoonosis for the human food supply. Obviously, not all of the dangers from animal husbandry have yet been contained; so, while beef and lamb may feed the multitude, the environmental issues raised by their production are not being fully addressed.

Parting wisdom

Those behaviors most essential for human existence -- reproduction and alimentation -- are imbued with strong instinctual drives and associated with extraordinary gratifications and pleasures. As such, there has been a reluctance to flout the negatives regarding the themes of sex and eating. Neither, however, is without its downsides and dangers. Inhibition regarding raising the due cautions about the former (sex) was shattered by the emergence of human immunodeficiency virus and other sexually-transmitted diseases in the 1980s. Culinary issues (eating) have remained somewhat more of a sacred cow. The image of specific foods and food-groups as only nourishing and nurturing, however, must be brought into appropriate balance as a service to the public good.

In the 21st Century, we can no longer afford either to eat or to exercise as our cave man ancestors did. To the extent that the Executive Summary may be more promotional than prudential, we have here raised some additional scientific points that created a larger envelope. We must let science and scientific evidence guide our dietary habits. What is currently on hand in the literature does not suggest, by any fairly balance reading, that the ideal change in behavior would be to increase red meat consumption. To the extent that the appropriate dietary balance for optimal health and chronic-disease resistance -- based more on plants than on animals -- may fall short on sources of certain nutrients, the guidance must place new and creative focus on developing concentrated and reliable sources for nutrients such as vitamins B-12 and D, and the minerals iron, zinc, and calcium; all of these micronutrients become problematic as the sources of animal protein are limited in the human diet. Hopefully, bringing all of the pros and cons of food choices into scientific relief will favorably shape a portfolio of considerations that consumers will take with them as they move between the green grocer and the butcher shop in their habitual food shopping activities.

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