

Original Article

Communicating food science and technology: From a developing country to a developed country point of view

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The history of food is a history of thousands of years of human choice set in the context of an almost Darwinian process of natural selection. Around the world, food is eaten to fill stomachs and to keep bodies strong and healthy. In Asia there is, frequently, a shift in emphasis. The Asian people, like everyone else, eat to survive, but they also eat to keep their bodies finely tuned, physically and spiritually. No food is a nutritious food if it is not safe. Food safety is of paramount importance for food trade, both domestically and internationally. Developed Asian nations such as Japan, Singapore, and South Korea have been paying more attention to healthy eating. Fearful of health problems, they are returning to traditional foods. On average, life expectancy has more than doubled from 34 years at the turn of the 19th century to 76 years in developed countries today. With the advance of medical science and technology, the figure is set to rise. There is growing scientific evidence that these major diseases are closely associated with lifestyle, dietary habits in particular. There are many well-accepted observations that show that protective immune responses are impaired in old age, that immune deficiency causes an increased risk of more frequent and more severe infections, and that nutritional deficiencies occur frequently and are a detrimen determinant of the immunocompetence of aging. The relationships of nutrition, aging and immune competence are attracting more and more attention. The world trend in foods will be focused into four food groups, which are characterized for their positive effect on human life in the future: (i) foods that will improve cardiovascular disease; (ii) foods that enhance the immune system; (iii) foods that increase women's health, fitness and beauty; and (iv) foods that could improve the nutritional status of children. To communicate better, there is an urgent need for easily available local-based textbooks that successfully discuss applications of food science and nutrition to people of the particular developing countries, and at the same time discuss in simple national language all the basic principles of foods and nutrition. If developing countries are to give their children the heritage of health as well as freedom, the people must change their attitude toward food. They must learn from each other and from the world about the kind of foodstuffs that make a person healthy.

Key words: aging, body, communication, food, soul, trend.

History of food

The history of food is a history of thousands of years of human choice set in the context of an almost Darwinian process of natural selection.

The diet that, over the millennia, ultimately predominated in different parts of the world was the diet best fitted not only to cultivation potential (although that was always a major factor) but also to the specific requirements of the inhabitants, requirements originally shaped more by work and living conditions than any considerations of pleasure or satisfaction.

People who lived in cold damp climates found that rich, fatty foods were comforting and warming, helping to build up a layer of flesh that acted as insulation against the weather. In milder climates what the field laborer wanted was not so much warming food as energy-giving food to fuel the digging, ploughing and hoeing that made up the pattern of their day. In tropical countries perspiration evaporating from the skin helped to cool the body; strong spices encouraged that perspiration and at the same time stimulated a thirst for the liquid necessary to replace it.

Observations such as these (the product of experience, not scientific analysis) laid the foundations of many food traditions, but over the last 200 or 300 years the basic logic of food habits has become increasingly complicated by shortage, surpluses and the introduction or development of new foods and attitudes. Even the common human desire to catch up with the Joneses has helped to alter traditional diets sometimes for the better, sometimes for the worse. Modern food production must satisfy the public's growing demand for quality, linked to health, well-being and enjoyment.

Nowadays people who live in cold damp climates have little need for rich, fatty foods; central heating is an excellent substitute. The field laborer who once burned up calories reaping and binding grain now drives a combine harvester. Air conditioning is a pleasanter means of cooling the body than perspiration.

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But old habits die hard, and the result is that the contemporary diet has in some ways become divorced from contemporary needs. The sedentary worker of the late 20th century is eating half as much again in the way of energy-giving foods as his more active predecessor did at the end of the 19th century.

The sad fact is that the stomachs of rich and poor alike very often have more fuel, and more of the wrong fuel, pumped into them than they need or can contend with.

Traditional food and medicine

In traditional Chinese medicine (TCM), functional foods have the following functions: improve health status; prevent disease and help in treating disease; and facilitate rehabilitation. Functional foods and corresponding recipes were documented in many classical TCM books. In TCM, each food has its unique 'taste' (sour, bitter, sweet, spicy, and salty) and 'property' (cold, hot, warm, cool, and plain), which are related to their functions. In addition, 'channel tropism' or *Gui-Jin*, is also an important theory of functional food in TCM. Foods, when used properly, could regulate the body's 'Yin', 'Yang', 'Qi' (vital energy), and 'blood'. In TCM, food and medicine are considered to be from the same source, based on the same theories, and have the same uses.

Many traditional Chinese functional foods were developed by combining foods with other foods, as well as foods with medicines. The TCM theory and practise provide important information for the research and development of functional foods with modern science and technology, which, in turn, will further develop and enrich traditional Chinese medical sciences.

The challenge for the coming years will be to obtain general scientific agreement on approaches to substantiation of functional foods. In addition, the aim will be to identify and refine molecular test systems as well as clinical trial programs that will enable not only identification of new and important functional foods but also provide for their adequate substantiation. The following are some examples.

Turmeric, which is known as 'salt of the orient', is a common culinary spice in Indian diets. The medical use of turmeric dates back to ancient times. It is known to have antiseptic and vermifugal properties, and its active component, curcumin, has received much attention as a medicament (anti-inflammatory agent) in recent times.

Turmeric and its active constituent curcumin are potent anti-oxidants *in vitro*. Animal experiments demonstrated that turmeric incorporated into the diet acts as a potent anti-mutagen against several carcinogens. It blocks the initial stages of carcinogenesis. In addition, it acts as an antipromotor, reduces the DNA damage, and stimulates enzymes such as glutathione-S-transferase participating in carcinogen detoxification. Both turmeric and curcumin were found to inhibit oral tumors induced by DMBA. Further, they exhibited potent anti-oxidant properties and protected the liver from oxidant damage. Turmeric *in vitro* also inhibited formation of N-nitroso compounds, which are known upper digestive tract carcinogens.

Food for body and soul

Around the world, food is eaten to fill stomachs and to keep bodies strong and healthy. In Asia there is, frequently, a shift in emphasis. The Asian people, like everyone else, eat to survive, but they also eat to keep their bodies finely tuned, physically and spiritually.

The physical fine-tuning is achieved by a series of weekly fasts to 'cleanse the system', and by careful selection of the seasoning used in daily meals. In Indonesia, people are used to practising Monday–Thursday fasting for body and spiritual tuning. According to the ancient Indian system of Ayurvedic medicine, all spices and herbs have been assigned medical properties. Turmeric, for example, is an antiseptic, both internal and external.

Undernutrition versus malnutrition

It has been said that many people in the West are overfed yet undernourished. The concept behind this statement is that although our total energy intake is excessive, the quality of food is often so poor that the actual nutrient intake in terms of vitamins, minerals and certain amino acids is inadequate and can produce disease.

This is in contrast to certain developing countries, such as Ethiopia or Bangladesh, where there simply is not sufficient food of any kind to sustain healthy life. This is true of undernutrition, which is seldom found in the West except in people with anorexia nervosa or certain severe illnesses. What we suffer from is malnutrition, and throughout the book we shall be looking at how and why such malnutrition comes about, and the effects that it can have on our health.

Food technology

With the advent of food processing at the end of the last century it became possible for man to interfere with natural foods in such a way as apparently to improve his nutrition. However, it has been clear for some years now that many of the effects of food processing can be detrimental to the nutritional quality of food and, more recently, that this has had long-term consequences for health. For example, the refining of flour not only removes dietary fiber, but also removes essential vitamins and minerals.

The idea behind food processing is to reduce its rate of deterioration (thus giving it a longer shelf life); to make it easier to distribute; to produce 'new' foods that would otherwise not exist at all; and, through the use of colourings and other additives, to make foods more 'appealing'. Many of the substances added to foods by food manufacturers can be harmful to certain susceptible individuals. It is hoped that increased public awareness will put pressure on the food industry to produce foods that are less contaminated by artificial additives, many of which are petrochemical derivatives and unnecessary.

No food is a nutritious food if it is not safe. Food safety is of paramount importance for food trade, both domestically and internationally. Developed Asian nations such as Japan, Singapore, and South Korea have been paying more attention to healthy eating. Fearful of health problems, they are

returning to traditional foods. (Caragay and Kurusawa, 1994).

The consumer's perspective and preference is deeply a powerful and emotional one. Mother's milk gives a baby not only nourishment and protection against infection but is also a gesture of deep love and caring. When creating a new marketing campaign, it is important to combine rational with emotional factors in order to strengthen a brand image rather than simply describing a product.

Aging and how to slow it down

Aging is nothing more than the collection of such common diseases as hypertension and diabetes, and cardiovascular disease. Instead of battling the diseases when they surface, does it may sense to delay the onset of these dreaded disease? People would seldom become sick if they could be young again.

In anti-aging medicine, aging is defined as a disease with three stages: In the subclinical phase of ages 25–35, most hormone levels have begun to fall. Pollution, stress and poor diet result in internal damage to cells not visible to the naked eye. In the transition phase of ages 35–45, we begin to show symptoms such as decreased strength and energy, lower libido, greying hair and deteriorating eyesight. For those ages 45 and above, the clinical stage spells more wrinkles, loss of strength and ailments such as diabetes and hypertension as organs begin to weaken and function less.

On average, life expectancy has more than doubled, from 34 years at the turn of the 19th century to 76 years in developed countries to day. With the advance of medical science and technology, the figure is set to rise.

There is growing scientific evidence that these major diseases are closely associated with lifestyle, dietary habits in particular. Although life is a downhill slide, the slope often varies greatly with the lifestyle and gene. With aging, skin becomes thinner, drier, less elastic and more wrinkled. Hair thins and turns grey as follicle cells stop providing pigment, or it falls out together. By the age of 70, body height shrinks by perhaps 2 inches, as gravity compresses spinal disks and joints. Even the taste buds wither, decreasing in number by two-thirds.

Just why all this happens is not clear. One theory holds that many cells simply cannot reproduce themselves indefinitely. Cell culture studies have shown that, particularly for humans 70 years old, somewhere between 40 and 60 cell division cycles may be the upper limits. While it is true that nobody gets out of life alive, better lifestyle and health care have put a lot more 'long' in longevity. Between 1950 and 1990 the average life expectancy at birth rose 35% worldwide from 46 to 63 years.

Diet, age and the immune system

There are many well-accepted observations that protective immune responses are impaired in old age, that immune deficiency causes an increased risk of more frequent and more severe infections, and that nutritional deficiencies occur frequently and are a detrimedeterminant of the

immunocompetence of aging. The relationships of nutrition, aging and immune competence are attracting more and more attention.

The percentage of the population over the age of 65 years has grown steadily in most countries and particularly in developed nations. The elderly are ill much more often than younger individuals. Thus, the elderly consume almost 40% of health-care resources although they comprise only 11% of the population today. Immunodeficiency contributes significantly to morbidity and mortality in the aged population. Adequate human nutrition is essential to maintain all normal physiological functions including defence of the self (i.e. immunity). Impaired immune responses are frequent findings in the malnourished, and in the elderly with nutrition deficiencies. In addition to general undernutrition, there may be a reduced intake of iron, zinc, and vitamins, which all contribute to the decline in immune responses.

There is evidence that actual processing of aging may produce impairment of the immune response, in particular affecting T cells.

Trend in foods

Foods have been known since earliest times to contribute more to an individual's well-being than sustenance. Specific foods and the extracts derived from particular plants were known to have beneficial and sometimes an adverse effect on a person's health. The increase in scientific knowledge concerning foods and food ingredients coupled with a heightened interest in traditional diet and 'folk' health remedies, has required a detailed examination of the specific role of foods in health and nutrition. The term 'functional foods' refers to the foods that can provide specific nutritional, dietary, and metabolic benefits, potentially play a role in disease prevention, the mitigation of disease, and the control of disease. The range of food and food ingredients that fall within this category is growing daily as our knowledge expands.

Consumers' awareness of food safety issues has rapidly grown during recent years. Changing demands (fresher and with more variation, but easier and quicker to prepare and with less salt, sugar, fats, preserving agents, chemical additives etc.) show that we pay more attention to what we eat. In addition, a number of food scandals, occurring recently, produced an extra stimulus to the discussion about quality and safety.

The world trend in foods will be focused into four food groups, which are characterized for their positive effect on human life in the future: (i) foods that will improve cardiovascular disease; (ii) foods that enhance the immune system; (iii) foods that increase women's health, fitness and beauty; and (iv) food that could improve the nutrition status of children.

Health claims and regulation

The 21st century is an age of ultra-advancement. In modern medicine, powerful drugs, radiation and even lasers are now being used to treat disease. In the modern food industry, food

is super cleaned, prepacked, freeze-dried, frozen, canned or microwaved. With those supposedly advanced methods in practise, why are most of us not as healthy or happy as we want to be. Why are we no healthier or happier than people of past ages when medical care was appalling and food sanitation atrocious? They may still be the victims of so many diseases and allergy.

Perhaps the new diet does not follow the law of nature, perhaps the lifestyle is not a healthy one, perhaps people are not spiritually aware of their body and do not appreciate those around them. In order to be healthy and happy there must be peace of mind, body and spirit; you cannot have one without the others, they are all closely connected and yet separate.

Health, happiness and peace of mind must be earned through discipline, organization, perseverance, positive thinking and appreciation for being alive (i.e. the food we eat, the air we breathe and the people and nature around us).

Food is clearly taking on a more prominent role in health promotion, much of which centers around health claims. This has been the subject of much discussion in European countries. These health claims can be broken down into 'enhanced function' and 'decreased risk'. The enhanced function claim refers to the enhancement of body functions such as cognitive function, natural defense and physical performance while decreased risk claims relate to the reduction of risk of a chronic disease such as cardiovascular disease, osteoporosis and diabetes type II. In terms of the latter claim, it is considered to be a medical issue, and in Europe such medical claims are not allowed for 'reduced risk claims' if the scientific basis of these claims is judged as adequate and the consumer is duly informed about the characteristic of the food.

From a marketing point of view, several health areas appear particularly attractive for the research and development of functional foods: weight management (prevention of obesity); natural defense, bone health (prevention of osteoporosis); skin health; prevention of cardiovascular disease; and 'food and mood'. The challenge for scientists is to develop new functions of foods from a health perspective.

Communication through education

Because repeated scientific studies have shown the importance of nutritional factors in the prevention and treatment of disease, it is now taken for granted by doctors and scientist that diet is a major factor in diseases in the Western world.

Many of the diseases from which we suffer in the West have been ascribed to excessive fat, excessive protein, or excessive refined carbohydrates that have been processed and have had the most nutritious components removed.

An American dental surgeon, Weston Price, undertook pioneering work in the 1930s when he studied the dietary habits of 30 or so primitive cultures. He observed that when they moved from their traditional diets and started to consume a typical 'Western diet', they also started to suffer an increase in Western diseases such as cancer, heart attack,

dental decay, allergies and so on. This has now been confirmed by many other researchers, therefore the concept that nutritional factors cause those diseases found mainly in Westernized countries, is no longer considered questionable.

The problem now besetting health-care professionals and those involved in responsible government is one of nutrition education. Professor John Yudkin, emeritus professor of Nutrition at London University, expresses this succinctly.

I make no apology for saying that the health of the majority of human being depends more on their nutrition than it does on any other single factor. However important and dramatic have been the advances in hygiene, medicine and surgery, it is still true that even more important will be the effects proper nutrition would have on human morbidity and mortality. For this reason, I believe that the ultimate objective of nutritionists must be the nutrition education of the public.

Yudkin points out that this viewpoint is based on the idea that man could be eating a healthier diet. Indeed, almost all Western populations are encouraged by governments and health education agencies to make dietary changes that many experts feel would result in reduced illness and mortality for the nation as a whole.

Some of the commonest diseases of civilization include heart disease, high blood pressure (hypertension), dental caries, obesity, diverticulosis, gallstones, appendicitis, gout, varicose veins, stroke, diabetes and cancer. They are all more common in the Western world than elsewhere.

As well as these very serious conditions, many of the non-fatal diseases that bear technologically advanced countries may also be linked to food; this includes asthma, eczema and other allergies; chronic degenerative diseases, such as osteoarthritis and rheumatoid arthritis; and mental illness. There is increasing, indeed, overwhelming evidence that many of these conditions can be prevented or treated by nutritional means. Many sectors of the public have been quick to understand the importance of nutrition in such conditions, but the medical profession as a whole has been somewhat slower. However progress is now under way.

The role of appropriate textbooks

Although food occupies the first position in the hierarchical needs of man, ignorance of many basic facts relating to food and nutrition is still widespread. Consequently various nutritional maladies for which there are simple remedies (such as blindness caused by vitamin A deficiency) persist. In developing countries, the most serious form of nutritional disorder is undernutrition arising from inadequate purchasing power.

However, even when purchasing power is adequate to ensure balanced nutrition, various forms of imbalances in dietary intake occur due to lack of knowledge.

The culinary arts, of which people in developing countries are justifiably proud, have placed organoleptic considerations as the sole criteria of excellence. The various opportunities for accomplishing balanced nutrition through synergistic interaction within the components of diet have not received the consideration they deserve.

Most of the colleges in developing countries usually recommend Western textbooks because of the absence of any suitable local textbook.

The Western textbooks, however, discuss the subject with reference to the needs of an economy different from developing countries, with the result that students do not learn anything about the applications of nutrition to their own countries' conditions.

Urgent need

To communicate better, there is an urgent need for easily available local-based textbooks that successfully present food science and nutrition to people of any particular developing country, and at the same time discuss in simple national language all the basic principles of foods and nutrition. Appropriate figures and drawings representing local conditions and tables should be used to explain to the beginner all aspects of foods and nutrition. For the more inquisitive and interested student references to advanced books should be included in the bibliography.

Through painstaking research, knowledge has been acquired about the nutritional needs of people. The book should be able to motivate teachers and students alike to make use of the knowledge and bring about a change in the health and welfare of their own people.

These textbooks should be designed so that their readers understand the following items: (i) functions of foods that supply their nutrition needs; (ii) how to meet the human need of nutrients in terms of available foods; (iii) that prices are guides of supply and demand and not of their nutrition value; (iv) techniques of preparation that help them meet their needs in an enjoyable manner; (v) meal planning as a tool in meeting the nutritional needs of the family through

acceptable enjoyable meals; (vi) preservation as an aid to improved food availability; (vii) health risks and disorders of malnutrition; (viii) safeguarding the supply through proper selection, careful storage and preparation; and (ix) one's responsibilities as a consumer.

Nutrition is a dynamic subject and knowledge is expanding rapidly. It is intolerable that the vast reservoir of knowledge and wealth that exist in the world are hardly being used for improving the lot of many who are desperately in need of it.

If developing countries are to give their children the heritage of health as well as freedom, the people must change their attitude toward food. They must learn from each other and from the world about the kind of foodstuffs that make a person healthy.

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