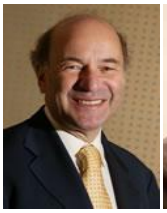


WN *Idea*

World Nutrition **Volume 5, Number 11, November 2014**

Journal of the World Public Health Nutrition Association
Published monthly at www.wphna.org/worldnutrition/

Nutrition
Principles for this century




Geoffrey Cannon
Centre for Epidemiological Studies in Health and Nutrition
School of Public Health, University of São Paulo, Brazil
Email: GeoffreyCannon@aol.com

Claus Leitzmann
Institute of Nutrition Science, Justus-Liebig University, Giessen, Germany
Email: Claus@Leitzmann-Giessen.de

See Acknowledgements for other contributors to this commentary

Editor's note

Idea is the 'brand' name for occasional contributions to *WN* that mainly focus on ideas, which include concepts and principles. These spark and shape investigations. They are inspirations for and conclusions from evidence. They are not timelessly true or false, but in practice more or less relevant, useful and convincing.

All organised human activity is or should be governed and guided by explicit principles. This commentary here is concerned with the principles of nutrition needed to guide global, national and local farming, food, health and well-being policies and programmes in this century. These have been developed from the outcome of a workshop meeting held in Giessen, Germany, and following meetings in Spain, Australia, China, Sweden, Chile, India and Brazil. They are published in the month of the UN International Conference on Nutrition in the conviction that they have special relevance now.

Introduction

This commentary is work in progress. It is the product of a series of meetings held throughout the world in which so far a total of about 200 people have participated. Its original main source is as an outcome of a workshop meeting held in Giessen, whose participants are listed in the acknowledgements below.

Here are specified the definition, dimensions, purposes and principles of nutrition science. Properly understood, nutrition in theory and practice is concerned with the health and well-being of humans as part of the living and physical world and the biosphere. What is now termed 'public health nutrition' is therefore nutrition seen as a whole, of which what is now termed 'nutrition', which is to say clinical nutrition, is a sub-set. The specifications here for nutrition are therefore for what is now termed 'public health nutrition', which is the master discipline.

Modern conventional nutrition science originated in the early 19th century mainly as a biochemical, physiological, pathological and thus a quasi-medical discipline. It gained status as a weapon in the wars for power in Europe and in the empires of the European powers. It displaced the very much broader natural philosophy of dietetics taught and practiced throughout history. It still tends to focus on acceleration of human growth, with the diagnosis and treatment of various human disorders and diseases, and with animals and plants reared and grown for human use.

At the time of and as part of the industrial revolution in Europe and the US, what is usually termed 'modern nutrition science' was spectacularly successful in growing big strong tall young people fit to work in factories and to fight land wars. Later with the discovery of micronutrients it also had phenomenal success with specific deficiency diseases such as those suffered by sailors, urban workers, people subsisting on 'store food', and populations in the European colonies and the US.

However, with the commonly identified exception of coronary heart disease, the modern science of nutrition is evidently unable fully to comprehend, or to prevent or control, chronic conditions and diseases in which food is implicated, such as obesity, or diabetes, and other epidemic or pandemic chronic diseases.

In this commentary, current conventional nutrition is perceived as a remnant of an ideology originated in Europe towards the end of the last millennium, in which humans are perceived as supreme beings, superior to and separate from the living and physical environment. This all now must end. We all now live in a new age. Nutrition now has a whole new prospect and task. It must now be concerned with personal, population and planetary health and well-being, and engage and integrate with the whole living and physical world and the biosphere.

The need for principles



The overall principles of nutrition science are ethical
The science should also be guided by the philosophies of co-responsibility and sustainability, by the life-course and human rights approaches, and by understanding of evolution, history and ecology

Like all the slides reproduced in this commentary, the one above on the overall principles of nutrition science and their ethical foundation derives from a series of meetings in different parts of the world

All sciences, and indeed all organised human activities, need to be defined, and their purposes specified. They make full sense only when they are governed and guided by principles. These should be explicitly stated and subjected to periodic examination and revision in the light of circumstances and experience (1). The sentences before this one are an example of a principle.

A total of 26 people engaged in public health, nutrition and allied fields, convened by us, met in Giessen, Germany in April 2005, or else while not able physically to participate, engaged in the process. They included Mark Wahlqvist, Ricardo Uauy and Ibrahim Elmadfa, presidents of the International Union of Nutritional Sciences successively in 2001-2005, 2005-2009 and 2009-2013, and Barrie Margetts, then editor of *Public Health Nutrition*, now president of the World Public Health Nutrition Association. Others included the naturalist Colin Tudge, Tim Lang of City University, London, Barry Popkin of the University of North Carolina at Chapel Hill, and Tony McMichael of the Australian National University. All those involved are named in the acknowledgements at the end of this commentary. Further meetings involving many more people were then held in the next years, in Spain (Barcelona), Australia (Hobart), China (Hangzhou), Sweden (Stockholm), Chile (Santiago), India (Hyderabad) and Brazil (Rio de Janeiro).

Definition and dimensions

One of the purposes of the Giessen meeting was to define nutrition science. This was done, in terms of four agreed dimensions, which are biological, social, economic

and environmental. (At the time of the Giessen meeting, the economic dimension, shown below, was subsumed under the social dimension). Thus:

> Nutrition science is the study of food systems, foods and drinks, and their nutrients and other constituents, and of their interactions within and between all relevant biological, social, economic and environmental systems.

This and all the other conclusions here have stood the tests of time and continued examination, but remain work in progress, subject to further consideration in the context of what are now rapidly changing circumstances. There is some feeling that nutrition has six distinct dimensions: biological, and also behavioural, social and also political, economic and environmental. In which case:

> Nutrition science is the study of food systems, foods and drinks, and their nutrients and other constituents, and of their interactions within and between all relevant biological, behavioural, social, economic, political and environmental systems.

The number of dimensions could be further elaborated, but so far it is felt that, for example, culture can be subsumed within the social dimension, and industry within the economic dimension. The scope of each dimension needs to be specified.

Purpose

Another objective of the meeting was to identify the overall general purpose of nutrition. To put this more simply, what is nutrition for? This was also done, as specified in the *Giessen Declaration*:

> The purpose of nutrition science is to contribute to a world in which present and future generations fulfil their human potential, live in the best of health, and develop, sustain and enjoy an increasingly diverse human, living and physical environment. Nutrition science should be the basis for food and nutrition policies. These should be designed to identify, create, conserve and protect rational, sustainable and equitable local, national and global food systems, in order to sustain the health, well-being and integrity of humankind and also that of the living and physical worlds.

Principles

All organised human activity should be defined, and governed by explicit principles. These guide investigations and are tested by evidence. They demonstrate context, structure and meaning. They are not forever true or false; rather, they are more or less relevant and valuable. They evolve. They make sense in some circumstances and not in others. They answer 'why?' and 'what for?' questions. They give purpose and focus to research and practice. They can be discussed and challenged at any time. Any discipline or organisation with no explicit principles is liable to become cryptic and thus the conventional wisdom of its dominant groups, who act like high priests.

The 'vision' and 'mission' statements now widely adopted and published by government, industry and civil society organisations are examples of dynamic principles. Thus Ricardo Uauy has proposed draft vision and mission statements for the International Union of Nutritional Sciences (2). One of these, an expression of the human rights domain of the social dimension of nutrition, is:

> To live a life without malnutrition is a fundamental human right…Nutrition improvement anywhere in the world is not a charity but a societal, household and individual right.

As another example, the paediatric principle, rarely stated but commonly implied, that accelerated growth in early life is the measure of good health, made sense in its original historical context of widespread deficiency diseases among the European lower classes in the period of rapid industrialisation. It is now however becoming generally seen as misguided. The principle gained inexorable momentum once nutrition scientists found out how to push human growth with infant formulae and diets high in energy and protein (3). But machines have replaced the need for muscle power, the proportion of middle-aged and old people in most populations has greatly increased, and the bigger people are the more resources they consume. It is now understood that there is little if any intrinsic benefit in large human size, so the context and so the rationale for this principle has generally vanished.

It does not follow that 'anything goes'. The group of 26 people who contributed to the analyses and conclusions that follow (1, 4-16) agreed that all specific principles should be governed by the over-arching concepts of ethics, evolution, and ecology, and be informed by history. Most nutrition professionals may well agree. Curiously though, principles seem to be absent from any formal document so far issued by any professional body concerned with nutrition, with the exception of the new national Brazilian dietary guidelines (*Guia*) (17). Documents on nutrition and its teaching and practice often include attempts at definition and usually include some purposes, but stop short of specifying any general governing or guiding principles.

In tranquil times principles may be implied rather than stated. In tumultuous times such as now, they need to be specified. Thus when modern nutrition science was initially shaped in the early 19th century, it was assumed that the natural and physical resources of the planet were limitless. When committees of experts estimated human protein requirements, they paid practically no attention to the capacity of the planet to provide specified adequate or desirable quantities of protein, or to the social, economic and environmental implications of recommending greater consumption of animal protein. They seem to have assumed that there was no issue – or else that the issues they might be aware of as citizens were not their problem as scientists.

Now follow the series of principles agreed as a result of the Giessen meeting and elaborated since then and up to the time of writing.

Overall



This is the dawning of the age of quality

We are moving out of the era in which human activity has been mainly concerned with exploitation, production and consumption, into a new period in which the main human concerns need to be and are with preservation, conservation and sustenance.

Principles are not axioms or in any other way quasi-mathematical. They are not matters of fact. They are insights, expressions of wisdom. Other than those in very general form, such as 'the golden rule' of 'do as you would be done by', they are designed to work well at particular periods in history and specific contexts, which is why they need to be reviewed and revised, or at least adjusted, fairly regularly.

All principles that relate to human affairs need to be responsive to realities. This makes the formulation of salient principles decidedly challenging. The four overall principles agreed as a result of the Giessen meeting, shown below, would not have been formulated half a century ago, although some far-sighted thinkers like René Dubos came close. Overall principles should have an inspiring and visionary aspect, but to be adopted and become effective, must respond to and resonate with the realities and spirit of their times, as understood and accepted by a sufficiently substantial number of thinking professionals and citizens. Thus:

- Nutrition science should follow ethical, evolutionary, and ecological principles, respect history, culture and tradition, affirm human rights, and be committed to preserve and protect the human, living and physical worlds, all together.
- The responsibility of nutrition science now is to be concerned with the human world (personal, community and population health) and also with the whole living and natural world (planetary health).
- Nutrition science should contribute to a world in which all people are able to fulfil their human potential, to live in the best of health, and develop, sustain and enjoy increasingly diverse human, living and physical environments.
- We are moving out of the era in which human activity has been mainly concerned with exploitation, production, and consumption, into a new era in which the main human concerns are of preservation, conservation and sustenance.

Ethics



Ethical principle

To live a life without malnutrition is a fundamental human right. The maintenance and improvement of nutrition everywhere in the world is a societal, communal and household right and responsibility

Proposals that are meant to hold fast to that which is good, and to identify and alter what is bad, imply awareness, and attention to what is right and what is wrong. Thus:

- The over-riding responsibility of nutrition science is to work to handing on to future generations an improved human, living and physical environment: healthy people, healthy populations, and a healthy planet.
- To live a life without malnutrition is a fundamental human right. The maintenance and improvement of nutrition everywhere in the world is a societal, communal and household right and responsibility.

The *Giessen Declaration* states (1): 'The overall principles that should guide nutrition science are ethical in nature'. Ethics is concerned with values and morals of human conduct: not with description but with judgement, not with 'is' but with 'should'. When the Commission on the Nutrition Challenges of the 21st Century stated (19): 'The persistence of malnutrition, especially among children and mothers, in this world of plenty is immoral', its members were making an ethical judgement.

Ethical issues are 'transcendent' (19). They may be well grounded in evidence, but by nature they are above and beyond experiment, and so are literally metaphysical. In the modern convention, ethical questions are usually not addressed by physical, chemical or biological scientists when at work, unless the consequences of scientific advances are so awesome (use of nuclear fission to make bombs being an obvious example) that most people including scientists cannot sustain a value-free attitude. Introducing ethics as the overall guiding principle of nutrition science, and food and nutrition policy, means that judgement of what is right and what is wrong, and acting accordingly, is part of its work. This is right. Ethical values are as fundamental in nutrition as they are in any science with social and environmental dimensions.

Evolution



Evolutionary principle

The human species is uniquely evolved to grow slowly and to mature late. Policies designed to accelerate human growth and sexual maturity are inappropriate biologically and also socially and environmentally

Development of recommendations on what is good to eat requires knowledge of the mechanics of living systems, and their adaptability. All sciences that involve biology make full sense only in the light of evolution. See Box 1, below.

- All nutritional theory, policy and practice should take into account, the diet-related evolutionary pressures that shaped the biological evolution of the hominid line and eventually, *Homo sapiens*.
- The human species is uniquely evolved to grow slowly and mature late. Policies and practices designed to accelerate human growth and sexual maturity are inappropriate biologically, and also socially and environmentally.

The search for food, then for secure supplies of food, then for food that is nourishing, is one of the defining characteristics of the evolution of the human species, and its adaptations to survive and thrive in families, groups, communities and societies in all sorts of environments. Pre-human adaptability in face of the need for food in almost any climate and terrain, including those that are extreme and unpredictable, explains much of human anatomy, such as a uniquely developed forebrain, the arrangement of teeth, and the length of gut. Humans are of course developed to be omnivorous. Human hands, with opposable thumbs, are uniquely dexterous in response to the evolutionary needs to make and use tools as extensions of hands that can kill animals, grow plants, and break, grind and cook food.

Any theory of nutrition developed in ignorance of evolution and adaptation will almost certainly be wrong. An outstanding modern example is the practice of accelerating physical growth and thus inducing premature sexual maturity with artificial foods, notably infant formula and then diets high in protein and fat, with all attendant physical, mental, emotional and social ill-effects.

Box 1

Evolution

Evolution is the study of the origin, development and adaptation of all life forms and in particular influences that enable the appearance and differentiation of living things. It is concerned with primordial and later forces that account for the relative success or failure of species. Understanding of evolution, which is likely to be 'far more responsive to immediate environmental forces' than has been supposed (20), is vital to nutrition science (21).

Built-in hunger

One explanation for the current vast increase in prevalence of chronic diseases relies on an evolutionary hypothesis. The human species has an in-built taste for three edible substances valuable or scarce in nature: sugar – sweetness in fruits and other plant foods signals ripeness and safety; salt – sodium can be scarce in foods found in nature; and fat – the usual human condition has been food-insecure, and fat from food is readily stored as body fat (22).

So humans will, when they can, tend to over-consume foods that are sugary, salty or fatty, many of which are energy-dense. This apparently trite perception has profound implications. It implies that hunger is not just for energy from food. It explains why food manufacturers make more money when they include more and more of these substances in their products. It also implies that consumption of excess and pathogenic amounts of sugar, salt and fat are not merely a matter of individual choice or voluntary behaviour that can be changed with suitable information and education.

When food insecurity is a major public health issue, consumption of a lot of fat and sugar can be seen as good. But now most populations are becoming increasingly overweight; and in middle- and even low-income countries obesity and diabetes even in early life are massive epidemics (23). The evolutionary approach suggests that the only effective policies and programmes to control and prevent obesity are those that alter the nature and quality of food supplies, by fiscal and other mechanisms that affect price and availability.

A general theory

Big-picture scientists now have a general theory of the fundamental cause of obesity and its related chronic diseases, also known as the 'metabolic syndrome' (24). The proposal is that humans have evolved to respond to times of energy restriction as if these are periods of scarcity or famine, by mechanisms that, after restriction ends, trigger hunger, inhibit satiety, and preferentially conserve body fat. Indeed, it is hard to see how *Homo sapiens* could have evolved and survived without some such adaptive mechanisms 'From an evolutionary point of view it makes sense that the body energy stores are defended during times of famine… and that in times of food surplus the essential requirements of the body can be met rapidly' (25).

This is why infants frugally nourished in the womb and thus born small, then fed *ad lib* energy-dense foods, tend to become fat children and obese adults (26), and why chronic diseases, at first more prevalent among the lower social classes in high-income countries, are now increasing explosively in middle- and low-income countries. The evolved drive to store excess fat becomes pathogenic and thus in effect maladaptive, most of all when after *in utero* energy restriction, babies, children and adults have plenty of readily available food to consume; when the food and drink is energy-dense; within sedentary populations whose energy balance is unnaturally low. It is only recently that these three conditions have often been met, but they are now the typical human condition in most parts of the world.

Ecology



Ecological principle

All relevant sciences, including that of nutrition, should be mainly concerned with the cultivation, conservation and sustenance of human, living and physical resources, and thus with the biosphere

Taking into account the impact of policies and actions on the whole living and physical world and the biosphere, involves awareness that living and physical resources have limits. See Box 2, below.

- To achieve a world nutritional state that is health-supporting, equitable and ecologically sustainable, it is necessary to understand the interplay between evolutionary, environmental and ecological dimensions and domains
- All relevant sciences, including that of nutrition, should be mainly concerned with the cultivation, conservation and sustenance of human, living and physical resources all together, and so with the health of the biosphere.

A crucial outcome of the Giessen workshop is the agreement that one dimension of nutrition as taught and practiced now, is the whole living and physical environment, Workshop members who played leading parts in this discussion included Colin Tudge, Tim Lang, Mark Wahlqvist, and Tony McMichael. Now almost ten years later there is no serious overt resistance to this concept.

To retain and regain credibility though, nutrition scientists still need to build into their work, the fact that the human species can no longer be seen as superior to or separate from all creatures that dwell on earth, or from its resources and its elemental commons of earth, air and water. It may be true to say that by and large, the ecological attitude is better understood by informed and thoughtful parents and citizens, and by journalists engaged with nutrition, than by professionals formally trained to think of nutrition as a biological science for the benefit of humans, and of animals 'in the service' of humans. At the Giessen meeting, Klaus Meyer-Abich made a lasting impression by advocating the concept of co-responsibility, and the respect that comes from understanding that 'we owe to others what we are' (11).

Box 2

Ecology

Ecology is the study of the environment as a whole system. The ecological approach to food and nutrition considers food systems as a whole, prefers variety and biodiversity, and is concerned with the impact of food systems and dietary patterns on the whole living and physical world. The ecological approach does not isolate human health, but rather places it in a wider context. Ecological nutrition or 'eco-nutrition', has already been advocated (27). A broader concept, 'nutrition ecology', includes social, environmental and biological science, and covers: 'total food quality, ecologic balances, and life-cycle assessments; the influence of nutrition systems on climate, world nutrition, and food prices; and a comparison of different diets and agricultural, environmental, and consumer policies' (28).

Food systems

The concept of 'food systems' (29) is an example of an ecological approach: it relates the human species to the living and physical world. Food systems are developed to sustain life at all levels, from global to national, local and individual. A food chain ('from plough to plate') is a static mechanical concept, as used by engineers. A chain is linear; it exists in space but does not change in time without external intervention; and without any link it breaks. By contrast food systems, and their expression in food culture and cuisine, have social and economic significance and are expressions of communal, regional or national identity.

Food systems are dynamic and organic, naturally understood by farmers, constantly evolving over space and time. They include the planting and breeding, production, harvesting and slaughter, storage, preservation and transport of food, and also its manufacture, processing, packaging, trade, distribution, sale and preparation of food, as well as its composition, consumption and metabolism, and also inter-related processes flowing within the contexts of evolution, history, resources, environment, tradition, culture, cuisine, health, technology, economics and politics. Compared with the 'chain' metaphor, food systems are obviously a more attractive, accurate and useful model of reality.

Traditional food systems necessarily make use of available resources adapted to local climate and terrain. The longest evolved food systems best known in the North are that of the Mediterranean littoral, from southern Spain, France and Italy, to Greece and Turkey, Lebanon, Palestine, and Egypt and the other Maghreb countries of North Africa. Derived from Persian, Egyptian, Greek, Roman, Arab and other cultures, the Mediterranean food systems have a history of over 3,000 years, and in their ancient and modern forms are celebrated by nutritional and culinary authorities (30,31).

Ecoagriculture

Agriculture as now developed by family and small farming communities still remains the basis of the economies of many countries. But agriculture is not merely a business. It sustains rural populations, and is a basis for national identity and culture (32). Understanding of the patterns of disease in any part of the world, and over any period of time, requires study of the ecology of agriculture and of its impact on the nutritional quality of the food produced. Thus, the nature and quality of any plant food is affected by the quality of the soil in which it is grown, and of any animal food, by the feed eaten by the animal and the conditions in which it lives.

History



Historical principle
Food and nutrition practices consistently followed in different cultures and times in history are probably valid. They do not need proof to be accepted, they require disproof to be rejected

Knowledge of the past is also essential. To gain a fair idea of the future, it is necessary to have a good sense of present circumstances and past events, especially those from which lessons should be learned. See Box 3, below.

- We can properly understand the food and nutrition issues that face us now and for the foreseeable future, only by examination of the historical decisions that have shaped the world's food systems.
- Food and nutrition practices consistently followed in different cultures and times in history are probably valid. They do not require proof to be accepted, they require disproof to be rejected.

Preoccupation with the present time in ignorance of past events turns us into prisoners of the past, inasmuch – which is usual – this has shaped the present. The examples of milk, meat and (white) bread are given in Box 3, below. Another example is the current expert consensus concerning the prime causal role of saturated fat from all sources in cardiovascular disease. This arises from, and many would now say is a relic of, decisions taken by powerful scientists led by Ancel Keys in the US over half a century ago, on shaky evidence.

The second principle above, which asserts the likely validity of traditional beliefs, has been invariably endorsed in successive meetings after the initial workshop in Giessen. While designed to be duly respectful of modern nutrition science as devised and developed in the last 200 years, it valorises earlier investigations and observations, including those gathered together by people living in nature over many generations as folk knowledge and practice. It follows that conventionally trained nutritionists need to be very careful indeed, before insisting on changes in long-established dietary patterns based on beliefs which are now often arrogantly dismissed as irrational, especially when this undermines cultures based on local foods.

Box 3

History

History discerns the significance of processes, phenomena and people in the past, in the context of their times, or as relevant to the present and future. The quality of civilisations and the meaning of sciences increase as a function of applied knowledge of their history.

Why so much milk and meat?

History explains why meat and cows' milk are still emphasised as of special value for human health, including in regions of the world whose food cultures include little meat and little milk other than human breastmilk, and whose land is not suited to cattle farming. The 'Basic Four' food groups were promoted by the US and UK governments between the 1950s and 1970s. Two of the Four were milk and meat (and their products). This made sense in a period of massive over-production of beef, milk and dairy products, itself a response to the mistaken idea of the dominant nutrition scientists that protein consumption should be boosted and that protein of animal origin is superior to protein of plant origin (33,34). Versions of the 'Basic Four' food groups continue to shape official dietary guidelines throughout the world (35).

Why white bread?

History also explains why degraded (14) white wheat bread is replacing other starchy staples made from rice, corn, oats, cassava and other grains and roots, throughout the world. This is a legacy of a time when nutrition science was dominated by the UK and the US, under the pressure of war and postwar recovery, a time of confluence between government, industry and nutrition scientists. In the late 1940s the British 'national loaf' was brown. Wartime governments accepted that wholegrain and brown bread is more nourishing. But the big millers and bakers wanted to be able to sell bran as animal feed, and germ as human 'health food', and to eliminate the essential and other fats in germ that become rancid and reduce the 'shelf life' of bread (36).

In 1946, in response to industrial pressure on government, Robert McCance and Elsie Widdowson were funded by the British Medical Research Council to determine what type of bread is nutritionally superior (37). They did this by experiments on German foundlings, who were segregated according to what type of bread they were fed, and were also all given potatoes, plenty of vegetables, vegetable soups, some meat and milk, and supplements of calcium and vitamins A, D and C. The regime of the children was more than adequate and amply varied, and all groups of children were found to be equally healthy (36). As a result, the British government in the mid-1950s abandoned support of brown bread, and allowed industry to flood the market with the 'fortified' white bread that suited them best.

In the historical context of postwar Britain and Europe this all made sense. Minimum nutrition standards had to be set. At times of scarcity and insecurity it is essential to use cheap available staples. And McCance and Widdowson, who went on to have extraordinary influence on British nutrition science up to the 1980s (38), supported and were supported by the UK government and also by the UK bread and flour manufacturers. The experiment on the German foundlings was bad biological science and bad integrated science. Nonetheless, it was the scientific rationale for mass produced white bread made from wheat flour. It has shaped modern food systems that are deleterious to human health, and that impede varied and diverse food systems suited to climate and terrain. In such ways history shapes current policies and programmes, and what is in the shops.

The four dimensions

Now follow some of the proposed principles for the four dimensions of nutrition as a science and as practiced: biological, social, economic, and environmental. As mentioned above, these dimensions could be elaborated. But at this stage a political dimension which could be made separate is subsumed under the social dimension (politics is after all a social science) and the behavioural dimension has not been included (it probably should be). One principle to govern principles is that these should not become too elaborate!

No attempt was made following the Giessen workshop to construct a complete set of principles, although more work has been done at the following meetings in Barcelona, Hobart, Hangzhou, Stockholm, Santiago, Hyderabad and Rio de Janeiro. Readers of this commentary are invited to make further proposals.

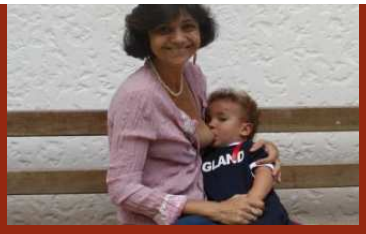
The principles that follow are grouped under the four dimensions agreed, some of which are sub-divided. We repeat that this commentary, the work that informs it, and the structure and number of principles designed to govern and guide nutrition now and in future, remains work in progress. We are sure that what is stated here is on the right lines. Our confidence is consolidated by the many books, papers, and policy positions prepared and published since the Giessen meeting that have adopted the conceptual framework of the *Giessen Declaration*, with or without explicit acknowledgement. Indeed, we and the participants at the meetings at Giessen, and in Spain, Australia, China, Sweden, Chile, India and Brazil, have been 'standing on giants' shoulders'. What is 'the new nutrition' for our age now, is also a rebirth of the age-old principles and practices of dietetics as the philosophy of the good life well led, and its specific application to the whole context of food and eating.

Biological

One important aspect of the biological dimension of nutrition is that its effect on health is seen in terms of the four aspects of health as a whole – physical, and also mental, emotional, and spiritual. Also the medical approach is secondary: in all aspects, well-being comes first.

- Nutrition defined as a biological science cannot make much difference to mass epidemics of any type of disease, because the social and environmental determinants of epidemic disease are outside its scope.
- The biological effects of food on the human body are part of a process involving microbial ecosystems within the gastrointestinal tract, which while composed of many thousands of other species, amount to a vital organ of the body.

Health (physical)



Well-being principle

The single nutritional factor that most protects human health is extended exclusive breastfeeding. The practice of breastfeeding is also emotionally vital, socially valuable, and environmentally sound

- All nutritional recommendations designed to improve human health should be consistent with and not contradict the need to sustain living and physical resources and to protect the environment.
- Middle- and low-income countries are now suffering a double burden of chronic diseases on top of nutritional deficiencies and infectious diseases. Effective programmes will integrate social and environmental with biological approaches.
- The prevention of malnutrition most of all of women and children by dietary means in deprived populations will work only if people have access to foods that are adequate both in quantity and quality.
- The single nutritional factor that most protects human health lifelong is extended exclusive breastfeeding. The practice of breastfeeding is also emotionally vital, socially valuable, and environmentally sound.

Health (mental, emotional, spiritual)

- Nutrition science should once again be concerned with well-being and health in the broadest sense. For humans, mental, emotional and spiritual health are as important as physical health.
- The best nutrition is from food eaten as shared meals. Good company and surroundings increase enjoyment and well-being, and enhance the meals' nourishment of physical and all other aspects of human health.

Social

As stated above, nutrition properly understood is public health nutrition, of which clinical nutrition is a branch. Nutrition is therefore necessarily always engaged with society. This was immediately accepted at the Giessen meeting. A more challenging

concept also accepted, is that the nutritional status of populations are outcomes of political, economic, environmental and other practices and phenomena which occur without nutrition in mind, but which can be guided by wise nutrition policies.

- Understanding the vast and rapid recent social as well as nutritional and epidemiological changes, and their basic driving forces, is essential for sustained prevention of disease and sustenance of human well-being and health.
- Choices made by communities, families and individuals play a part in shaping food systems. But social factors, including technological development and economic and political policies and practices, are more powerful driving forces.
- The main solutions to nutritional problems lie less in unlocking biological pathways, and more in creating healthy societies and also environments. Change unhealthy society and maintain healthy societies, and nutrition will follow.

Food systems

- Food and nutrition policies should identify, create, conserve and protect rational, sustainable and equitable food systems, to sustain the health, well-being and integrity of humankind and also that of the living and physical worlds.
- The most sustainable food systems and therefore diets, contain a high proportion of foods of plant origin, and a low proportion of foods of animal origin, and are very heterogeneous and biodiverse.
- Food systems that are biodiverse are superior to those that reduce biodiversity. Biodiverse systems also protect against environmental disasters, as well as providing the most healthy food supplies.
- Animals are not merely human resources. They should be able to develop and live a proper life before they serve as our food. The industrial production of animals for human consumption is immoral.

Tradition

- Nutrition policies should take into account that almost all the great cuisines of the world are high in staples (cereals, pulses, roots, tubers), make maximal use of available vegetables and fruits, and are sparing in their use of meat.
- Indigenous and traditional food systems, when these are known or reliably considered to be beneficial to human health, and which have light environmental impact, should be preserved, reinstated and developed.

Culture and cuisine

- Nutrition scientists and allied professionals should understand and respect the traditional, cultural, religious and other social factors that drive people's food and health beliefs and practices.
- There is an absolute one-to-one correspondence between good husbandry, sound nutrition, and great gastronomy. Traditional cooking rooted in the home, supplies good nutrition, agreeable social life, and autonomy.

Political

Also as mentioned above, the political aspect of nutrition is here seen as part of the social dimension. There is a case for identifying it as a whole separate dimension, but for the moment it is placed here.

- Nutrition science has never been neutral. Its advances have been made in engagement with society's leaders. Nutrition scientists now should become more organised, more active, tougher and more engaged.
- The idea that nutrition can be isolated from economic and political drivers of well-being, health and disease, is a delusion. Like the best of past nutrition, the new nutrition scientists will accept and work within these contexts.
- The basic causes of epidemics now include the results of decisions increasingly taken beyond democratic process. Action to control and prevent disease requires new structures of governance at international and global levels.

Economic

This separate dimension was agreed after the Giessen meeting and needs more development. It includes industry and technology, and very big issues such as economic globalisation, so-called 'free trade', and economic development.



Economic principle

New economic models are needed. Development should not be equated with more industrialisation and urbanisation and more use of money, but with personal fulfilment within agreeable and just societies.

- Food subsidies in rich countries and tariffs imposed on agricultural products from poor countries, damage human health, social fabric, and the environment, and are a key basic cause of intractable epidemic diseases.
- New economic models are needed. Development should not be equated with more industrialisation and urbanisation and more use of money, but with personal fulfilment within agreeable and just societies.



Industrial principle

Food systems are largely a function of available technologies, all of which should be examined to ensure that they benefit human health and welfare and that of the living and physical worlds

- Food systems are largely a function of available technologies, all of which should be examined to ensure that they benefit human health and welfare and that of the living and physical worlds

Environmental

The environmental dimension of nutrition is now universally accepted. The whole living and physical world and the biosphere are now perceived as inseparable from the human world. Much work is still needed to incorporate this insight, a revival of ancient thinking, into farming, food, and nutrition policy and practice, as part of the systematic thought and action needed to protect and preserve the planet.

Resources (living, physical)

- Industrial food production – amplified by need to earn foreign exchange, and the growing consolidation and power of the food-producing industry – is doing increasing damage to the natural resource base.
- The only rational food and nutrition policies are those that take account of global renewable and non-renewable resources, designed to sustain renewable resources and not to continue to rely on non-renewable resources.
- Priority should be given to renewable sources of energy that do not create problems of safety and waste, for food systems. These include solar energy, wind power, geothermal energy and tidal energy.

Agriculture

- Monocultural farming systems can be sustained – though not for ever – in rich countries whose people buy imported foods; but in poor countries they cause food insecurity, and increase poverty and instability at all levels.

- Getting food right means good farming – productive and efficient husbandry that is kind to animals, looks after the environment, and creates stable rural societies. While modern science can we welcome, essentially this is peasant farming.
- Mixed farming systems suited to climate and terrain that support the natural fertility of the soil by sustainable methods, and make minimal use of chemical inputs, are ecologically and environmentally sound.
- Industrialised agriculture degrades the nutritional quality of food. As a conspicuous example, the flesh of factory-farmed animals and poultry becomes more fatty, and the quality of the fat deteriorates, becoming more saturated.

Conclusion



We humans are now living in a new age. This fact needs to be repeated again and again until it is accepted in thought and incorporated in action. Climate scientists say that the move is from the Holocene to the Anthropocene, which is to say, an age when human activity is disturbing natural planetary balance to an extent that may accelerate and became irreversible. This is serious. It means that all organised human activity must be reviewed. Nutrition is not an exception.

In common with very many colleagues, we are sure that humanity now is in the midst of a crisis on a scale with the darkest days of the Cold War when a nuclear holocaust seemed almost probable. Many knowledgeable scientists, including people with cool and calm personalities, have stated that within the lifetimes of people who are now young, there is a strong possibility that the homeostatic systems that keep the planet stable, will have in profound ways become wrecked by human overuse and abuse of living and natural resources. We suggest that the temptations to doubt this, or as professionals to act if this is none of our business, must be resisted.

Instead, as one of many related tasks, the theory and practice of nutrition has to be reborn. For a start, nutrition as a discipline and as used for the benefit of populations must slough off medical clothing. The one reliable and tried, tested and true strategy is to return to the principles and practice of dietetics, which have been devised and adapted literally over thousands of years as a common theme of civilisation and culture. The task now is to recover dietetics and review and shape this natural philosophy in ways that suit the world as it is now.

The scope of nutrition is vast, as indicated above in a slide that has been compiled as a result of all the meetings that began at Giessen. Nobody can personally master all these disciplines, and there is no need to try. Good work now means teams.

The general direction for nutrition was suggested by José María Bengoa, a founder of public health nutrition, at a conference held in Barcelona in 2006:

> One can glimpse a great expansion in the horizons of the science of nutrition… We are getting closer and closer, like a great magic wheel, to the ideas that the Greeks held about dietetics – as the dominion of life itself, both in the biological and social sense. It seems as if we are redefining nutrition as the beginning and end of life itself

A systematic reorientation of human societies, implying adoption of collaborative social and political philosophies currently ignored or rejected by the governments of powerful countries, is needed. There are signs of this rebirth. As part of this process, the theory and practice of nutrition also needs to be reborn. Happily, the concept of renaissance is apt. The new nutrition fit for purpose in this century, is also in effect a return to dietetics in its classical sense of the philosophy of the good life well led, in harmony with family, community, society, and the living and natural world.

References

1 The Giessen Declaration. *Public Health Nutrition* 2005; **8**(6A): 783-786.

2 Uauy R. Defining and addressing the nutritional needs of populations. *Public Health Nutrition* 2005; **8**(6A): 773-780.

3 Cannon G. *The Fate of Nations. Food and Nutrition Policy for the New World*. London: Caroline Walker Trust, 2003. Obtainable at www.cwt.org.uk/

4 Cannon G, Leitzmann C. The new nutrition science. *Public Health Nutrition* 2005; **8**(6A): 673-694.

5 Beauman C, Cannon G, Elmadfa I et al. Principles, definition and dimensions of the new nutrition science. *Public Health Nutrition* 2005; **8**(6A): 695-698.

6 Cannon G. The rise and fall of dietetics and of nutrition science 4000BCE – 2000CE *Public Health Nutrition* 2005; **8**(6A): 701-705.

7 McMichael A. Integrating nutrition with ecology: Balancing the health of human and the biosphere. *Public Health Nutrition* 2005; **8**(6A): 706-715.

8 Tudge C. Feeding people is easy: But we have to rethink the world from first principles. Public *Health Nutrition* 2005; **8**(6A): 716-723.

9 Popkin B. Using research on the obesity pandemic as a guide to a unified vision of nutrition. *Public Health Nutrition* 2005; **8**(6A): 724-729.

10 Lang T. Food control or food democracy? Re-engaging nutrition with society and the environment. *Public Health Nutrition* 2005; **8**(6A): 730-737.

11 Meyer-Abich K. Human health in nature - a philosophy of nutrition. *Public Health Nutrition* 2005; **8**(6A): 738-742.

12 Beaudry M, Delisle H.. Public´(s) Nutrition. *Public Health Nutrition* 2005; **8**(6A): 743-748.

13 Pettoello-Mantovani M. The social and environmental aspects of nutrition science. *Public Health Nutrition* 2005; **8**(6A: 749-752.

14 Leitzmann C. Wholesome nutrition: a suitable diet for the new nutrition science project. *Public Health Nutrition* 2005; 8(6A: 753-759.

15 Vorster H, Margetts B, Venter C, Wissing M. Integrated nutrition science: From theory to practice in South Africa. *Public Health Nutrition* 2005; **8**(6A): 760-765.

16 Wahlqvist M. The new nutrition science: Sustainability and development. *Public Health Nutrition* 2005; **8**(6A): 766-772.

17 Ministry of Health of Brazil. *Dietary Guidelines for the Brazilian Population.* Draft for consultation. Brasilia: *Ministério da Saúde,* 2014.

18 James WPT, Smitasiri S, Ul Haq M, Tagwiri J, Norum K, Uauy R *et al.* Commission on the Nutrition Challenges of the 21st Century. *Ending Malnutrition by 2020: An Agenda for Change in the Millennium. Food and Nutrition Bulletin* 2000; **21**(3): 1-88.

19 Medawar P [Section 5. Where then shall we turn?] *The Limits to Science*. Oxford: Oxford University Press, 1985.

20 Margulis L, Sagan D. Darwin revisited: species in the evolutionary dialogue. [Chapter 13] *Acquiring Genomes. A Theory of the Origins of Species*. New York: Basic Books, 2002.

21 McMichael AJ. *Human Frontiers, Environments and Disease. Past Patterns, Uncertain Futures.* Cambridge: Cambridge University Press, 1993.

22 Weiffenbach J (ed). *Taste and Development.* Bethesda, MD: USDHEW, 1977.

23 World Health Organization. *Obesity: Preventing and Managing the Global Epidemic*. Report of a WHO consultation. Technical report 894. Geneva: WHO, 2000.

24 Gluckman P. Hanson M. *The Fetal Matrix. Evolution, Development and Disease.* Cambridge: Cambridge University Press, 2005.

25 Yajni CS. Obesity epidemic in India: Interuterine origin? *Proceedings of the Nutrition Society* 2004, **63**, 387-396.

26 Van Baak M. Adaptive thermogenesis during over- and under-feeding in man. *British Journal of Nutrition* 2004, **92**, 329-330.

27 Wahlqvist M, Specht R. Food variety and biodiversity: econutrtion. *Asia Pacific Journal of Clinical Nutrition* 1998, **7**, 3-4, 324-319.

28 Leitzmann C. Nutrition ecology: the contribution of vegetarian diets. *American Journal of Clinical Nutrition* 2003, **78**, S657-659.

29 Sobal J, Khan L, Bisogni C. A conceptual model of the food and nutrition system. *Social Science Medicine* 1998, **47**, 7, 853-863.

30 Nestle M. The Mediterranean. Diets and disease prevention. In: Kiple K, Ornelas K (eds). *The Cambridge History of Food*. Cambridge: Cambridge University Press, 2000

31 Roden C. *A Book of Middle Eastern Food*. London: Penguin, 1980. (First published 1968).

32 Seymour J. *The Ultimate Heresy.* Bideford, Devon: Green Books, 1989.

33 Cannon G. *The Fate of Nations. Food and Nutrition Policy in the New World.* London: Caroline Walker Trust, 2003. Obtainable from www.cwt.org.uk

34 Nestle M. From 'eat more' to 'eat less'. [Chapter 1] *Food Politics. How the Food Industry Influences Nutrition and Health*. California: University Ptess, 2002

35 Food and Agriculture Organization of the United Nations. *Statistical Handbooks*. Rome: FAO, annual

36 McCance R. Widdowson E. *Breads White and Brown*. London: Pitman, 1956.

37 Widdowson E, McCance R. Studies of the nutritive value of bread and on the effect of variations in the extraction rate of flour on the growth of undernourished children. *Medical Research Council special report series 287*. London: HMSO, 1954.

38 Cannon G. *The Politics of Food*. London: Century, 1987.

Acknowledgements and status

The original and new text was drafted and approved by Geoffrey Cannon and Claus Leitzmann, with advice and guidance from many colleagues. It remains work in progress. The original text is an outcome of the 2005 Giessen workshop meeting on *The New Nutrition* of which Claus Leitzmann and Geoffrey Cannon were co-convenors. It was first published in a specia issue of *Public Health Nutrition* in September 2005. Workshop participants whose contributions in discussion, and as prepared for the meeting and then published, informed and influenced this paper, were Micheline Beaudry, Christopher Beauman, Hélène Delisle, Ibrahim Elmadfa (IUNS president 2009-2013), Peter Glasauer, Ingrid Hoffman, Markus Keller, Michael Krawinkel, Tim Lang, Bernd Lötsch, Barrie Margetts, Tony McMichael, Klaus Meyer-Abich, Ulrich Oltersdorf, Massimo Pettoello-Mantovani, Barry Popkin, Joan Sabate, Prakash Shetty, Marco Sória, Uwe Spiekermann, Colin Tudge, Ricardo Uauy (IUNS president 2005-2009), Esté Vorster, and Mark Wahlqvist (IUNS president 2001-2005). The authors renew their thanks to the Baroness Mariuccia Zerilli-Marimò for support of the *New Nutrition* work, and to Barrie Margetts for enabling the September 2005 special issue of *Public Health Nutrition*. The authors wish to acknowledge the inspired contribution made by Tony McMichael at the Giessen meeting, and for his insights that informed the Giessen Declaration, adopted by all participants. Many thanks also to the many participants at the workshops in Barcelona, Hobart, Hangzhou, Stockholm, Santiago, Hyderabad and Rio de Janeiro, not listed here.

Readers may use the material here if acknowledgement is given to: Leitzmann C, Cannon G. Nutrition. Principles for this century. *[Idea]. World Nutrition* November 2014, **5**, 11, 971-992. Obtainable at www.wphna.org/worldnutrition/ Contributions to *World Nutrition* are the responsibility of their authors. They should not be taken to be the view or policy of the World Public Health Nutrition Association unless this is explicitly stated.

How to respond

Please address letters for publication to wn.letters@gmail.com. Letters should usually respond to or comment on contributions to *World Nutrition*. More general letters will also be considered. Usual length for main text of letters is between 350 and 1,000 words. Any references should usually be limited to up to 12. Letters are edited for length and style, may also be developed, and once edited are sent to the author for approval.