FEATURES

A COMPARISON OF GUIDANCE TO FOOD AND NUTRITION IN AYURVEDA AND WESTERN MEDICINE

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Medicinal Systems

Good nutrition is central to maintaining good health and longevity. We in Sri Lanka benefit from two very different schools of thought on the topic; the Western medical sciences and the Traditional Herbal practices. The latter system in Sri Lanka is a synthesis of the Indian *Siddha* ayurveda medical system introduced into the country and ancient medical skills (*'Hela medicine'*) that predate the introduction of Ayurveda and goes back several thousands of years. For convenience these practices taken together will be referred to as the 'Ayurveda' (the term means 'science of longevity') system here. According to Ayurveda three factors that control health, are *Aushada* (medication), *Ahara* (Food) and *Vihara* (lifestyle) and the dictum "food is medicine" illustrates how important good nutrition is to health. Western allopathic medicine similarly emphasizes the importance of good nutrition. Each school has its own strengths. It is therefore interesting and worthwhile to compare and contrast the knowledge on topics developed within each of these, especially on any practical guidance on selection and consumption of food.

At the outset we appreciate the difficulty of making this comparison because of the very different ways the human body or body-mind is modelled in the two systems of medicine. Western allopathic models are based on microstructure and physiological function ranging from cell membrane receptors to the major organ systems of the human body. Allopathic medical specialties are based on organ systems such as heart, brain, kidney or skin. Ayurveda models the human body holistically tracing poor health to overall imbalances of the three *doshas* in the body. The traditional medical specialties therefore tend to be by class of disease. Despite this fundamental difficulty and the ensuing differences in terminology it is still enlightening to make such a comparison.

Eating Enough Food for Good Health

Modern nutritionists take an accounting approach to the question of how much food is needed daily to maintain good health in a healthy person. Ideally, a balance between the caloric (we mean the food calorie ~ 4.184 J) of the food consumed and that expended for function (and growth) is suggested.

A young person will then need 2000-3000 calories (male) or 1600-2400 calories (female) depending on age and activity.

Sedentary individuals, especially those over 51, are recommended to use the lower numbers in the range. An athlete or a soldier expends more energy and will need a much higher intake. If more calories than needed are consumed obesity will result unless vigorous physical exercise is deliberately undertaken to 'burn off' the resulting stored adipose. The body mass index (BMI), a common measure of body fat relative to a subject's height and weight is commonly used to assess obesity in individuals. Sadly, especially in North

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America and Western Europe, obesity is prevalent. The 2010 numbers for Sri Lanka 25.2% overweight and 9.2% obese (BMI >30) is relatively high for a middle-income country[1] .

Ayurvedic guidance has no such metric to estimate the 'required' intake of calories or food though obesity is still recognized as a disease condition and treated[2,3]. Ideally, the intake of food is based on physiological cues; the quantity one should consume is based solely on the appetite. One must never eat unless hungry and not consume to full satiation; it is recommended that at the end of a meal one should have residual appetite for 20-30% more food. The number of daily meals also depends on body cues. Digestive capability of the body is believed to be strongest between 10:00 am and 2:00 pm and the heaviest meal is best taken during this period.

Ayurvedic understating of nutrition parallels the views of modern nutritionists in that both agree that only digested or absorbed fraction of the food is assimilated and used by the body. This part (called *prasada in* Ayurveda) is used to grow or maintain the seven *dhatus* in the human body (corresponding to different classes of body tissue in modern Biology).The seven *'dhatu's* of Ayurveda can be approximately compared to the following tissue types in Table 1.

Table 1: A comparison of the Dhatu's in Ayurveda with Body Tissue Types

***Dhatus* in Ayurveda**	**Corresponding Tissue**	**Class of Tissue**
Rasa	Lymph and Plasma	Connective
Rakta	Blood	Connective
Mamsa	Muscle	Muscular
Meda	Adipose	Connective
Asthi	Cartilage and Bone	Connective
Majja	Bone Marrow & Nerves	Connective/ Nervous
Shukra	Germ cells	Cells – Not a tissue

There are two interesting points in the Table. Some classes of tissue such as the epithelial tissue that include stomach lining, surface lining of organs and skin, is either missing or included in other categories of *dhatus*, in the Ayurveda classification. Also, the *dhatus* are said to develop in sequence from one another, starting with *Rasa* making the *Rakta* and the *Rakta* making *Mamsa* and so on, ending up with *Shukra*. Relatively more energy and nutrients are needed to synthesize the *'dhatus'* lower in the Table such as *shukra*. Obesity for instance, according to the Ayurvedic model, is a result of nutrients flowing down the cascade in the first column of the Table and accumulating in the *'Meda'* step, unable to move down further.

Modern science sees enzymatic digestion in the alimentary canal as a means of reducing the molecular sizes of complex food molecules to a range that allows their transport across the wall of the gut. These can then be metabolized and the energy from their oxidation is used for maintenance and growth of the body tissue. Tissues do arise from embryonic stem cell tissues differentiating into different tissue types, though not in any sequence.

Basic Food Categories

In addition to the total intake nutritionist also need the requisite calories to be derived from the main food groups of Carbohydrates, Fats and Proteins in different proportions. For an adult, the majority of the calories (45-65%) should be from carbohydrates (rice, bread, pasta) and the rest from fats (20-35%) and proteins (10-35%). Selection of food from the five 'food groups' ensures that these as well as micronutrients such as vitamins and minerals are included in a healthy diet. For example, according to US Department of Agriculture, an 18 yr. old who intakes 2400 calories, must select 8 oz. grain (4 oz. unrefined), 3 cups of vegetables, 2 cups of fruit, 3 cups low-fat milk, 6.5 oz. of meat, fish or protein-rich seeds such as lentils. One is encouraged to vary choices but within each food group (leafy veggies versus brightly colored) and cheese or yoghurt may be substituted for milk. Western medical guidance on the above food types is for all healthy individuals. The need for a more 'personalized' nutrition regime is now drawing research interest[4].

Figure 1: Food Pyramid according to western formula for good nutrition. (Source: Food and Drug Administration, USA)

Ayurveda has a different classification of foods that is not based on their carbs, proteins or fat content. The six-fold classification of food groups in Ayurveda is based on taste. The two classifications are compared in Table 2. The basic difference between the classifications is that Western medical grouping is chemical/structural while the other (the Ayurveda) is purely sensorial.

Table 2: Food Classification
Ayurveda and Modern Nutrition

	Food Types (Western)	Food Types (Ayurveda)
1.	Vegetables	Sweet
2.	Grains - rice or bread	Salty
3.	Fruits	Sour
4.	Dairy	Pungent
5.	Protein	Bitter
6.	-	Astringent

Each of the six food categories of Ayurveda must ideally be included at each meal. The ratio of these in a meal varies with the body type of the person. Looking at the different tastes, however, it is likely that 'salty' category is intended to provide mineral micro-nutrients while some of the 'acidic' food ensures a supply of Vitamin C. Leafy greens such as broccoli in the 'bitter' category provide other vitamins and phytonutrients. An Ayurvedic equivalent of a food pyramid will have all six tastes, but the emphasis of each taste differs with the body type of the individual. So no single Ayurvedic food pyramid that is generally applicable can be drawn.

An interesting aspect of Ayurvedic nutrition not met with in the Western system is the preferred sequence in which the food should be eaten. It is counter-intuitive and in some respects is the exact opposite of what we commonly practice at the dinner table in Sri Lanka.

The Ayurvedic recommendation is to consume "sweet" category of food at the beginning, "salty" and "acidic" in the middle and "bitter" and "astringent" at the end of the meal. This is the exact opposite of our dining practice where we tend to start off with an appetizer, then have a heavy meal and finally end up with a sweet (or fruit) dessert! Also, drinking iced beverages is discouraged in Ayurveda. The digestive capacity of the body (due to on active *pachakpitta)* is believed to be compromised by iced beverages. On the other hand a weak *pachakpitta* is revived with some spices such as black pepper *(Piper nigrum),* long pepper *(Piper longum),* and ginger *(Zingiber officinale).*

A somewhat surprising related teaching is that water that is too hot to drink must never be cooled by adding iced water or cold water to it; it should be left aside to cool or poured from cup to cup to accelerate cooling. The strict warning against mixing hot and cold drinking water (as well as eating ice cold and hot beverages at the same time) is even described as '*visha*' or poison. Perhaps one can speculate that in ancient times, adding un-boiled cold water to boiled or hot water was risky because of potential microbial contamination with potential activation of dormant spores in the cold water by elevated temperature. The cold water is typically from a well or a river and water as collected can easily be contaminated. Eating hot and cold food together can be bad for teeth (because of thermal stress on the enamel due to alternate hot and cold contact). But, triggering the hot and cold receptors in the epithelium together is not expected to have an ill effect according to Western medicine (medication such as Vick's Vapor Rub for instance has Menthol and camphor intended to do exactly this!).

Individual Food Prescriptions

The recommendation on what food to consume is generic in Western medicine but the need for a more 'personalized' nutrition regime is now drawing research interest[5]. Caloric count and food groups all apply across the board to all individuals of same weight/height, age and physical activity. Ayurvedic system gives general guidelines; eat locally grown food (rather than imported food), eat raw or partially cooked vegetables and eat whatever is available in season. It has a volume of instructions in this regard and goes into great details on the classification of individual body types and the food appropriate for each.

Samkhya, the Indian philosophical foundation of Ayurveda, specifies three governing principles or humors in the human body, called *doshas: vata, pitta* and *kapha.* These three *doshas* or qualities exist in individuals to varying degrees, although one and sometimes two tend to be predominant and the other(s) secondary. Ideally, the three *doshas* should be in balance to promote the normal functioning of the body. When out of balance, they create mental, emotional and physical ailments. The body-types (or *prakirti*) classification in Ayurveda is based on the body type which can be determined by the nature of the pulse, physical constitution, skin type and other characteristics (usually by a qualified practitioner). Individuals generally fall into one of these categories.

The three main types *vata, pitta* and *kapha* along with *vata-pitta, vata-kapha* and *pitta-kapha* make the 6 types. All three in balance can be a 7th type.

Different foods have the property of increasing or decreasing one or more of the *doshas*. Appropriate foods are those that help the individual's own *doshas* to be kept in balance. For instance, an individual with a high *kapha* must avoid 'salty' and 'pungent' foods but consume more 'sweet' and 'sour' food to keep the humor in control.

Table: Types of Foods and their Effect on Doshas

Taste	Taste		Decrease	Increase
Sweet	Heavy	*Madhura*	V, P	K
Salty	Light	*Lavana*	K	P, V
Sour	Oily	*Amla*	V,P	K
Pungent	Dry	*Katuka*	K	V,P
Bitter	Hot	*Tiththa*	V,K	P
Astringent	Cold	*Kasaya*	P	V,K

However, even within this classification all the classes of food in the Western classification as well as vitamins and minerals are likely included.

This allows personalized Ayurvedic 'food pyramids' to be qualitatively developed.

Both systems of medicine, however agree that food is best eaten raw or lightly cooked to preserve the nutrients in them. Also both agree that the evening meal should be light and taken fairly early in the evening. Ayurvedic knowledge in addition encourages one to eat 'locally' – fruits and vegetables grown in the location where one lives and seasonal produce.

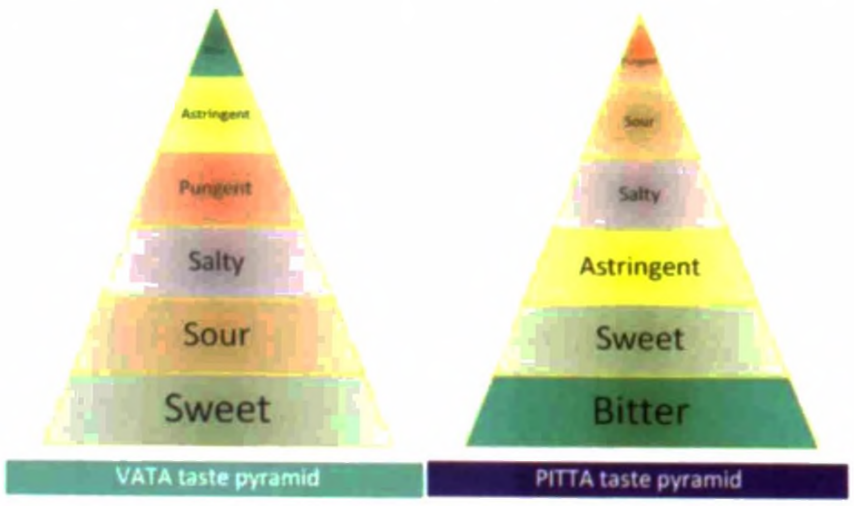

Figure 2: Ayurvedic Food Pyramids for *Vata* and *Pitta* body type. Courtesy: Ayurveda and Yoga. http://ayuryoga.com.sg

Incompatible (*apathya* or *viruddha*) Food Combinations.

The notion of 'incompatible' combinations of food is found only in the Ayurveda system and is a generic prescription that does not depend on individual body type or other personal characteristics. Individuals may have specific allergies to foods that can be discovered using appropriate tests that suggest specific foods be avoided. The restriction incompatible food is not made on an individual basis in Ayurveda[6]. Scientific basis behind these food combinations are not always easy to discern.

Ayurveda recognizes 18 different criteria for *viruddhaahara*. The space does not allow a full description of all of these. Some examples are incompatibilities that are location-specific (*deshaviruddha*), season-specific (*kalaviruddha*), digestive-capability specific (*agniviruddha*). Some examples of contradictory combinations that should apply to all individuals are as follows.

a) Milk: With bananas, melons, sour fruits, fruit salad or any sour food including yoghurt. Or with mung beans, chickpeas or gram varieties. Meat, fish and baked goods with yeast. Also, consuming milk after eating radish, garlic or basil leads to skin problems.
b) Yoghurt or buttermilk: With milk, eggs, fruit, cheese, fish, meat and hot tea or coffee.
c) Fish: All meats, milk, sugar or jaggery.
d) Meats: With fish, sugar, honey, sprouts, radish or lotus stalk.
r) Beans: Fruit, dairy items, eggs, fish and yoghurt.
f) Eggs: Milk, fish, meat yoghurt, cheese and beans.
g) Tapioca: Banana, mango (and most other fruit) raisin and jaggery.
h) Hot Beverage: with or after alcohol, curd (yoghurt) or honey, mango, fish, meat, yoghurt.
i) Fruits, especially melons, are best eaten without combining with any other type of food as a single meal or snack.

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The Dry Eyes Syndrome; DES..

This syndrome is fast becoming a new concern. There are numerous reasons for this and the main risk factors are the wearing of contact lenses, and the staring onto computer screens for long periods of time, a common feature of the modern lifestyle. The ability to maintain a stable tear film, which acts as a protective covering that spreads over the eyes each time we blink is an important necessity to keep the eyes comfortable, and healthy. The tear film lipid layer (TELL), is located at the interface between the outer air and the tear layer. It is mainly composed of melbomian lipids, complex mixtures of wax, steroid esters and polar molecules. It is believed that the role of the TELL is to minimise the evaporation of the tear fluid. But recent studies reveal that the TELL layer is ineffective in that role. Recent ly, work carried out by Georgi Georgiev of the University of Sofia, Bulgaria, and Norithiko Yokoi, of the Kyoto Prefectural University of Medicine, Japan, have another view. These workers think that the visco-elastic properties of the TELL, which determine how the film stores energy within its structure may be the key to its importance. They extracted the melbomian lipids from healthy volunteers, and and sufferers of melbomian gland disfunction – a condition strongly associated with DES. They spread the lipid films over a replica tear-air interface and measured how the films responded to controlled blink like deformations. Healthy TELL s were leastic: they were able to store the energy transferred upon deformation, and recover rapidly when the deformation was eased. Diseased TELLs on the other hand were viscous and less able to recover after stress and more liable to breaking up. Emergent treatments that the group may develop would be based not on the motive of suppression of evaporation but on the improvement of TELLs mechanical properties such as viscoelasticity.

Kate Bayliss in Chem. World. 2014. July p23.

Sex after a field trip brings a scientific first.

An American vector-biologist is reported to have accidentally written virological history just by having sex with his wife following his return from a field mission to Senegal. The story reveals that Brian Foy of Colorado State University in For Collins and a graduate student Kevin Kobylinsky got bitten mercilessly while collecting mosquitoes in Sengal for their research studies on Malaria. On returning home both researchers developed severe symptoms such as rash, fatigue, swollen joints and pains and similar unpleasant symptoms. Days later Foy's wife also fell ill with similar symptoms. The scientists suspected mosquito borne virus but laboratory studies failed to reveal any confirmatory clues. On hi next visit to Senegal Kobylinsky told the tale to Andrew Haddow a medical entomologist at the University of Texas Medical Branch at Galveston, whose grandfather had isolated a virus called ZIKA in Uganda way back in 1947. Haddow suggested that the obscure mosquito borne agent might be the cause. Sure enough laboratory tests turned up zika antibodies in samples from all three persons.

Now, Zika transmitting mosquitoes do not live in northern Colorado. A paper published online in 2011 in Emerging Infectious Diseases, points instead to "vagina sexual intercourse in the days after patient (Foy) returned home – which would be the first case of a sexual transmission of a mosquito borne virus." Foy was to comment: "My wife wasn't happy but she is a co-author of the paper".

Gleaned from Science (2011), 332, 290.