Asian Functional Foods

John Shi
Chi-Tang Ho
Fereidoon Shahidi

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Evolution of Korean Dietary Culture and Health Food Concepts

CHERL-HO LEE

Graduate School of Biotechnology, Korea University, Seoul, Korea

TAI-WAN KWON

Department of Food and Nutrition, Inje University, Kimhae, Korea

NORTHEAST ASIA IN THE PALEOLITHIC AGE

Western society has commonly amalgamated all Northeast Asian culture into the category of Chinese culture, when it is in fact comprised of many cultures and segments of ethnic groups that have developed their own identities and distinctive cultures throughout history. At present, these cultures are grouped according to nation: China, Mongolia, Korea, Japan, and part of Russia (Siberia). However, 15 centuries

ago, the ethnic group (or tribe) was more important than the nation in distinguishing the way of life for a people.[1]

The early existence of human beings in this region is indicated by Early Paleolithic remains (1,800,000 to 300,000 years ago, B.P.) of the Early/Middle Pleistocene period on the Northern Chinese Mainland and Korean Peninsula. Evidences of the existence of *Homo erectus* (1,800,000–650,000 B.P.) were found in the Xihoudu, Lantian, and Zhoukoudian sites on the Northern Chinese mainland; in Jinniushan, in the Manchurian Basin; and in the Sokchangni and Chungbuk Keumkul sites on the Korean Peninsula. Zhoukoudian Cave, Locality 1, near Beijing, has yielded the largest number of *Homo erectus* fossils in the world; 40-odd individuals, together with thousands of animal bones.[2] *Homo sapiens* fossils were found in Yokpo Cave (500,000 B.P.) and in Sangwon Cave (400,000 B.P.), near Pyungyang on the Korean peninsula.[3] Recently, several Middle Paleolithic (350,000 to 40,000 B.P.) remains were found on the Korean Peninsula. The stone tools and animal fauna of the Seungrisan, Jommal Yonggul, Durubong, and Chongongni sites were similar to those of the Dingcun site in China. The fauna and stone tools of the Sokchangni seventh and eighth layers, Chongchongam Cave, Gulpori 1, and Sangmu Yongni were comparable to those of Xujiayao site in Northern China. The earliest Paleolithic remains found in Siberia at the Irkutsk site on the Kamchatka Peninsula, were those of 130,000 to 70,000 years ago, similar to those of the Gulpori site on the Korean Peninsula.[4]

Numerous Late Paleolithic (400,000 to 10,000 B.P.) sites were found on the Korean Peninsula, in South Manchuria, and on Japanese Islands as well as the Chinese mainland. These sites indicate the increase in population and the spreading out of the people in this region during the Paleolithic Age.[5] Throughout the glacial periods (Günz, Mindel, Riss, and Würm) of the Pleistocene, the Yellow Plain and the Seto Plain were exposed by lower sea levels, and the East Sea became merely a large lake, which drained through the present Korea Strait. These increased land areas facilitated the movement of humans and animals among and between parts of East Asia.[6] It is also assumed that the Asian Mongolides

moved to the American continent over the Bering Strait in the course of these periods.[2] On the other hand, during the warm interglacial period, the sea levels rose to the present level, and the Korean peninsula became a land bridge, connecting the Japanese Islands to Manchuria and the Maritime Province of Siberia. The sites of Paleolithic remains excavated in Northeast Asia, and the possible migratory routes indicates that mobile hunters chased after large animals moving seasonally from southern Kyushu to northern Manchuria and Siberia through the Korean Peninsula.[6] Animal meat, intestine, and blood were probably the main foodstuff for these people, and the use of vegetable supplements, such as grass seeds, tree nuts, and wild fruits and roots, increased at the later stage of Paleolithic era. The people probably began living in mountain caves, and then gradually moved to the lower plains and riverbanks at the Late Paleolithic Age.

THE IMPORTANCE OF THE PRIMITIVE POTTERY AGE IN KOREAN DIETARY CULTURE

The migratory forager's life of Paleolithic men following the periodical and seasonal movements continued until the use of textured pottery. Textured pottery was probably invented by the people in the Far Eastern region, which includes the southern parts of the Japanese Islands, the Korean Peninsula, and the Bohai (Balhae) Corridor between the years 10,000 and 6000 B.C. The use of *chulmun* (Korean) or *jomon* (Japanese) pottery had spread over the region by 6000 B.C., and it gradually changed the migratory hunter's life into the littoral forager's life along the coastal line. The littoral foragers, using textured pottery as the main tools for food processing and storage, probably existed in the Korea Strait region between 8000 to 3000 B.C., prior to Neolithic agricultural settlement. The authors suggest naming this period "Primitive Pottery Age" in order to distinguish it from the European Mesolithic culture.[7,8] The numerous shell mounds excavated along the coastline and major rivers in the Korean Peninsula indicate that the people were engaged in hunting with bow and arrow, and fishing with carved bone tools and fishing equipment.

Animals provided men with meat, gut, and blood. In addition they may have eaten plants such as acorn, chestnut, wild grape, arrowroot, and other wild roots and vegetables.[6] Gradually they developed the skill of food storage by drying. Knowing they could obtain plenty of food around the dwelling sites they stayed longer in these areas. As long as they habited in one place, they reduced mobile hunting practice, and instead obtained more food collecting seeds of grass and barnyard grass, millet, and wild beans. Step by step they became accustomed to collecting frog and snail in the damp ground, and clams and shellfish in the river or beach. However, these marine foods were difficult to dry, and easily decomposed by autolysis and were rapidly spoiled by microbial growth, so they had to consume them instantly without storage, and therefore did not rely on them.

At this time, crockery was invented, and the event must have changed the primitive people's dietary life greatly. Earthenware enabled them to cook perishable foods easily, handle the wet materials, and store them longer for eating. The earthenware at the initial stage was very weak and clumsy, and water absorbency was too high to be used for proper cooking and long-time storage of liquid foods. Although their use for cooking and storage must be very limited for this reason at the beginning, the people became aware that marine foods could be dried easily after boiling and stored longer, like meat. The initial development of pottery technology must have focused on acquiring this effect, and in this way the Northeast Asian people could have experienced major technical advancements in food processing and culinary cuisine.[8]

The Origin of *Chigae* Culture

Before man knew salty taste by using marine foods, people used to take this mineral ingredient from either animal blood or intestine. They came to crave that salty taste in vegetables and plant foods, which they survived on when game was scanty. The people in Primitive Pottery Age who knew the salty taste and the source, lived near the seashore, so seawater and seafood were used to make food with vegetables,

roots, and grains. This must be the origin of *chigae* culture, which is the most characteristic Korean food culture. *Chigae* is a stew made by boiling slices of vegetables, seaweeds, clam/fish/meat in salty bouillon. It is used as a side dish for a rice meal. In fact the tribes of Papua New Guinea living in the coastal region today still use seawater as a salty ingredient for cooking.[9]

Northeast Asian people, who survived mainly on captured animals, changed their staple food to fish, shellfish, and vegetables after they began to use earthenware in the Korea Strait region. It was the recipe of *chigae* with marine products that furnished a clue as to how salt could enhance the palatability of vegetable food during cooking. The existence of salt would be naturally discovered in the process of boiling seafood in pottery. Although we do not know exactly when the making of salt started, we can presume that people knew about salt from the beginning of *chigae* culture by observing the white powder left around *chigae* bowl when seawater or seafood were boiled. According to Ishige,[9] the pottery for making salt discovered in the Kanto Province has been dated to approximately 500 B.C. after the *Jomon* period in Japan. It was claimed as one of the oldest archeological evidences of making salt by boiling seawater in pottery. He concluded that the production and consumption of the edible salt started at a much later date, after full development of the Agricultural Age. However, if primitive pottery was made at around 6000 B.C. all over the coast of Korea Strait, and people used the pottery to cook *chigae*, they must have known about salt and its production much earlier than Ishige's assumption. From this point of view, we suggest that the production of edible salt from seawater began at the early stage of Primitive Pottery Age.

Nuruk and the Origin of Fermentation Technology

In areas with high temperature and high humidity, mold growth is a natural process in a container storing wet starchy materials, such as plant seeds, millet, barnyard millet, nuts, beans, and tubers. Some molds like *Rhizopus* species produce

enzymes, which can hydrolyze raw starch and convert it into sugars. When sufficient amount of moisture is provided, the sugar is transformed into alcohol by the yeast existing in nature. An alcoholic food or beverage having an attractive aroma is produced within 3 to 4 days in the summer after adding a small amount of water to cooked starchy material in a crock. This is a natural process, which can be easily observed even by early man. When useful microorganisms are grown primarily on the wet seeds and grains, it is called *Nuruk*, the traditional fermentation starter of cereal alcoholic beverage used in Northeast Asian countries. When *Nuruk* is mixed with cooked rice and water in about a 1:1:4 ratio, alcoholic fermentation takes place and is normally completed within one week in summer season. When it is strained with a sieve, turbid liquid is produced, so-called rice-beer, *Makkolli* or *Takju*, and when filtered with a fine filter cloth into a clear liquid it becomes rice-wine, *Chongju*. It appears that the beginning of cereal alcoholic fermentation started by using uncooked starchy ingredients, thus the use of pottery may imply the start of cereal fermentation.

According to the literature, the history of alcoholic beverages is deep-rooted. Chinese literature credits the daughter of King Woo, a legendary king of China who lived around 2100 B.C., as first making an alcoholic beverage.[10] The term "Yojuchonjong (thousand wines in Yao)" implies that alcoholic beverages were made much earlier than Woo's period, and may date from the Yao Shun period, the earliest legendary nation in China. Alcohol fermentation is considered one of the oldest food processing technologies man has ever had, and some believe that alcoholic food or beverages existed from the time human being appeared on earth. The oldest archeological evidence of alcohol fermentation is the rice-wine crock found in the remains of Shang period around 1600 B.C.[10] However, alcohol has been a common beverage from the Myth Era of Northeast Asia dating to 4000 to 3000 B.C. and numerous myths related with alcohol exist in this region.

As stated above, the grain brewery in Northeast Asia presumably started in the early Primitive Pottery Age with the invention of pottery. Although the full-scale production of

grain wine began after the farming culture stage of around 3000 B.C., primitive alcoholic foods must have been known for a long time from the use of primitive pottery. It can be also explained by the fact that alcohol made from grain actually heightened the importance of grain and so may have encouraged the farming culture in this region.

Origin of *Kimchi* Fermentation

It is possible to observe lactic acid fermentation of vegetables yielding sour taste by keeping withered cabbage or turnip slices immersed in 2% brine for 3 to 4 days. This condition resembles that of primitive men putting foraged vegetables into a container holding seawater, and with no exception the result would be lactic acid fermentation. In such condition, *Leuconostoc mesenteroides* will be the suitable candidate dominating the system at the initial stage of fermentation.[11] It is heterofermentative bacteria producing both lactic acid and acetic acid from sugars in vegetable and growing actively until the pH goes down to 4.8. When *L. mesenteroides* cease growth at lower pH, other homofermentative bacteria like *Lactobacillus plantarum*, which produce mainly lactic acid only, start to grow, and the vegetable become very sour like sauerkraut of Germany.

This phenomenon is a natural fermentation, which occurs in any region at any time when the right conditions are provided, and it would be no exception for the people of Primitive Pottery Age. The representative traditional foods are *kimchi* in Korea, sauerkraut in Germany, *dhamuoi* in Vietnam, *dakguadong* in Thailand, and *burong mustala* in the Phillipines.[11] Many of the lactic acid fermented vegetables are made under anaerobic conditions by packing vegetables in sealed containers like ensilage, resulting in very sour products. The vegetable pickles described as "zer" in ancient Chinese literature appears to be this type of product, and are much different from *kimchi,* which is made with brine. *Zer* appears in Shiching, one of the oldest Chinese literatures. In a book on Confucius written in 200 B.C. *zer* was described as follows, "Since King Mun of Zhou enjoyed the taste of *zer*,

Confucius who respected him, tried to eat this pickle with a frown face to follow his every action. Three years later, he finally was able to enjoy the taste like the king." From this story, we can assume that Chinese *zer* had very strong sour taste to the degree that he had to frown his face.[10] The Chinese dictionary written in 100 B.C. also describes *zer* as "sour vegetable pickle."

On the other hand, the vegetable pickles traditionally made in Northeast Asia including the Korean Peninsula are made by salting and subsequent lactic acid fermentation, and have a meeker sour taste. This indicates that the Korean style pickles originated from the natural fermentation of withered vegetables stored in seawater. At the beginning, putrefaction may have occurred due to the low concentration of salt in seawater, and people had to increase the salt concentration in order to keep the vegetable longer and palatable. At around 1000 B.C. salted vegetables with very high salt concentration, 20% or more, were widely made. The most unique factor of Korean *kimchi* is that it has the balance of taste, going through the lactic acid fermentation with relatively low concentration of salt, 3 to 6%, and the addition of other vegetables and spices to help the multiplication of lactic-acid bacteria and to prevent other microbes from growing.

Origin of Fish Fermentation

The Paleolithic men of the Korea Strait came to invent and use earthenware to quickly cook by heating and storing the marine products they had gathered, hence there must have existed and developed some kinds of seafood storage techniques. There would not have been enough salt available at the early stage of this period to be able to make fish sauce and fish paste similar to today's products. Under these conditions, there were not many ways to put seafood in earthenware vessels and to store them for a long time. One possible method is mixing the half-dried seafood with vegetables preserved by the lactic acid fermentation process or with alcoholic foods, as explained above, or else with acidic fruits such as wild berries, grapes, and plum. If one mixes the seafood, which

easily putrefies, with lactic acid fermented vegetables and lowers the pH to under 4.5, one can prevent the proliferation of harmful microorganisms, and therefore it can be stored over a long period of time and be consumed. Under this condition, because of the low salt concentration, the fish decompose rapidly by autolysis due to the intestinal enzymes, and a strong flavor or putrid stench is formed. The smell and taste created in this process would be an unacceptably strong putrid stench to modern men, but to the people of primitive era, who relied on rough plant materials like acorns, plant roots, grass seeds etc., it reminded them of the savory taste of animal meats and intestines. In fact, some fermented fish products made in different regions of the world have too strong a flavor to be consumed by other people. Therefore under conditions where harmful microorganisms do not prevail, the putrefaction and fermentation are distinguished only according to the subjective judgment of consumers.

Seen from such perspective, the mixture of low-salt cured seafood with lactic acid fermented vegetables would be an essential condiment for the people at the transitory stage between a meat diet and vegetarian diet, and can be an archetype of lactic acid fermented fish products, like *sikhae* in Korea, which are widely consumed in East Asia nowadays.[12] It seems that the rapid decomposition of whole fish and the emergence of concomitant strong smell or putrid stench would have been the target to improve, and as a result, the salt concentration would have been gradually raised. There are several ways to increase salt content in the fermentation system without using crystal salt. For example, seawater in earthenware is concentrated by heating, and cooled and then half-dried fish is added. By these means, high-salt fermented fish containing 20% salt can be easily prepared. In case of high-salt curing, lactic acid fermentation with cereals and vegetables or addition of acidic fruit is not necessary. The high-salt fermented fish products, *joetkal,* would have been developed in such way in the Korean Peninsula.

At an even later stage, when, having raised the salt concentration, people came to add *nuruk* in order to achieve

rapid decomposition of fish as well as to reduce strong putrid stench by the action of the enzymes in *nuruk*. This is the origin of *jang*, which has been used widely in Northeast Asia and China as the major preserved food and condiment. The first description on *jang* appears in Juolii written in 200 B.C. in China. It describes two types of *jang*, *hae* and *hie*, and records the methods of preparation. *Hae* is made from sun-dried meats of foul, beast, and fish, and ground into powder, mixed with rice-wine, salt, and *nuruk* made from millet, and packed in a jar, sealed, and aged for 100 days. *Hie* is made from the same materials as *hae*, but acidic plum juice is added to provide a sour taste. It is apparent that *jang* was originally made from meat, and is a kind of meat sauce, not fermented soybean products, which *jang* is commonly called today.[10] It can be said that *jang* is a high-class condiment developed through thousands of years of experience, and applies the same fermentation principles that might have been developed by the people in Korea Strait region during the Primitive Pottery Age

The *chigae* culture and fermentation technique that developed together with the use of earthenware is deemed to have exerted a huge influence on the nutritional condition and social development of the inhabitants of Northeast Asia, especially in Korea. The stewing method of *chigae*, whereby various ingredients were mixed together and boiled, made it possible to provide a more nutritionally balanced diet and from the hygienic standpoint made it possible to have a higher developed food culture. Once the saltiness of food can be adjusted by means of seawater, the taste of food improved and it became possible to use various ingredients that could not be used before. Furthermore, since the fermentation technique made it possible to store seafood and vegetables that putrefy easily, for a long period of time, a stable food supply and improvement of the food taste became possible. This technical development is considered to have greatly improved the nutritional condition of the people of the Primitive Pottery Age compared to that of Paleolithic Man, and consequently resulted in the extension of life span and increased birthrate,

and it probably brought about a sharp population increase. Such social development would have accelerated the development of agriculture and the formation of tribal nations around 4000 B.C. and also would have become the driving force that nurtured the rise of the leading tribe of Northeast Asian megalithic culture named Dong-Yi, the Eastern Tribe, who opened the early monarchical system of the region.

DEVELOPMENT OF KOREAN DIETARY CULTURE

Food habits of a people are primarily decided upon by the availability of food material obtainable in their natural environment. Other influencing factors of food culture include religious belief and thought, influx of foreign culture by war and invasion, knowledge in health and nutrition, and technological developments.[6] Korean dietary culture has evolved from the Primitive Pottery Age culture, which is characterized by the abundant use of marine foods incorporated with fermentation technology.

The Influence of Northern Nomads

When the horse riding people of the north, the *Yemaek* tribe of northeastern *Dong-yi*, came south to the Korean Peninsula to form agrarian communities, they needed to have a stable protein source to replace meat from the animal herds. They invented the use of wild soybean as food by soaking it in water and cooking it properly to be edible and also to eliminate the antinutritional factors in the bean. The *Maek* tribes are considered the first consumers of soybean as food in history.[10] It was cultivated by the nomads who began settlement farming around Mt. Baekdu, South Manchuria, and the Korean Peninsula at the beginning of the Bronze Age (1500 B.C.). In a Bronze Age excavation in Paldang, near Seoul, a smooth earthen vessel having the traces of soybean on the surface was discovered. Botanists believe that the origin of soybean is the line from South Manchuria to the Korean Peninsula where most abundant varieties of wild soybeans are found. The first record on soybean appears in *Shijing*, a Chinese

literature written in the seventh century B.C. The story of soybean expansion into China follows that soybean was brought into China from Sanyung (South Manchuria) in the early seventh century B.C. by Hwangong of the Chhi Dynasty as he conquered Sanyung during the Chhun Chhiu Period, and it was therefore called *yungsuk*.[10]

The early cereal grain cultivated and utilized by the people in Northeastern Asia and the Korean Peninsula appears to be millet, which is the native plant in this region. The origin of short grain rice in this region is obscure, but numerous carbonized rice grains dated to be of the Bronze Age or earlier have been excavated. Soybean played an important role not only in supplementing protein but also providing palatability in the form of fermented soybean products to the bland cereal and vegetable diet. *Weyjyh, Dong-yi joen, Kokuryo cho* of *Sanguojyh*, a history book written in the sixth century in China, describes the people of Kokuryo (one of the three Korean Kingdoms) as experts in preparing fermented soybean products.

The production of soy sauce by the *Maek* tribe, who were originally meat-eating nomads, created a typical Korean dish, *Bulgoki* "fire" beef, the grilled meat marinated with soybean sauce. In Chin (B.C. 221 to 206) of China, the marinated grilled meat was called *Maek-chok*, which meant Korean grilled meat. The meat diet of the nomads gradually changed because of their changing settlement patterns, as they adapted to the cereal-based food diet of the natives on the southern plains.

The Influence of Buddhism

The introduction of Buddhism to the Korean Peninsula in A.D. 372 (Koguryo) and in A.D. 528 (Silla), accelerated the reduction of animal food consumption and encouraged the spread of vegetarian food habits. According to *Samguksaki* (1145), the oldest document of Korean history, rice, wine, oil, honey, soy sauce, soybean paste, dried meat and fish sauce were all important food items that were prepared for a wedding in the royal family in Silla in the year of 683 A.D. The people of the Unified Silla and succeeding Koryo dynasty were

strong Buddhists. During these thousand years of the period, the nomadic animal food habits disappeared. The extensive use of salted vegetables and soybean, as the major source of protein, resulted from this change. The technologies of soy-sauce fermentation and rice-wine making were well developed and transferred to neighboring countries. The document of *Shoso-in* (752 A.D.) of Japan describes *Miso*, the Japanese name of soybean paste, as a dialect from *Koryo* (Korea) and often called *Koryo Jang*.[10] The ancient Japanese history book, *Kojiki*, mentions that a man from *Baekje* taught them how to make rice-wine. The memorial tablet of a man called *Chin* of *Silla* is kept in a shrine, the Matuo Taisha in Kyoto, as a god of rice-wine. The rice-wine producers in Japan today attend an annual worship ceremony for him, in order to pray for success in their own wine brewing.

The Influence of Mongol (Yuan) Invasion and Confucianism

The Chinese *Yuan* (Mongol) invasion of Koryo in the 13th century (1259 to 1356) and the respect for Confucianism in Chosun Kingdom brought about the suppression of Buddhism and restored the animal food habit of Korea. Another important change in the Korean diet took place when red pepper was introduced, in the 17th century. The route of the propagation of red pepper into Korea is unknown. Korean literature describes how it was introduced from Japan during the Korean-Japanese War in the 1600s, while some Japanese literature records that it was introduced through Korea into Japan. With the introduction of red pepper, the traditional salted-vegetable dish was transformed into today's *kimchi*. *Kochujang*, a typical hot soybean paste of Korea was also developed through the introduction of red pepper.

During the Chosun Kingdom (1382 to 1910), a well-balanced variety of foods, of both animal and vegetable origins, were utilized. *Imwon sibyukchi*, an encyclopedia written in 1827 by *Soe YuGu*, describes 11 kinds of water, 36 kinds of cereal, 72 kinds of vegetables, 13 kinds of poultry, 34 kinds of fish, and 8 kinds of spice, as major food materials that were

used in the 19th century of Korea. The ideal diet for Koreans was standardized between the 15th and the 19th centuries. Records of an ideal standard meal for Koreans appear in much of the literature of the Choson Kingdom, for example, in *Shiui Chonso*, written in the 19th century. The literature written between the 17th and the 19th centuries outline a standard meal consisting of a bowl of cooked rice, a bowl of soup, and a dish of kimchi as the basic constituents. To this basic menu, side dishes are added, forming a three-dish meal (*samchop bansang*), a five-dish meal (*ochop bansang*), a seven-dish meal (*chilchop bansang*) (Table 8.4), and so on.[13] A 12-dish meal was an extravagance served only for the king.

The Influence of Western Culture and Korean War

Korea opened her gate to Western countries in the 1870s, much later than Japan and China. The European and Russian diplomats, as well as missionaries from America introduced cakes and coffee. However, it was soon overshadowed by the Japanese invasion of Korea, and she was annexed to Japan in 1910 for 36 years. One of the statistical records of the colonial regime shows that one-third of rice produced in Korea was extorted to Japan every year during this period.[14]

The people suffered greatly with the shortage of food and even defatted soybean flake was rationed as a substitution of rice. Soon after the rehabilitation in 1945, hundreds of thousand people moved from Communist North Korea to South Korea. The total number of refugees from North to the South after the Korean War (1950 to 1953) was estimated at 2 million.

The famine during the Korean War was barely overcome by wheat flour and nonfat dry milk given by the U.S. Aid Program. Milk porridges were rationed to the starved people who had been nonmilk-eating people. After severe lactose intolerance symptoms, people gradually adapted to eating milk porridge. It triggered the explosive consumption of milk products during the economic growth of the 1970s to 1980s, and the rapid Westernization of Korean food habits afterward.[14]

HEALTH CONCEPTS IN TRADITIONAL MEDICINE

The early classics of Chinese literature are the products of a long history of philosophy, religion, culture, and wisdom of the many tribes in this region. The early historians in China described the lives of neighboring countries. The Eastern Tribe inhabited a wide range of Northeast Asia, from the Shandong Peninsula to the Bohai Corridor, the Manchurian Basin, the Liadong Peninsula, and the Korean Peninsula, which was mostly ruled by Koguryo until the fifth century A.D.[2] Taoism, the folk religion that originated from the shamanistic beliefs of this region, forms the basis of the health concepts found in the traditional diet and medicine of the Northeast Asian people.

Taoism

Korean thought on life and health is based on the shamanistic folk philosophy, Taoism, which sets as the ultimate goal a healthy eternal life. The established Taoism, as developed by early Chinese philosophers teaches that this goal can be achieved by discipline, mainly through the control of breath, sex, and food. The principle of control is the harmony of *yin* and *yang*, the negative and positive nature of the universe.[15]

The pictographs on the engraved tortoise shells found in China show that the basic principles of *yin* and *yang* were a part of the Shang dynasty, and that they originated from the legendary saint, Bok-Eui (3000 B.C.), the God of Divination. The Chinese characters, which are used today, were formed in the Jou dynasty (1100 to 220 B.C.). The Theory of Interchange developed through the Jou dynasty for 3,000 years led to Taoism and Confucianism.

YIN AND *YANG* AND THE *FIVE PHASES* THEORY

The Book of Changes, *Yijing*, is the basis of the *yin* and *yang* theory and the Principles of *Five Phases*, and it contains the principles that explain changes in the universe and in nature.[15] Examples of *yin* and *yang* that are commonly found in nature are dark/bright, female/male, inside/outside, center/circumference, weak/strong, empty/full, cold/hot,

rise/descend, plants/animals, death/life, moisture/dryness, big/small, sparse/dense, and electron/proton. The important principles applied to the *yin-yang* relationship are mutual suppression and repulsion, mutual dependence, mutual compensation for equilibrium, and mutual transformation. The principle implies that there is no absolute *yin* (negative) or *yang* (positive) in nature, and that everything is relative.

Wood, Fire, Earth, Metal, and Water represent the Principle of Five Phases. It implies transition, movement, or passage, rather than the stable, homogeneous chemical constituents such as Earth, Air, Fire, and Water, the four eternal elements of ancient Greek science. The Five Phases is the principle of changes linked by the relationships of generation and destruction (or suppression), as shown in Figure 8.1.[16]

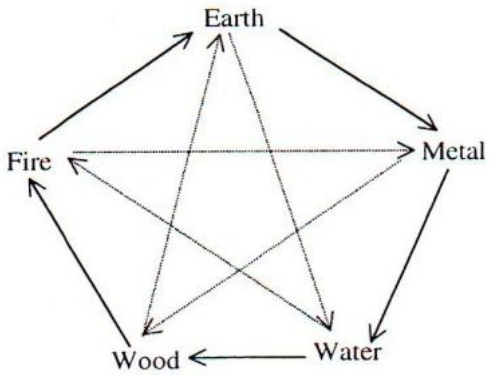


Figure 8.1 The Five Phases. As individual names or labels for the finer ramifications of yin and yang, the Five Phases represent aspects in the cycle of changes. The Five Phases are linked by relationships of generation and destruction. Patterns of destruction may be summarized as follows: water puts out fire; fire melts metal; a metal ax will cut wood; a wooden plow will turn the earth; an earthen dam will stop the flow of water. The cycle of generation proceeds as water produces the wood of trees; wood produces fire; fire creates ash, or earth; earth is the source of metal; and when metals are heated, they flow like water. (From LN Magmer, A History of Medicine, New York; Marcel Dekker, 1992, p. 46.)

TABLE 8.1 Classification of the *Five Phases*

5 Phases	Taste	Organs	Intestines	Senses	Tissues
Wood	Sour	Liver	Gall bladder	Eye	Tendon
Fire	Bitter	Heart	Small intestine	Tongue	Pulse
Earth	Sweet	Spleen	Stomach	Mouth	Meat
Metal	Hot	Lung	Large intestine	Nose	Skin and hair
Water	Salty	Kidney	Bladder	Ear	Bone

According to *yin-yang* and the Five Phases Theory, all food materials are classified by their properties and their different tastes. The properties are cool, as *yin*; neutral; and warm as *yang*. For example, fruits on the tree are considered to have *yang* property, while roots in the soil have *yin* property. *Yin* property also represents material entities such as nutrients; while *yang* property represents functions, like energy. Taste is divided into five groups, representing the Five Phases; sour-Wood, bitter-Fire, sweet-Earth, pungent-Metal, and salty-Water. As shown in Table 8.1, taste can be related to the human body and its organs, senses, and feelings, and even to color, the weather, and the seasons, through classification into the Five Phases. Antagonistic or affinitive relations between tastes and organs/senses are also judged or predicted by the principles of the *Five Phases*. For example, sour (*wood*) generates heart (*fire*) but suppresses spleen (*earth*), and salty is related to kidney and generates liver and suppresses heart. Though simplified unrealistically, it explains the basic notion of *Five Phases* applied to food and health practice.[8]

Eastern Medicine

The oldest Chinese medicinal book, The Yellow Emperor's Classic of Medicine, written in the Chin and Han period of China (220 B.C. to 220 A.D.) contains theories of man–universe unity, *yin* and *yang*, the *Five Phases*, the Ten Calendar Signs (the decimal system), Earth's Twelve Branches (the duodecimal system), and other fundamental principles of medical treatment.[17] This book was first introduced into Korea in the

period of Koguryo King Pyungwon, in year 3 (561 A.D.). Since then, Chinese medicinal knowledge has greatly influenced the health concepts and food habits of the Korean people. It has contributed to the development of Eastern Medicine, in combination with traditional folk medicine in Korea, as recorded by Hur Jun in 1611.[18] Eastern Medicine was further developed during the 18th and 19th centuries, and grew into Sasang Medicine: as described by Lee Je-Ma in 1894.[19] Sasang is a unique theory of categorizing people into four body types according to their physical constitutions, Tae Yang, Tae Eum, So Yang, and So Eum. It emphasizes the importance of individual body type in the diagnosis and treatment of diseases and suggests prescribing different medicinal treatments and food supplies for each.

HEALTH CONCEPTS IN TRADITIONAL KOREAN DIET

The basic idea of traditional Korean nutrition is to harmonize properties and tastes in the diet on the basis of *yin* and *yang* and the *Five Phases*. A diet that emphasizes one property or extreme taste is considered to be unhealthy. Korean meals are prepared to harmonize the properties and tastes through selecting the proper ingredients and process. A Korean meal containing a bowl of rice, mugwort soup, cabbage kimchi, shepherd's purse salad, broiled plant root (*Codonopsis lanceolata*) fernbrake salad, stewed yellow corvina, and leek pancakes was analyzed in terms of *yin-yang* and the *Five Phases*, as shown in Table 8.2.[20] It showed that the composition of the meal is well balanced in terms of *yin* and *yang* and the *Five Phases*.

Recently, K. B. Lee, Emeritus Professor of the Medical School of Seoul National University, compiled several food lists categorizing foods as desirable or undesirable for people of different body type according to Sasang Medicine, as shown in Table 8.3. He developed a simple test to identify the body types of individuals, which is known as the "O-Ring Method."[21] Table 8.3 shows that some foods, like rice, Italian millet, and corn, are desirable for all types of people; while glutinous rice

TABLE 8.2 Analysis of a Korean Meal in Terms of *Yin-Yang* and the *Five Phases*

	Wood (Sour)	Fire (Bitter)	Earth (Sweet)	Metal (Pungent)	Water (Salty)
Yang (warm)	Leek	Mugwort	Shepherd's purse, wheat flour	Green onion, garlic, ginger, black pepper, sesame	Salt
Neutral			Water, rice, soybeans, yellow corvina		
Yin (cool)	Vinegar	Plant root, fernbrake	Cabbage	Onion	Soy sauce, soybean paste

TABLE 8.3 Desirable (O) and Undesirable (X) Foods for the People of Different Body Type

	TY	SY	TE	SE		TY	SY	TE	SE		TY	SY	TE	SE		TY	SY	TE	SE
Polished rice	O	O	O	O	Sugar	X	X	X	X	Tomato	O	O	O	O	Walnut	X	X	O	O
Brown rice	O	O	O	O	Glucose	O	O	X	O	Mustard	X	X	O	O	Gingko nut	X	X	O	O
Glutinous rice	X	X	O	O	Chocolate	O	O	X	X	Pepper	X	X	O	O	Pinenut	O	O	O	X
Barley	O	O	O	X						Curry	X	X	O	O	Peach				
Wheat bran	X	O	O	X	Korean cabbage	O	O	X	X	Chinese radish	X	O	O	O	Sea mustard	O	X	O	O
Buck wheat	O	O	O	X	Cabbage	O	O	X	X	Carrot	X	X	O	X	Laver	O	X	O	O
White soybeans	X	X	O	O	Kale	O	O	X	X	Lotus root	O	O	O	O	Sea tangle	O	X	O	O
Black soybeans	O	O	X	X	Lettuce	O	O	O	O	Root of Chinese bellflower	X	X	O	X					
Colored beans	O	O	O	O	Young radish	X	O	O	O	*Codonopsis lanceolata*	X	X	O	X	Beef	X	O	O	O
Kidney beans	O	O	O	O	Spinach	O	O	O	O	Burdock	O	O	O	O	Pork	X	O	O	X
Peanuts	X	O	O	X	Crown daisy	O	O	O	O	Hemp	X	X	O	X	Chicken	X	X	O	O
Gray redbeans	O	O	O	X	Celery	X	O	X	X	Musk melon	X	O	X	X	Dog meat	X	X	O	O

Red beans	O	O	O	X	Parsley	O	O	O	O	Watermelon	X	O	O	X	Milk	X	O	O	O
Adlay	X	X	O	X	Watercress	X	O	X	X	Strawberry	O	O	O	O	Egg	X	O	O	O
Italian millet	O	O	O	O	Green onion	O	X	O	O	Persimmon	O	O	X	X	Shellfish	O	O	X	X
Indian millet	X	X	O	O	Onion	X	X	O	O	Pear	O	O	X	X	Shrimp	O	O	X	X
Sorghum	X	X	O	X	Leek	O	X	O	O	Apple	X	X	O	O	Crab	O	O	X	X
Corn	O	O	O	O	Red pepper	X	X	O	O	Citrus fruit	O	X	O	O	Oyster	O	O	X	X
Mung beans	O	O	X	X	Ginger	X	X	O	O	Orange	X	X	O	O	Squid	O	O	X	X
White sesame	X	X	O	O	Garlic	X	X	O	O	Lemon	X	X	O	O	Hairtail	O	O	X	X
Black sesame	O	O	X	X	Sesame leaf	O	O	X	X	Grape	O	O	X	X	Mackerel	O	O	X	X
Perilla	O	O	X	X	Pumpkin	O	O	O	O	Banana	O	O	O	X	Herring	O	O	X	X
Potato	O	X	O	O	Eggplant	O	O	O	O	Jujube	X	X	X	O	Yellow corvenia	O	X	O	O
Sweet potato	O	X	O	O	Cucumber	O	O	O	X	Chestnut	X	X	O	X					
Honey	X	X	O	O	Young antler	X	X	O	O	Ogapi	O	X	X	X	Vitamin E	X	O	X	X
Ginseng	X	X	O	O	Youngji	X	O	X	X	Vitamin B	X	X	O	O	Vitamin C	O	O	O	O

Note: TY=Tae Yang; SY=So Yang; TE=Tae Eum; SE=So Eum

is desirable only for *yin*-type people and cabbage only for *yang*-type people. The reliability of this categorization is not confirmed, but it provides an example of how to select the foods that are desirable for an individual body. This kind of thinking forms the basis of the therapeutic food concepts of the Korean people.

NUTRITIONAL VALUE OF THE TRADITIONAL KOREAN DIET

On the basis of the philosophical ideas and medical knowledge developed in China and Korea, the Korean people have developed a standardized ideal meal, within a systematic menu program, that is called *Chop Bansang*. Recently, the nutritional value of the Korean traditional diet was analyzed using the seven-dish meal menu of Kim Ho-Jik (1944) and the standard weekly menu of Pang Sing-Young (1957) and was compared to the current Recommended Dietary Allowances (RDA) for Koreans.[20] Table 8.4 shows the nutritional value of a traditional Korean meal in the menu of Kim Ho-Jik as calculated by the current Food Composition Table of Korean Food. The basic meal consisting of a bowl of cooked rice, a bowl of soup, and a dish of kimchi, could supply 40% of the energy and 48.7% of the protein of the RDA. When three dishes were added to the basic meal, the three-dish meal (*samchop bansang*) contained 47.2% of the energy and 94.3% of the protein of the RDA. Sufficient amounts of minerals and vitamins were supplied by the three-dish meal. Carbohydrates contributed 77% and 64.4% of the total energy in the basic meal and the three-dish meal, respectively; while lipid contributed only 8.3% and 11.6%. The energy from lipid did not exceed 12% of the total energy supply until a five-dish meal, which was considered a luxury, was analyzed.

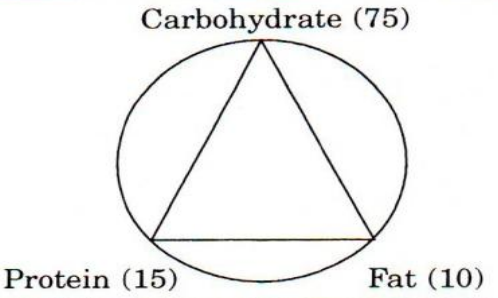
The Korean traditional diet was estimated to be able to supply from 2,000 to 2,500 calories and from 80 to 90 grams of protein per day. The energy constituents were 73 to 77% carbohydrates, 15 to 18% proteins, and 10 to 12% lipids. Animal protein was 20 to 30% of the total protein. The contribution of lipid energy in total calorie intake did not significantly

TABLE 8.4 Evaluation of the Nutritional Value of a Traditional Korean Meal in the Menu of Kim Ho-Jik (1944)

Type of menu	Basic meal	Three-dish meal	Five-dish meal	Seven-dish meal
Composition of menu	Cooked rice, soup, kimchi	Basic meal + spinach, roasted beef, dried fish	Three-dish meal with stew + meat jelly, fermented fish roe	Five-dish meal + panned oysters. radish kimchi
Total energy (kcal)	995 (40.0)	1181 (47.2)	1320 (52.8)	1672 (66.8)
Carbohydrate (%)	77.0	64.4	60.1	53.4
Protein (%)	14.7	24.0	28.0	27.7
Lipid (%)	8.3	11.6	11.9	18.9
Total protein (g)	36.5 (48.7)	70.7 (94.3)	92.5 (123.3)	115.5 (154.0)
Animal protein (g)	28.7	59.5	69.0	72.3
Ca (mg)	161.1 (26.9)	216.3 (36.1)	255 (42.5)	596 (99.3)
Fe (mg)	12.1 (121.9)	23 (230)	26.8 (268)	40.3 (403)
Vitamin A (I.U)	426.2 (17.1)	8,7616.6 (350.5)	9,129 (365.2)	9,965 (398.6)
Vitamin B_1 (mg)	0.62 (47.6)	0.86 (66.2)	1,08 (8.1)	2.16 (166.2)
Vitamin B_2 (mg)	1.92 (127.9)	3.03 (202.2)	3.44 (229.3)	4.35 (290.4)
Niacin (mg)	11.6 (68.3)	28.9 (169.9)	37.1 (218.2)	45.8 (269.4)
Vitamin C (mg)	19.7 (35.9)	83.7 (152.2)	86.4 (157.2)	99.6 (181.2)

Note: () percent of RDA

TABLE 8.5 Estimated Dietary Goals as Shown in the Traditional Korean Standard Meal

Daily intake of an adult man	
Energy 2,000 to 2,500 kcal	
Protein 80 to 90 g	
Energy composition	
Carbohydrate 73 to 77%	
Protein 15 to 18%	
Lipid 10 to 12%	
Protein composition	
Animal protein 20 to 30%	

change by increasing the number of side dishes up to five, but that of protein did increase. It appears that the Korean traditional diet could supply amounts of protein, minerals, and vitamins sufficient to nourish an adult male whose energy intake exceeded 2,000 calories per day.

The dietary goal to be achieved in the Korean standard meal appears to be for an adult man to be supplied daily with 2,000 to 2,500 kcal energy, made up from 75% carbohydrate, 15% protein, and 10% lipid, as shown in Table 8.5. The daily intake of energy to be achieved in a Korean standard meal is similar to present-day recommendations, but the composition of the energy is different. The traditional diet emphasizes the low intake of lipids, only 10% of total energy, which are one half of today's recommendation and a quarter of the average American diet. The large amounts of carbohydrates, which are mainly supplied from cereals and vegetables, and the small amounts of animal meat and fat are characteristic of the traditional Korean diet.

FOOD AS MEDICINE

In the traditional Korean culture, food was considered to be the fundamental source of health, and it was believed that all diseases could be cured by the control of food intake. Without any knowledge of the chemical composition of foods, nutritional value could be evaluated solely through the medicinal effects on human subjects. While the science of nutrition

in Western society was tested mainly through animal experiments, Korean concepts of food and nutrition developed through long experience with human trials.

On the basis of the health and nutritional concepts of Korea, Hong Seon Pyo proposed dietary guidelines in his Book of Korean Cookery, published in 1940, as follows[22]:

1. Eat only when hungry
2. Eat hard materials, with adequate mastication
3. Stop eating before achieving satisfaction
4. Eat raw food wherever possible

He suggested using certain principles in selecting ingredients for the preparation of healthy food:

1. fresh
2. raw
3. natural
4. long-lived plants and animals
5. dense texture
6. young plants and animals
7. materials produced nearby
8. nonstimulating foods

He also recommended the reduction of salt and fine sugar intake. His dietary guidelines and his principles of selecting food materials are widely accepted today.

Considering food to be medicine, practitioners of traditional medicine studied each food ingredient for its property, taste, and medicinal effects. Their knowledge has been compiled in numerous medicinal books for thousands of years, and has been practiced in everyday life at the household level as a part of Korean dietary custom. Food preparation was likened to prescribing medicine for the individuals in a household. The word *yaknyum,* the general term for seasoning, means "thought of medicine." This mentality refuses to accept processed food made in a mass production system. The enormous size of the health food market today in Korea reflects the country's tradition of "food as medicine."

A recent survey of consumers' attitudes toward health food and their perceptions on health and food habits in Korea

revealed that the people considered their food habits as being the most important factor in the maintenance of health, followed by physical exercise. More than 90% of the people believed that food habits were the most important factor determining the health condition of human beings, and those diseases could be prevented and cured by adjusting food habits.[23] One half of the subjects had made use of health foods, and 68 percent of them believed in their effectiveness.[24]

Conclusion

Many reports suggested that low fat intake and high plant food intake of the Koreans might be part of the reason for the lower prevalence of obesity, lower death rates due to coronary heart disease, high blood pressure, and the lowest rate of breast cancer and prostate and colon cancers than in many other Asian and Western countries.[25] Koreans believe the adage of "food as medicine." Therefore, herbs or fruit ingredients such as ginger, cinnamon, adlay, mugwort, pomegranate, citron, mushroom, ginseng etc., were used in cooking, and also used for their therapeutic effects. Some of the well-known food supplementary ingredients today in the United States such as ginger, garlic, dates, chestnuts, gingko, soybeans, and others have been used as spices in traditional Korean dishes for generations. Therefore, today the Western term "functional foods" is the same as the traditional Eastern term of therapeutic foods or health foods that have been commonly used in Korea for many years.

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