

## CHAPTER II

### Human Diet Before Modern Times

By Birger Jansson

In: Sodium: "NO!" Potassium: "Yes!"  
Sodium increases and potassium decreases cancer risks.  
Jansson Birger, Unpublished book, 1997

Were our ancient ancestors, who belonged to the genus *Homo* and especially the ones belonging to our own species *H. sapiens*, vegetarians, meat-eaters or both? Did they eat salt? These are questions for which the answers are vague or non-existent. The information available indicate that they were omnivorous and with no or a very small intake of salt. Let us first look at the information we can obtain from our knowledge of the human evolution and then continue with studies of the diet and salt intake of primitive people studied in recent times. Finally, the history of the use of salt in Scandinavia will illustrate the human salt intake from the middle ages till now.

*"Biologically speaking, man is still a wild animal and there is no reason to suppose that his biology is adapted to anything but wild foods. There simply has not been time for any selective evolution to have changed mankind as mankind has changed its pattern of eating".*

Michael Crawford & David Marsh (1).

#### Information from human evolution.

Our closest living primate relatives are the chimpanzees and the gorillas. Comparisons of the nuclear and mitochondrial DNA for these species and for us have shown that the chimps are closer to humans than they are to the gorillas and that these two apes are closer to us than the orangutans and the gibbons are (2, 3). The gorillas are strictly vegetarians feeding almost exclusively on leaves. The chimpanzee's main food is fruit, however, they occasionally kill and eat small mammals such as monkeys. Insects are also part of the diet for these apes. The diet of the chimps consists in the wild to more than 95% of vegetables and the diet of the gorillas to practically 100% of vegetables.

The human line separated from the African apes 5-10 MYA (million years ago) (4, 5) and it is quite possible that the chimpanzee ancestor at the point of breaking out from the humans was more vegetarian than the chimp is today and that an increased meat eating among the chimpanzees has followed a similar development as it has for humans.

Fossil finds in Africa have unearthed the oldest species considered to be an hominid. Its genus is *Australopithecus* of which a skull was discovered in the 1920s in South Africa by Raymond Dart. It was followed by a number of findings of which the most well-known undouble is the almost complete skeleton of "Lucy", a young woman whose remains were found at Hadar in the Afar Depression in West Africa in 1974 by Donald Johanson (3, 6). It was given the name *Australopithecus afarensis*, which means the "South Ape from Afar". It has been estimated that *A. afarensis* lived between 4 and 3 MYA while later species of *Australopithecus* may have existed until 1 MYA (million years ago). An analysis of the wear of the teeth indicates that the

early australopithecines were vegetarians while later species might have been more omnivorous. There are no indications that they were real meat eaters. Their diet was thus close to the diet of the apes.

A little more than 2 MYA (million years ago) the first species considered to belong to the genus *Homo* evolved from the australopithecines. This was *H. habilis* - the handy man. He was the first to make and use stone tools, which gave him his name. These tools may have been used for preparing meat before eating and it is believed that *habilis* is the first hominid that was carnivorous. The dominating part of the *habilis* diet was probably still vegetarian, but bone fragments of animals found together with the tools indicate meat eating. He was probably a scavenger rather than a hunter getting his meat from the rests of the meals left by carnivorous animals.

About 1.7 MYA *H. habilis* was replaced by *H. erectus*. While *habilis* seems to have stayed in Africa during all the 0.5 million years of its existence *erectus* was the first *Homo* to spread to other parts of the world. He became the first human to settle on the euro Asian continent. *Erectus* was clearly more advanced than *habilis*, his tools were more sophisticated, he probably used furs for cloth and for sleeping on, he mastered the use of fire and thus almost certainly cooked his meat, it is possible that he even had a primitive language. Another sign of his success was that he remained in more than one million years until the arrival of modern man *H. sapiens* about 0.5 MYA. *Erectus* was without doubt a hunter and scavenger and thus a meat-eater. It is, however, most likely that he was also a gatherer eating many sorts and many parts of edible plants. The percentage of his meat intake certainly varied from a low percent in the warm regions to a higher percent for the people living close to the cold northern areas of his domain.

Half a million years ago modern man, *Homo sapiens*, entered the stage first in an archaic form and later from sometime between 200,000 and 400,000 years ago as today's man displacing *erectus* probably not by higher strength but by higher intelligence. By using mitochondrial DNA Cann (5) determined that the first truly modern human was a woman living in Africa about 200,000 years ago. She was thus our ancestral Eve and the paradise of Eden was somewhere in Africa. It is no reason to believe that the diet of *H. erectus* did not prevail also for *H. sapiens*. The stone age humans were gatherers, hunters and scavengers as many of today's primitive people still were at least until a few decades ago. Very little information exists on the diets before the agricultural revolution that occurred about 10,000 years ago almost simultaneously all over the world. The humans were before the introduction of agriculture nomads following growing seasons of various plants and the movements of the animals. Their knowledge of edible and healthful parts of plants was great and their diet well balanced. The meat they ate, which probably in most places, - was only a small part of their diet, came from lean game and is not comparable to the fat feedlot meat consumed today.

The arrival of agriculture and domestication of animals changed the diet and it did not improve it. The anthropologist Diamond has said that introduction of agriculture was "the worst mistake in the history of the human race" (7). The well balanced and mainly vegetarian diet was replaced by a diet based on only a few staple grains and a few vegetables. Later the lean game meat was traded for a fat meat, which furthermore in our times has been preserved by salt and "protected and improved" by chemicals. We have thereby changed our diet drastically in such a short time that our slow human evolution has not had time enough for us to adapt to the changes. I echo the sentences quoted from Crawford and Marsh and used as a vignette to this paragraph. The conclusion is that we are made for the wild men's diet and not for the un-physiological diet we are exposed to. A consequence is that we are today vulnerable to a number of diseases of

civilization, — such as cardiovascular diseases, diabetes, asthma, and cancer.

What about intake of salt (sodium chloride) in prehistoric times? Very little is known on the use of this chemical among people before the introduction of agriculture. We know that apes in the wild normally do not eat salt. Jane Goodall, however, reports that the wild chimpanzees she studied in Gombe (10) ate salt when they were offered it. It has been reported that apes and other animals search for and eat mineral rich dirt to get essential minerals. A study on baboons, however, showed that even if they since birth had been fed high salt diets they choose to eat low salt food when they were given a choice (9). Animals certainly do not collect salt and use it together with their food. The same must have been true for the australopithecines and the earlier *Homo* species. Since salt taste is believed to be acquired, which, however, is contradicted by the baboon results mentioned above, it is possible that people finding and trying salt may have developed a liking for it and continued searching for and eating it. The amount of sodium chloride taken in this way is, however, to be expected to be small and not at all comparable to the amounts we indulge in today mainly caused by processing and preservation of our food by the food industries. As will be found in the next paragraph primitive people living on or almost on stone age standard without exceptions avoid salt and the taste of salt, which indicates that the earlier humans were not salt eaters.

### **Robinson Crusoe discussing Friday:**

*"...but that which was strangest to him, was, to see me eat salt with it; he made a sign to me, that the salt was not good to eat, and putting a little in his own mouth, he seem'd to nauseate it, and would spit and sputter at it, washing his mouth with fresh water after it"*

Daniel Defoe "Robinson Crusoe"

### **Salt intake among primitive people.**

The primitive people of the world, the hunter-gatherers, rapidly disappear. Our generation is certainly the last one to be able to study these people in real life. The few remaining hunter-gatherers are our last opportunity to get to know their lives and food intakes. The anthropologists conclude, that people before agriculture changed their nomadic lifestyle, lived good lives with well-balanced diets based on a deep knowledge on existing edible plants and animals. Only a few hours a day was used for work, that is for collecting the day's food either by gathering foodstuff from the plant world or by hunting or scavenging from the animal world. They had plenty of leisure time for creating art, telling stories, music, dance, etcetera. They had no reason to envy today's hard working persons with their lack of free time and their artificial and non-physiological diets. The primitive people had no reason to preserve their food the way we do. Their "preservation" was by food sharing. The successful hunter shared his boot with the other people in the tribe. The day he was less successful he was on the receiving line for sharing the results of that day's successful hunter (10). Even if the primitive people had known how to preserve food by using salt there would have been no incentive for them to do it.

Let us look closer at some primitive people and especially concentrate on their

dietary intake of potassium and sodium and compare with our intake of these elements. Eaton and Konner (11) in an interesting article and in a book (12) have estimated that in the Paleolithic time the intake of sodium was 10-30% of what it is today while the potassium intake was 2-3 times higher than today. They concluded that the potassium/sodium ratio in the Paleolithic diet was about 16 times higher than what it is today. As we shall see their estimate may be much too low, the correct figure may be 100 or even higher.

## **The Yanomamas**

In the borderland of Venezuela and Brazil, where Rio Orinoco has its sources, a primitive Indian tribe has its territory (13,14). These Indians, who are named the Yanomamas, lived almost completely isolated from other people and especially from all influence of civilization until the 1960s. They have taken the first steps away from the hunter-gatherer state by being primitive horticulturalists; they mainly grow plantains, bananas, and manioc. Their gardens are simple openings in the forest where bushes and trees are removed. Frequently they abandon a garden and move to another site where a new garden is started.

Besides the gardening they are hunters and gatherers. The jungle gives the Yanomamas an abundance of plant and animal food. They gather palm fruits, tubers, nuts, etc. and hunt monkeys, fowl, wild pigs, etc. They also collect honey and eat insects.

Most remarkable is that their staple foods are potassium rich plantains (*Musa paradisiaca*) and bananas (*Musa sapientum*), which they eat to each meal. Also remarkable is their repugnance for salt (sodium chloride). They behave as Robinson Crusoe's servant Friday when they get salt in their mouths (see the vignette above!) and it is of interest to note that Defoe already in the year 1719 had this understanding of primitive peoples' abhorrence for table salt. It has been reported, that the Yanomamas as many other primitive people use the ashes of burned leaves and other parts of plants as condiments. This ash is, however, lacking in sodium and it is instead rich in potassium.

The Yanomamas have during the last three decades been thoroughly studied by medical groups, who have lived with them during long periods of time. A general conclusion from these studies is that these Indians are very healthy. They are not hit by such diseases that are characterized as "diseases of civilization", such as cardiovascular diseases, cancer, diabetes, asthma, dental caries, etc. The dominating causes of death among the Yanomamas seems to be infectious diseases and violence. Selective infanticide is practiced and common. About 40% of the girls die during their first year of life compared to about 20% of the boys (15). Of the females, who survive until 15 years of age 18% will be 65 or older. The corresponding figure for the males is 14%. These figures are high enough for assuming that persons afflicted with "diseases of civilization" should have been observed by medically trained people if such diseases had existed among the Yanomama Indians.

Oliver et al. (16,17) and Nowaczynski et al. (18) measured the urinary excretion of sodium and potassium in the Yanomama Indians and compared it to excretions in the medical people in the study groups. From their data we find that in average the Indians K/Na was 150, 303 and 185 (18). The corresponding values for the study groups were 0.38, 0.32 and 0.51. With the plausible assumption that the urinary excretions reflect the dietary intakes we thus conclude that the dietary K/Na is about 400 times or higher than this ratio is for the controls in the study groups. Now, of course, the "no salt-much banana" eating Yanomamas may be unique, however, they prove that people can live healthy lives on diets very high in potassium and very low in sodium. The Yanomamas' K/Na ratios are much higher than the estimate given by Eaton, Konner

(11, 12), which was only 16.

Oliver et al. (16, 18) measured the blood pressure for the Yanomamas and reported that both the systolic and the diastolic pressures for males as well as for females are lower than respectively 110 and 70 and that they do not change by increasing age in the way they do for acculturated people.

There are no reports in the literature that Yanomama Indians with cardiovascular diseases, cancer, diabetes, asthma, obesity, etc. have been observed. Since these Indians are practically nude experienced medical people living with them must be expected to have noted such diseases if they existed.

## **Papuan people in the Highlands of West New Guinea**

The west part of New Guinea belonged to the Netherlands until 1962. It consists of a mountainous highland with peaks up to 15,000 feet. This highland is inhabited by the Papuan people, who lived on stone age standards until their discovery in the 1930s. The regions, where this people live, is very difficult to reach and even today many of the tribes remain very primitive (19-22). The staple food is sweet potato (*Ipomoea batatas*) of which both the tubers and its leaves are eaten. The sweet potatoes are grown in gardens around the villages.

It has been estimated that the daily intake of food consists per capita of 2 kg. of sweet potatoes and 200 g. of sweet potato leaves. Very small quantities of other types of food is consumed. The Highland Papuans keep pigs but these are only eaten at feasts and even then in very small quantities and not more than 50 g per capita. Some small animals are hunted by bow and arrow and shrimps are caught by people living at the shores of lakes. These dietary additions contribute, however, only little to the daily intakes, which thus consists almost exclusively of sweet potato products.

Comen et al. (20) report on salt intake and dietary sodium and potassium intakes of the Highland Papuans. I quote from their paper: "Amazingly little sodium is available for many of the Highland Papuans. Most of the 'bush- salts', which are essentially plant-ashes, contain very little sodium." The plant-ash is sodium-poor and potassium-rich and the authors find that the ash contains 200 to 400 times more potassium than sodium. They conclude that the dietary intake of these people thus contains 200 to 400 times more potassium than sodium. This was confirmed also by urinary analysis showing a urinary potassium to sodium ratio of 200-300. It was finally said that "a sweet potato eater from the highlands would often not consume more than 75 mg NaCl daily".

The Papuans are evidently fully comparable with the Yanomama Indians regarding dietary potassium/sodium. When the Indians consume bananas the Papuans consume sweet potatoes again confirming that humans can survive on very small amounts of sodium and on high amounts of potassium. The Eaton-Konner estimate that the stone age people had a dietary K/Na ratio of 16 is probably an underestimate.

The highland Papuans are mal-nutritioned and suffer from protein and vitamin deficiencies and of diseases following these deficiencies. They as the Yanomamas get infectious diseases. The Papuans blood pressures are low. They have been determined to be for men in average 125/80 and for women 122/80 but unfortunately no information was given on relations between age and blood pressure (21-22). Most likely the blood pressure does not change by increasing age. Cancer rates for the west part of Papua New Guinea do not seem to have been determined. The Australian east part of the island, however, is studied regarding cancer incidence rates for a number of different organ sites (22). I met Dr. Atkinson, the first author of

this epidemiological work, at a visit to Sidney sometime in the middle of the 1970s. I was at that time mainly interested in other questions of cancer epidemiology and it was just in passing that Dr. Atkinson handed over his then New Guinea cancer incidence tables to me. I thanked him and filed the tables thinking that I would probably never return to them again. Then in 1993 Dr. Luyken (19) from Holland informed me on the sodium and potassium intakes of the Papuan Highlanders and then the tables came in very handy. And already ten years before that I used the tables when I was studying differences in cancer rates for people living at high altitudes and at sea level. I will return to this study in Chapter VII on "Altitude and cellular potassium and sodium and cancer". A lesson to be learned here is: "Don't discard information which is not today actual for you, sometime in the future this information might be very important and then you need to recall that you have it and where to retrieve it!". Now the Atkinson tables are given for the Australian part of New Guinea but there are no reasons to believe that the Highlanders' cancer incidence rates differ in the east and west parts of the island. People living in the two parts are ethnically the same and they have the same living and dietary patterns. The cancer incidence rates are for males 8.6 per 100,000 and for females 8.0 per 100,000 for the Papuan Highlanders. The corresponding rates are in USA for males 297 and for females 278 (23). The dietary potassium/sodium ratio is most likely one of the reasons for these tremendous differences in cancer rates. The high altitude living is probably another important factor for the explanation of the low cancer rates among the New Guinea Highlanders. This will be further discussed in Chapter VII.

### **The Kalahari !Kung people**

In the north part of the Kalahari Desert lives a people of which in the 1970s about 5% were still hunter-gatherers (24, 25). They are called the !Kung San people, where the !-sign stands for a clicking sound characteristic of their language. San is a common name for a number of people with similar languages while !Kung is a special one of these San people. While they once occupied a big part of the south of Africa they are now limited to an area in Botswana stretching out into Namibia and Angola. The Dutch colonization of South Africa almost exterminated the San people with the few remaining restricted to continue their nomadic lives in the north of the Kalahari Desert. In the middle of the seventies (25) most of the !Kung people seems to have changed their lifestyles to the ones of their neighbors, the Bantus, by taking up cattle raising and growing of plants thereby transferring from a sharing economy to a storing economy. This has probably made them more vulnerable to e.g. drought periods when their cattle and plants suffer from lack of water.

It is fortunate that the !Kung people, one of the last hunter-gatherer people of the world, were studied intensely in the 1950s to the 1970s before their transformation to agriculturalists. Harvard University in 1963 started a Kalahari Research Group, that has published hundreds of articles on the !Kungs based on observations made mainly between 1963 and 1973. The following information is from the review book edited by Lee and DeVore (24).

The !Kungs were essentially vegetarians. About 80% of their food came from different plants collected by the women. Among the staple plants were the mongongo nuts and the baobab fruits, which are both extremely rich in potassium and poor in sodium. The K/Na ratios are in the mongongo nut over 300, in the mongongo fruit over 1700 and in the baobab fruit and nut over 50. The meat part of the !Kung diet (20%) consisted of a great variation of game from small mammals such as hares to big mammals such as kudu antelopes, of fowls and of reptiles. There

are salt pans in parts of the area where the !Kungs live but there is no information on any collection of salt from these pans for use as dietary supplements. I quote from the Truswell and Hansen chapter on medical research among the !Kung in the Lee-DeVore book: "(The !Kung) are living on a low salt regime. Their urinary sodium and chlorides are very low and correspond to NaCl intakes around 2.0 grams per day. There is no salt available to the San at Dobe; the nearest source is 35 miles away". Dobe is the name of the San village, where the Harvard studies were performed. The urinary K/Na ratio was for the !Kung San adults reported to be about 3.5 compared to about 0.35 for the controls. The serum cholesterol is for these people among the lowest in the world, it is reported to be about 120 mg/100ml.

Diseases of civilization are not reported for the San people. Their blood pressures are low and do not change with age as they do for people in developed countries. From childhood and up in the 80s the !Kung San have blood pressures about 120/70 and no persons with hypertension were found among them nor were any evidences of heart diseases found. Their plasma insulins are low and there are no indications that diabetes exists among the Sans. Obesity and dental caries were never observed and no cases of cancer reported. The !Kung San people die of infectious diseases such as malaria and tuberculosis. They are heavy smokers and chronic bronchitis and emphysema are common. In contrast to the Yanomamas violence is rare among the !Kung people.

We conclude that the !Kung people with their low sodium/high potassium diets are free of the diseases that follow civilization.

## **The Eskimos**

The un-aculturated Eskimos, who lived in the very north of Asia, America and in Greenland, are interesting as an example of a mainly meat-eating primitive people. It has been estimated that about 95% of their diet in the pre-civilization time consisted of meat and fish. Furthermore, they most often ate their fish and meat raw of which their name bear witness. The word "Eskimo" is developed from an American Indian word meaning "eaters of raw flesh". During the short summer they could complement their diet with some berries and vegetables, which gave them the remaining 5%. Before being in contact with the white civilization, which came to their land with missionaries, crews on fishing and whaling ships, etc., they did not use any salt at all. Vilhjalmur Stefansson (26), who spent many years in the beginning of the 1900s living with the Eskimos and sharing their lifestyle, has written a number of books on his experiences in Eskimo land and among them a charming book "Cancer: Disease of Civilization?" in which he describes both how the Eskimos lived, what they ate and how free they were from the type of chronic diseases that we today call diseases of civilization.

In his discussion on cancer Stefansson goes back to the beginning of the 1800s and to a French physician Tanchou, who already that early formulized the theory that "mortality from cancer is in direct ratio to the intensity of human civilization". Many of the physicians that visited the Eskimos in the 1800s and the beginning of the 1900s supported the Tanchou idea. They never saw any cases of cancer until the Eskimos began changing their lifestyles toward the "civilized" one. Stefansson himself, who lived in the Eskimo houses for long periods of time, reports that he never saw any persons with cancer. Since the temperatures inside the Eskimo igloos in winter time is almost tropical and "at the peak heat something like 90° F" the Eskimos spent their indoor time half naked and an experienced observer could not have missed signs of cancer.

The Eskimos did not abstain from the fat in their food--on the contrary the fish, seal and whale fat such as the blubber was an essential and considered delicate part of their meals. The marine oils, however, are of a good type, which even takes part in transforming bad oils into good oils. It is presently in many laboratories studied how fish oils are beneficial to our health. Carroll (27) in a review discusses and points out the effects of fish oil in relation to a number of chronic diseases. The Eskimos were "no-salt" eaters, which was obviously also a beneficial element of their diet. How did they get their potassium? They had a very small intake of fruits and vegetables but that was well compensated by their big intake of fish meat, which raw contains large quantities of potassium. It has been shown that flesh from raw salmon contains about 9 times more potassium than sodium. The corresponding ratio for meat is only about a third of that. The way the Eskimos ate their food, either completely raw or boiled as a soup containing fish and meat, preserved the minerals and vitamins in the food and they never threw these essential foodstuffs out with the boiling water. We must conclude that from a health point of view the Eskimos' diet was a very good one.

### **The Hunza people**

High up in the Himalayas at the crossroads of Pakistan, India, Afghanistan, China and Russia there was until recently a small principedom called Hunza. This principedom of Hunza is now a part of Pakistan. Stefansson (26) in his book on the Eskimos devotes one chapter for describing Hunza and the people, the Hunzekuts, who live there. In the first half of this century a number of physicians (28-30) have lived with the Hunzekuts and they ail unanimously claim that the people in Hunza are extremely healthy and long lived. There are reports that many people reach the age of 100 and some will even be 120 and more. No cases of civilization diseases such as cancer were noticed. In the discussions of causes of this good health among others the following points have been put forward.

They were mainly vegetarians; meat consumption was only a few percent of the diet. The vegetables and fruits were preferably eaten raw. Dominating among the fruits were apricots, which were used for wine production, oil production or eaten as they were. Apricots have very high potassium concentrations and this intake can be compared with the high intake of bananas among the Yanomamas. Meat was stewed, sundried or eaten raw. This can be compared with the eating of raw food among the Eskimos. No salt or very little salt was used. This means that the dietary potassium/sodium ratio can be expected to have been very high. Non-dietary causes may have been the hard exercise required for persons living high up in the mountains on altitudes of 10,000 feet or more and the habit to breast-feed their new-borns in 2 or 3 years.

The drinking water coming down from the mountains has a white milk-like appearance. The mineral concentrations of this water has been measured (31) and it was found that the K/Na ratio was almost 8, which is to be compared to ratios below 1 in most streams in the USA. The very low sodium and very high potassium concentrations in the Hunza water give a high K/Na ratio. This "good" water can certainly be a part of the explanation of the good health in this far away part of the world.

As for all other primitive people civilization has reached even this Pakistan province with canned and salty products etc. and following this is an increase of diseases of civilization (32).

### **North America Indians and Sahara Arabs**

Thomas Neumann (33) in a thesis-like paper discusses salt restrictions and salt taboos in

early days among the Indians in Southeastern United States. C. Paque (34) in a comment to Neumann's work adds a discussion on salt intake among the nomads in the Sahara Desert region. Both these regions are salt rich and from both of them salt was sold and transported to salt poor areas. Neumann's data come from observations by naturalists, soldiers, etc., who travelled in the area. They report that salt intake was forbidden especially during occasions such as menstruation, pregnancy, puberty/initiation rites, mourning and during preparation and conduct of warfare. Neumann hypothesizes that the Indians had observed the bad effects of a salt intake during such circumstances (by causing edemas etc.) and had regulated their lives accordingly. There was an abundance of salt in particular in the Tennessee-Kentucky region and the Indians traded the salt for corn, flint, copper and mica. Corn and different kinds of nuts were among their dietary plant products and gave them necessary amounts of potassium while animal products from hunting gave them the sodium they needed.

Camel caravans transport salt over the Sahara Desert but as pointed out by Paque (34) that does not indicate that it is used by the carriers. The waters in most part of this region is very salty and it is impossible to avoid ingesting salt through the water, however, any extra salting does not occur and salt is not added to any foodstuff. Despite the salty water the urinary concentration of sodium is not raised. The meat eaten by these people is never preserved by salting, it is sundried, and to "obviate the objection to salt provisions, which increases the propensity to drink water" they bring with them when they cross the desert "melted butter, called smin; this (being) prepared without salt". The low use of salt persists even in zones of sweet water and also their people exclaim "Salt, I never take it" and women often indicated by gestures that salt gave them headaches.

These examples from the Indian world and from the Arab world thus show that also primitive people living in areas with plenty of salt avoid ingesting it.

*Des fruits, des legumes, des herbes, et enfin  
quelques viandes grillees, sans assaisonnement et  
sans sel, firent les festins des premiers hommes.*

Jean-Jacques Rousseau, Emile ou de l'education, 1759.

*(Fruits, vegetables, herbs, and finally some meats  
grilled without seasoning and without salt  
constituted the feasts of the first men)*

## **Conclusions.**

Before the introduction of agriculture primitive and un-aculturated men lived in a sharing economy. There were no reasons for them to preserve their food. It was "preserved" by the guarantee that days when they were unlucky in hunting or finding edible plants some of the other persons in the tribe would have been less unlucky and he would by the tribal rules share his boot. As we have seen this is how it still is or until recently was among the primitive people studied by anthropologists.

A change became necessary when humans altered their life style to a storage economy. Then their food had to be preserved and stored for sometimes very long periods before it was consumed. Different preservation methods were introduced such as drying, smoking, freezing

and salting. Salt became an important article and was considered of great value. It was for instance in the Roman Empire used as a form of payment to the soldiers which is the background to the English word salary. Most likely the use of salt as a food preservative evolved from its use for preservation of human bodies in mummification procedures.

In colder climates with short vegetation periods the use of salt became increasingly essential. The people in the Nordic countries in Europe, however, are believed not to have used salt in prehistoric times (35). Use of salt for preservation of herrings from the Baltic is reported from the 12th century, however, the importance of salt as a fish, meat and butter preserver did not peak until the 1500s. During this century and the two preceding centuries the import of salt in Sweden climbed to being as much as 25% of the total import (36) thereby being the dominating import product. During this time period the human intake of salt was immense. Hildebrand (37) estimated that the salted fish, mainly herring and salmon, by weight contained 25% or more as salt and that the corresponding figure for salted meat as well as for butter was 10%. The Crown accounts from the 1500s in Sweden give information on the rations of different types of food of the Crown's employees. Hildebrand (37) by using these figures estimates that the daily intake of salt per person for this category of people was well above 100g a day. In the coming centuries the import of salt dropped but it was still up till the beginning of the 1800s between 5 and 10% of the total import (38). Dividing the amount of salt imported with the size of the population gives a per capita intake of salt of 30-35 g a day well up in the 1800s. Morell (39) studying daily rations of food stuff for people in homes for older people finds that the amount of salt per person per day could still around the year 1830 be 20 to 25g to which then came the intake of salted fish, meat and butter. This immense salt intake required a high intake of liquid and oceans of beer were consumed by the people. Heckscher (40) reports that soldiers in the 1500s had a daily beer ration of 4 liters on weekdays and over 5 liters on Sundays. There are no reasons to believe that Sweden was a unique country regarding salt and beer intake. Most likely all the European countries were quite similar in this respect. Not until refrigerators and freezers became common around 1950-1960 did the salt intake drop to 10-20 g a day.

That this enormous salt consumption followed by an equally enormous beer consumption in earlier times was detrimental for person's health seems obvious. The mortality rate in Sweden was about 3,000 per 100,000 per year in the 1500s, 1600s and 1700. It then dropped almost linearly from 2,800 in 1800 to about 1,000 in 1960 (41). Many factors contribute to this decrease in mortality. That the high intake of salt combined with a low intake of fresh vegetables and fruits was a part of the high mortality is a reasonable assumption. Guteland et al. (41) also point out that the mortality in the big cities in the middle ages was almost double as high as in the countryside. This is often explained by the dense and stressful living conditions in the cities. The greater access to fresh food and during some seasons of the year reduced necessity to preserve the food by salting may also contribute to the difference in mortality between city and countryside.

We conclude that primitive people have a very low intake of sodium. It may be of the order of 1-2 g per day or less. Their potassium intake is high and their dietary potassium to sodium ratio is over 10 and can be up to 100 or more. When agriculture necessitated food preservation the sodium intake increased in some instances to 100 g or more per day. This change in the intake of a nutrient, that in small quantities is essential but in great quantities toxic, is one of the greatest changes in the human diet that has ever occurred in the short time period of only a few thousand years. The slow human evolution has not had time to adapt our species to this change. Consequently, our intake of sodium has been and still is un-physiologically high

while at the same time our intake of potassium is too low. This has caused an increase in a number of so-called diseases of civilization and among them cancer.

## References

1. Crawford Michael, Marsh David. *The Driving Force. Food, revolution and the future*, Harper & Row, Publishers, New York, 1989.
2. Gibbons Ann. Our chimp cousins get that much closer, *Science* 250(19 Oct):376,1990. Goodman Morris, Miyamoto MM, Koop B, Slightom J, Tennant M. Molecular systematics of higher primates: Genealogical relations and classification, *Proceedings of the National Academy of Sciences USA*, vol. 85, pp 7627-31, Oct 1988.
3. Klein Richard G. *The Human Career: Human biological and cultural origins*, Univ. of Chicago Press, Chicago, 1989.
4. Brown Michael H. *The search for Eve*, Harper & Row, Publishers, New York, 1990. Johanson Donald, Edey M. *Lucy. The beginnings of mankind*, Simon and Schuster, New York, 1981.
5. Cann RLM. Mitochondrial DNA and human evolution, *Nature* 325:31- 6, 1987.
6. Vigilant Linda, Stoneking M, Harpending H, Hawkes K, Wilson AC. African populations and the evolution of human mitochondrial DNA, *Science* 253(27 Sept 1991):1503-7,1991.
7. Diamond Jared. The worst mistake in the history of the human race, *Discover*, May 1987, pp.64-6.
8. Goodall Jane. *The chimpanzees of Gombe. Patterns of behaviour*, The Belknap Press of Harvard University. Press, Cambridge, Mass., 1986.
9. Barnwell George, Dollahite J, Mitchell DS. Salt tastes preference in baboons, *Physiol. Behav.* 37(2):279-84, 1986.
10. Farb Peter. *Humankind*, Houghton Mifflin Company, Boston, 1978.
11. Eaton S Boyd, Konner MJ. Paleolithic nutrition. A consideration of its nature and current implications, *N Engl J Med* 312(5):283-9, Jan 31, 1985.
12. Eaton S Boyd, Shostak M, Konner MJ. *The Paleolithic Prescription. A program of diet & exercise and a design for living*, Harper & Row Publishers, New York, 1988.
13. Smole William J. *The Yanomama Indians. A Cultural Geography*, University of Texas Press, Austin and London,1976.
14. Chagnon Napoleon. *Yanomamo. The Fierce People*, Holt, Reinhart and Winston, New York, 1968.
15. Neel James V. The population structure of an American tribe, the Yanomama, *Ann Rev Genet*, 12:365-413, 1978.
16. Oliver William J, Cohen EL, Neel JV. Blood pressure, sodium intake, and sodium related hormones in the Yanomama Indians, a "No-salt" culture, *Circulation* 52(1):146-51,1975.
17. Oliver William J, Neel JV, Grekin RJ, Cohen EL. Hormonal adaptation to the stresses imposed upon sodium balance by pregnancy and lactation in the Yanomama Indians, a culture without salt, *Circulation* 63(1):110-6, 1981.
18. Nowaczynski W, Oliver WJ, Neel JV. Serum aldosterone and protein-binding variables in Yanomama Indians: A "No-salt" culture as compared to partially acculturated Guaymi Indians, *Clin Physiol Biochem* 3:289-306, 1985.
19. Luyken R, Luyken-Konig FWM, Pikaar NA. Nutrition studies in New Guinea. *Am J Clin Nutr* 14:13-27,1964.

20. Comen HAPC, Spoon W, Heesterman JE, Ruinard J, Luyken R, Slump P. The sweet potato as the staff of life of the Highland Papuan. *Trop Geogr Med* 13:55-66,1961.
21. Couvee LMJ. The nutritional condition of the Kapauku in the Central Highlands of West New Guinea. II. Clinical and hematological data. *Trop Geogr Med* 14:314-24,1962.
22. Atkinson L, Clezy JK, Reay-Young PS, Scott GC, Wigley SC. The epidemiology of cancer in Papua New Guinea. Department of Public Health, Box 2084, Konedobu, Papua New Guinea, 1974.
23. Third National Cancer Survey: Incidence data. (Cutler Sidney J, Young JL, eds.), DHEW Publication No. (NIH) 75-787, NCI Monograph 41, March 1975.
24. Lee Richard B, DeVore Irvin. Kalahari Hunter-Gatherers. Studies of the !Kung San and their neighbors, Harvard University Press, Cambridge, 1976.
25. Yellen John E. The transformation of the Kalahari !Kung, *Scientific American* 262(4):96-105, April 1990.
26. Stefansson Vilhjalmur. *Cancer: Disease of civilization? An anthropological and historical study*, Hill and Wang, New York, 1960.
27. Carroll Kenneth K. Biological effects of fish oil in relation to chronic diseases, *Lipids* 21 (12):731-2, 1986.
28. Banik Allen E, Taylor Renee. *Hunza land*, Long Beach, California, 1960.
29. Berglas Alexander. *Cancer: Nature, Cause and Cure*, Paris, 1957.
30. Wrench GT. *The wheel of health*, London, 1938.
31. Keller WD, Feder GL. Chemical analysis of water used in Hunza, Pakistan, *Proc Trace Substances in Environmental Health* #13, (Hemphill Delbert D. ed), pp. 130-7, Univ of Missouri, 1979.
32. Michaud Roland, Michaud S. Trek to lofty Hunza - and beyond, *National Geographic*, pp. 644-69, November 1975.
33. Neumann Thomas W. A biocultural approach to salt taboos: The case of the Southeastern United States, *Current Anthropology* 18(2): 289-308,1977.
34. Paque C. Comments to (33), same reference, pages 302-3.
35. *Kulturhistoriskt Lexikon for nordisk medeltid fran vikingatid till reformationstid*. Band XIV. Allhems Forlag, Malmo 1969, pages 692-714. Entries: "Salt" and "Salthandel"
36. Heckscher Eli F. *Svenskt arbet och liv. Fran medeltiden till nutiden*. Albert Bonniers Forlag AB, Stockholm 1957.
37. Hildebrand, Karl-Gustave. Salt and cloth. In: *Swedish Economic History. The Scandinavian Economic History Review*, Vol II (2): 74-102.1954.
38. Reports from the Department of Commerce. The Swedish Royal Archives.
39. Morell Mats. Studier I den svenska livsmedelskonsumtionens historia. Hospitalhjonens livsmedelskonsumtion 1621-1872. Uppsala Studies in Economic History 29, Acta Universitatis Upsaliensis, Almqvist & Wiksell International, Stockholm,1989.
40. Heckscher E. *Svenskt arbete och liv. Fran medeltiden till nutiden*. Albert Bonniers Forlag AB, Stockholm 1957.
41. Guteland G, Holmberg I, Hagerstrand T, Karlquist A, Rundblad B. *Ett folks biografi. Befolkning och samhalle I Sverige fran historia till framtid*. Liber Forlag. Stockholm. 1980/ (Tabell A.1).