

Nutritional Problems of the Western World

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Strolling downtown Boston during the Bicentennial of the USA some years ago, looking for the exhibition and marked historical sites, my eyes were caught by groups of young people. It was Saturday afternoon, and these youngsters were occupying ice bars, pizzerias or Mac-Donalds-restaurants, enjoying sweets, sundays, coke, ice-cream, french fried potatoes and pizzas.

By calculating the energy content of these food items, as done in the slide, it isn't difficult to picture the bodies of these girls and boys as a result of this eating behavior: obese, lots of fat, heavy overweight.

Two years later, I had a stopover in Bombay for a weekend. A friend, picking me up at the airport, invited me for a coffee break. We went by car to a small, elegant coffee house. And here, I was remembered my experience at Boston, because of the similarity of the pictures: big and fat ladies, eating tarts, cakes and creams and drinking coffee with lots of sugar.

All looked like very prosperous, well-off people. Is the meaning of that, there is no difference between here and there, between Orient and Occident?

Of course, there are lots of differences. In countries like the USA or Germany 50% to 75% at the adult population suffers on overnutrition and overweight. This seems to be the picture of a "normal" westerner. In the West, obesity is seen in connection with life expectancy. It is known, that the fat people's life is more dangerous. For that reason, they have to pay more premium for

life insurance. This is proved statistically for a long time. But at present, increasing rates of overweight persons are seen among the younger people. A report was given by the German Society of Nutrition, based on research work on the countryside with over 10,000 adults in the age range between 35 and 65 years. It was shown, that 55% of the females and 47% of the males must be classified as people with overweight. To standardize the term overweight, the Brocca-Index is used mainly in Germany. That means: height in cm-100, given for example for a tall person of 170 cm=70. From this value 10% must be removed in case of a male and 15% for females, yielding to $70-7=63$ kg for a male and $70-10,5=59,5$ kg for a female as shown in the slide. People with overweight are according to this classification those with more than 15% above the normal.

During a study, done with 2,100 students at New York and our university city Kiel, it was observed, that in the average obese youngsters are found more often in the United States compared with Germany. In the United States 22.7% of the male students and 33.5% of the female students must be classified as obese, the data found among the Germans are 17.9% and 12.1%, respectively. Most of the American students are not considering the fact of having overweight as observed during the interviews.

In the Orient at the contrary small groups are obese only, belonging the rich people, merchants and traders as well and officials with a fixed monthly salary. It can be assumed that this part

of the population is enlarging with increasing income per head, but at present we are far away from this. In the Orient, a symbol for a rich and prosperous man is often seen in respect to his body weight. Similar motivations based on the same fact, that a rich wealthy man must be a fat one, were seen in Germany 80 years ago: Slim merchants had to fill their waist with an artificial waist-coat, to embody the image of wealth.

In my opinion it seems to be worthwhile to go back in history for the roots of this special kind of malnutrition. The body reacts to an overload of food, concerning the energy content, with the building up of new fatty tissues. This tissue serves as a store for energy to be prepared for periods of famine and undernutrition. During the evolution of mankind, this property of the body was a very important one. Food was not available constantly through the year. Harvesting time or game hunting, if successful, were the periods of plenty, followed by long intervals of small food uptake. It was important biologically, to have energy stores in the body for survival. Later during evolution, after establishing of husbandry, the dependence of mankind on nature was less strong but existing. Concentrating on a single crop that yields the most energy, famine is the result, if this crop fails from draft or blight. The Irish potato famine in the middle of the last century was the most terrible example for this in Europe. The Irish peasants at this time had become completely dependent on potatoes. Till today, there are many famines round the world, but now concentrated on the poor countries of the third world.

The problem of overweight exists for a longer time, but it wasn't the average, but the exception among a population. During the 16. century, the figures of the famous painter Peter Paul Rubens in his paintings are vigorous and fat. On the slide from a picture out of this time, a captain of the civil guard of an Italian city is seen, proud of his reputation and body weight. For the normal consumer of this time, the burgher, worker and peasant, "normal" weight or underweight can be

assumed.

From this part of my lecture it may be concluded, that people with overweight are very often seen with increasing frequency in the western world and are rare in the poor countries of the third world.

We have to look now for the reasons for that uneven distribution. With increasing annual income one observed a higher energy intake and a change of the pattern of the main nutrients in the diet. For poor people, unrefined carbohydrates are the staple foods, fat and protein are small and mainly of plant origin. This style of nutrition and the distribution of nutrients are typical for most of the people living in developing countries. For people with western habits, carbohydrates are yielding now for 40% of the energy uptake only and being of refined origin mainly. Fats and proteins are delivered from foods of animal origin to a higher extent.

The affluent societies of the Western world present nutritionists with a new set of challenges. In place of undernutrition we are now more worried by overnutrition. Step by step all groups of the population are affected. Between the surrounding areas of overnutrition and undernutrition, there is a small pathway only within narrow limits leading to a proper nutrition behavior.

As observed in Switzerland during the years of the last war, in connection with a shortage of food, a strong rationing and food distribution system was arranged. A lot of diseases, known to be related to wrong nutritional habits, showed a decrease in the incidence. But a regulation of food distribution is considered to be not democratic.

Now, we are still illing ourselves with knives and forks, eating too much.

Western people are free of fear of crop failure, they can eat their favourite dishes all the year round. Modern food industry uses foods imported from many parts of the world and preserves them mainly by refrigeration and canning. This overflow of foods of all kind can be seen in connection as a result of the industrial revolution, changing

all kinds of habits of men. This must be considered as the origin of the main nutritional problems of the western world.

We are now worried about our foods being too refined or adulterated by fertilizers, pesticides and food additives. Fertilizers as products of the industry, improved the yield of the harvests for raw material for basic food during the last century till today and were a main condition to make industrial progress possible. Pesticides as a newer product of the industry, are reducing the losses after harvesting and increase the amount of food available.

Food additives are improving the quality of food in many respect. Adding vitamins to a basic food for countries, suffering on deficiencies may be necessary, to improve the health of the people. An addition of an essential amino acid to certain foodstuffs is at least questionable, if the total protein consumption is high. The addition of dyestuffs to color food is not necessary from the nutritional point of view. For example, many kind of azo-dyes, produced by the industry since 1860, were used for coloring food. The use of these dyestuffs is more and more limited by regulations. The food authority of Norway has declared the complete banning of all added dyestuffs for foods some weeks ago. The use of these children of the food industry could be restricted easily by food regulations and law.

Instead of food taking much time and effort to prepare and being eaten formally with all the family, there are instant and convenience food. Instant food, often a colored powder, the texture of the raw material may recognized only on the picture of the pack. Convenience food is giving more time off for the housewife. Sometimes the art of cooking afforded to prepare the meal is to boil water only. For this type of food the housewife may not be sure what is in them. The family tends to eat in a hurry in different places, the mother may not know what her children are eating. Things are running out of control.

Near the half of the energy of a western diet

came from fat and about 20% from sugar. There is a strong suspicion that the choice of diet constituents has at least something to do with several of the chronic and degenerative diseases in later life. It is well known, that too much food is resulting in diseases of metabolism, because the body is stressed constantly by supplying more tissue as normal. A man with a real weight of 80 kg, constructed in relation to his height for 60 kg is taking with him at day and at night, at work, at other activities and at sleep 20 kg of overload. The metabolism of the body and the skeleton are more used up, some diseases are seen more often on obese people. The relationship between diet and dental disease is fairly clear though what is to be done is not. The refining of the western diets results in a decrease of the plant fibre content. This problem will be discussed more in detail later on, because of the growing concern of the topic. For these and other reasons: heart disease, hypertension, diabetes, gallstones, gout, diverticulosis and some others may each be partly determined by dietary factors.

In my opinion, the job necessarily done by professional nutritionists must be the field of nutrition education. Of course, scientific research has to continue but the main target must be all what is known already to translate from the scientific publications into the language of the consumer. He get small advice already from different nutrition societies and consumer organizations. But the main sources are second hand informations from newspapers, women magazines, television, radio advertisements and supermarket shelves. This type of information is often reflecting the competing interests in the food industry, from journalists and from some medicalmen, claiming to be experts on nutrition. One can hardly blame the man in the street if he concludes, that all the advice and advertisements cancel one another out. "It can't matter much what you eat, so I'll eat what I enjoy".

It is'nt easy to transfer science in spoken words and one has to discover how to give a better understanding of what they should aim to eat.

And since an increasing proportion of our food is prepared by manufacturers, there is a responsibility to advise them on long term planning of their products. This could be another way to reach the consumer. If the nutritionist failed to convince him about the opportunities of a diet being healthy but not tasty, with the help of the food technologist, a change of the composition of some of our foods is possible. Examples are: the exchange of animal protein for plant protein in a certain food, partly or totally, yielding in a lower fat content of the diet, or, the use of filling agents like natural gums or fibres with low energy content to diminish the caloric density of our food.

It is concluded that the main nutritional problems of the western world are showing direct connection to:

1. the enlarged uptake of food of all kind and enough money to buy them, resulting in overweight.

2. the relation of the main nutrients in the diet, being far from the recommendations.

During the last part of my lecture, some examples are presented to demonstrate how we can try to overcome these bad food habits of the consumers.

Obesity is defined clearly as the result of an excess of intake of energy in the form of food over the output of actual energy in the form of work inside and outside of the body. This seems to be very simple and comprehensible: the problem could be solved by either eating not so much or by more exercise. The trend of having less exercise and hard work in the western community must be counteracted by decreasing food intake. This solution seems to be easy, but as practice shows, we are far away from this.

There are the feelings of hunger and appetite for the regulation of food intake. Appetite is a most complex feeling, depends on the nature and quality of the food, the environment of the eater and is influenced further by his habits, family customs, his education and his cultural background. The regulation is nearly perfect, but a small

amount of surplus energy daily, a lump of sugar for example with 20 kcal is yielding during the year about 1 kg of fat tissue!

Obese people would lose weight without suffering. That the reason that every year at springtime, if the swimming seasons is approaching and the hidden fat will be visible on the beach, new and evergreen plans and programs for slimming diets are present. During the first days of such a superslimming diet, a strong reduction of the body weight is often observed. Then the daily weight losses are smaller, after two weeks the variations of the body weight may be greater than the weight loss. This is a reason for many slimmer, despairing of the success of the diet, to cancel the food regimen. After some time, the old body weight or even more is reached again. Experience shows, it is easy to lose weight but very difficult to keep the reduced body weight. The method for keeping the weight was not learned during the diet regimen: the right way for a good nutrition is still closed.

I like to explain now some research work we have done at this field during the last years.

I mentioned already, that in the mind of the consumer, the best method for slimming must allow him to eat as much as he wants without restrictions, but this is against the energy law of natural science. But knowing the opinion of the consumer, a manufacturer tries to make money with this. Some years ago, we checked such a miracle-product. According to the producer, 2 x 5 g daily of his powder should be sufficient to gain a reduction of the body weight. The powder was very expensive, consisting out of filling agents, vitamins and minerals. Food was allowed restriction. During the experiment, the weight curves of the obese volunteers showed (as expected) no change. Our experiment was continued by a investigation, at court the slimming-product don't exist any more.

In another study we checked the influence of altered proportions of nutrients during slimming regimens.

Reducing diets are often quite different in composition with respect to the main nutrients and therefore the energy as supplied by the individual nutrients from the Recommended Dietary Allowances which are considered optimal. Diets with a considerable reduction of energy contain relatively more protein than normal diets, while the reduction of energy leads to a low fat content, but particularly to a substantially decreased carbohydrate content. In cases where the amount of carbohydrates is reduced to a level of 80 g daily, necessary to impair an increased ketone body formation, and the amount of fat is limited to the supply of the essential fatty acids of 10 g daily, one deals with reducing diets which are typical in their nutrient composition for certain successful super-slimming diets.

The body reacts to such a diet with a low energy content and extreme composition concerning the main nutrients with a decrease in body weight. This is caused by a loss of fat tissue and an increased output of body water, at least during the first days. This loss of water can be influenced by restriction of water intake or by changes in the mineral composition of the diet.

Our experimental diet is seen on the next *slide*, showing the proportion of the nutrients! The amount of protein in the diet was 185g daily and the energy intake equaled 4.5 mJ/d for the first 10 days of the investigation.

The protein was of animal origin, lean fish were used. The protein content of these fish is in the range of 18-23%. The fish were prepared with fat-saving methods. The experiments were conducted to study the behavior of the body weight including some parameters of the metabolism. In a metabolic unit 10 female students in the normal weight range for their age group received the fish diet for 10 days after a preexperimental phase for 1 week. From the 11 day of the investigation the diet changes to an energy intake that was more or less the same (4.2 wJ/day), but only 70g of protein from soybeans and milk products were given daily.

Determinations were done daily or periodically on the following parameters:

Protein, fat, carbohydrate and water in the diet Sodium, Potassium, Calcium, and Phosphorus in the diet, and in the urine. Body weight and urine volume daily, urea, uric acid, creatinine and the minerals in the urine and Phosphorus in the feces.

We expected the most interesting results at the change between the diets, when the extremely high protein load drops to about 1/3 to a normal range.

Both diets were well accepted. During the period with fish the volunteers did not feel hungry. An explanation for this may be the fact, that by using large amounts of lean fish in the diet energy density of the meals is very low and the volume is rather large since the rest of the energy was supplied in the form of low energy vegetables and fruits. By changing to the soybean-milk diet, the hunger reappeared since the volume of the meals was smaller. It seems that for this reason slimming diets with low energy density as seen here with the lean fish diet are excellent.

At the beginning a steep decrease of the body weight reflecting the high water losses is seen up to the 3rd day. After that a more uniform decrease is observed. Immediately after changing the diets no further decrease in the body weights is observed for the next 3 or 4 days; after that the loss of body mass starts again in accordance with the unchanged low energy intake.

The reasons for these observations are not fully understood. Possible explanation is given in the next *slide*. The high protein load during the fish diet causes a drastic increase of the urine volume. In one case a maximum of 2900 ml urine daily was recorded. The urine volume is immediately reduced after decreasing the protein amount. In one case a minimum of 500 ml urine daily was observed.

During the period of constant body weight at low energy intake the amount of newly bound water and the loss of body mass by utilizing fatty tissue are equal. As a result the body weight

remains constant. In conclusion it can be said that low energy diets for slimming with a high amount of protein cause a drastic weight reduction as a result of losses of fat tissue and a high water output with increased excretion of metabolites and minerals in the urine. This may bring spectacular weight losses for a limited period of time.

Changing to a normal diet or to a more reasonable one (concerning the composition in accordance with the dietary goals) causes normalization of the water economy and an increase of the body weight, making the "success" of the slimming procedure questionable.

2. Dietary fiber. Despite the suggestion that deficiency of fibre may be responsible for many western diseases, strong evidence is given for the role of dietary fiber for constipation and diverticular disease only, but the incidence of other diseases may be influenced at least. It is difficult to conclude about the effects of dietary fiber, because the analytic methods for the determination of the member of the group are incomplete. Dietary fiber containing foods are cereals, vegetables and fruits mainly. The loss of dietary fibre in the western diet is mainly due to the fact, that the proportion of refined foodstuff is increasing. Wheat, for example, could be milled for whole flour, or white flour and bran. Our investigations on this field are on the analytic sector and on the practical use of high fiber diet with humans.

8 Students in the age of 20-23 years were participating in a 25 day study. The aim of the study was to check the influence of the dietary fiber on transit time (passage of the food through the body) and amount and moisture content of the feces. The performance of the study and the results on the investigation were described in understandable words for lectures, held for interested consumers. First, the details of the study were given. The basic diet was fixed for a week and given on three each other following weeks. In addition during the first week a special type of bread was given, resulting in a total intake of dietary fibre of 15g daily. During the second

week with the same basic diet, bran was offered, the total of fibre being the same as during the first week. During the third week, white bread was eaten, yielding in a total of fibre of 4g daily only.

Looking for the results, the amount of feces collected daily was the same during the first and the second week (fresh weight and dry weight). In the 3rd. week however, the amount drops to about the half. The different periods of the diet were marked by a colored marker. The water-content of the faeces was the same during the whole experiment. It was observed, that the volume of the faeces was increased the second week. The amount of bran eaten is responsible for that due to the strong evolution of gases in the intestine.

The transit time was mainly the same for each experimental period it was complained of obstipation, probably because of the smaller amount faces and the minor filling of the intestine. This investigation do underline the importance of an sufficient amount of dietary fibre in the western diet, but the other factors and influences, acting and counteracting the activity and function of the digestive tract are seen, like age, amount of food and physical activity. As a result of the public discussion about the dietary fibre an increase in the production of breads with high fibre content is reported.

Another bad eating habit is the taking of 3 big meals of high energy density instead of 5-6 smaller meals. As experiments with animals have shown, the effect of nibbling versus full meal eating is mainly the results of a better control for food intake.

On the last international congresses for nutrition and food science two main topics are seen: undernutrition in the countries of the third world and overnutrition in the industrialized countries. Discussion and meetings were organized about the questions how to give one part of the population of the world more food and another part less food to improve the health of all?

From the point of a nutritionist, the main nut-

ritional problem of the western world is 'overnutrition and obesity due to wrong eating habits, concerning the amount and the composition of our daily food. As a result of these practices the incidence of certain diseases is increasing. Nutritionists must try to demonstrate the consumer the consequences of his behavior and try to conv-

ince him with understandable methods to change his habits concerning nutrition.

* 위의 논문은 1979년 2월 24일 주한 독일문화원 강당에서, 한국영양학회·사단법인 한국식품과학회 공동주최와 주한독일문화원 (Goethe-Institut, Seoul) 후원으로 열린, Feldheim 박사 내한기념 강연회에서 강연한 내용임.