

Errors and myths in feeding and nutrition: Impact on the problems of obesity

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Abstract

The increase in obesity prevalence cannot be explained by a sudden and generalized change in human genome. It is certainly due to the modification of lifestyle habits and especially of the diet, as well as a lack of physical activity and sedentary living. Changes in the feeding pattern and the subsequent unbalance in the caloric profile of the diet may have had great importance in the occurrence of obesity.

The social pressure in relation to the body image, the desire to have a slim body, and the fear to gain weight present in the current society have given way to the proliferation of myths and errors regarding pretentiously weight-losing foods and the appearance of miracle diets and dietary complements with magic results on weight loss. Weight-losing foods such as grapefruit, pineapple, apple, cucumber, wholemeal bread or drinking water while fasting are among the most popular and with less scientific evidence errors and myths. On the other hand, miracle diets cause more harm than good and their success is based on weight loss, but not fat loss, since they initially induce dehydration and a decrease in the muscle mass. The intervention study described here shows, once again, that when someone takes a hypocaloric diet he/she will lose weight and that the supplements tried with a satiating, lipolytic and supposedly weight-losing effect do not modify the weight loss produced by the hypocaloric diet.

The main therapeutic tools available to fight against obesity are dietary therapy, which is a must in the program, education and behaviour modification, increased physical activity, to fight against sedentarism, and some pharmacological therapy available. The best solution to all these problems that have a great repercussion on the society surely is the development of wide and prolonged informational and educational campaigns in the field of nutrition.

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Key words: *Obesity. Errors. Myths. Miracle diets. Miracle products.*

ERRORES Y MITOS EN ALIMENTACIÓN Y NUTRICIÓN: IMPACTO EN LA PROBLEMÁTICA DE LA OBESIDAD

Resumen

El aumento de la prevalencia de obesidad no podría ser explicada por un cambio repentino y generalizado en el genoma de la población. Sin duda, se debe a la modificación de los hábitos de vida y, especialmente, de la alimentación, así como a la falta de actividad física y a la vida sedentaria. Los cambios en el modelo de alimentación y el consecuente desequilibrio en el perfil calórico de la dieta pueden haber tenido gran importancia en la aparición de la obesidad.

La presión social en relación con la imagen corporal, el deseo de poseer cuerpos estilizados y el miedo a engordar presentes en la sociedad actual, han dado lugar a la proliferación de mitos y errores sobre alimentos supuestamente adelgazantes, a la aparición de dietas milagrosas y de complementos dietéticos con resultados mágicos sobre la pérdida de peso. Entre los errores y mitos más extendidos y con menor evidencia científica se incluyen alimentos que supuestamente adelgazan, como pomelo, piña, manzana, pepino, pan integral, o beber agua en ayunas. Por otro lado, las dietas milagrosas provocan más perjuicios que beneficios, su éxito radica en la pérdida de peso, que no de grasa, pues inicialmente producen deshidratación y disminución de la masa muscular. El estudio de intervención descrito en este capítulo, demuestra, una vez más, que cuando un individuo ingiere una dieta hipocalórica pierde peso, y que los suplementos con efectos saciantes y lipolíticos ensayados, supuestamente adelgazantes, no modifican la pérdida de peso producida por la dieta hipocalórica.

Las principales herramientas terapéuticas de las que se dispone para luchar contra la obesidad son el tratamiento dietético, base irrenunciable de la terapia, la educación y modificación de la conducta, el incremento de la actividad física, la lucha contra el sedentarismo y la escasísima terapia farmacológica disponible. La mejor solución frente a todos estos problemas, de una gran repercusión para la sociedad, es sin duda el desarrollo de amplias y duraderas campañas de información y formación en el campo de la nutrición.

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Palabras clave: *Obesidad. Errores. Mitos. Dietas milagrosas. Productos milagro.*

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Abbreviations

BMI: Body mass index.

FDA: Food and Drug Administration.

Introduction

The obesity epidemics taking place in the modern, developed and reach world in the last decades cannot be explained as the consequence of a sudden and generalised change in the genome of the population, since it would be scientifically impossible that this change would occur in such a short time. The increase in obesity prevalence must be the consequence of modifications in environmental factors, such as lifestyle habits and feeding models, the decrease in physical activity, and the ever increasing sedentarism, although the predisposition to overweight and obesity may vary considerably among individuals (genetic factors).

The occurrence of this epidemic in some developing countries is especially alarming since not all the favourable circumstances that took place in the modern world occur there. All this would one make think that the changes in the feeding model may have repercussion more important than the one thought, and that it would be a big error not to consider these changes appropriately.

The humankind is evolutionarily better adapted to face excessive intake of energy than the lack of it, even if the first one is very important. The organism can store the energy in excess very easily. As a consequence of this evolutionary process, in order to control the weight, our system is more effective fighting against weight loss than preventing excessive gain. All the factors cited generate an obesogenic environment that is favoured by the extraordinary offer of foods, not only in their amounts but also in their variability and palatability.

The main therapeutic tools available to fight against obesity are dietary therapy, which is a must in the program, education and behaviour modification, increased physical activity, to fight against sedentarism, and some pharmacological therapy available.

The social pressure in relation to the body image, the desire to have a slim body, and the fear to gain weight present in the current society have given way to the proliferation of myths and errors regarding pretentiously weight-losing foods and to the appearance of miracle diets and dietary complements with magic outcomes on weight loss.¹⁻⁵

Errors and myths

Figure 1 shows the changes in the dietary pattern that have occurred in Spain in the last 60 years regarding the caloric profile of the diet. In the period between 1964 and 1990, there was a change in the energy distribution brought by each group of macronutrients: there was an increase in the proportion of energy provided by proteins from 12% to 14%; also for fats, from 32% to 42%, and logically a decrease in that provided by carbohydrates, from 53% to 42%. This nutrients proportion has remained unchanged until today, with very little modifications. By contrast, total energy intake has not varied much in that same period and even a decreasing trend has been observed.⁶⁻⁹

We do not know what impact this change has on the increase in overweight/obesity since no direct studies have been performed and we only count on epidemiological studies. When the nutrients do not reach the internal milieu in determined proportions, it is metabolically difficult, sometimes impossible, to obtain energy from them. Therefore, if not used, they will be stored in the only way that our organism can and knows how to do it, that is to say, in the form of triglycerides by accumulating fat in the adipose tissue. It is important to keep in mind that when the glycaemia is compromised, it is impossible to use fatty acids as an energy substrate and, therefore, they will accumulate. This situation may be occurring since the proportion of carbohydrates has been reduced and that of lipids has increased. These circumstances would justify the concomitant increase in the incidence of cardiovascular diseases, which have become the main cause of death in Spain.¹⁰

As a consequence of the epidemic of overweight and obesity that is occurring lately, there has been a prolife-

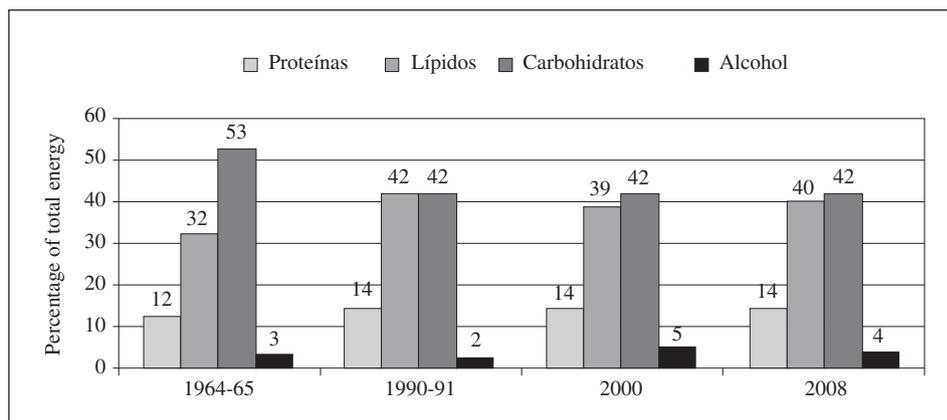


Fig. 1.—Evolution of the caloric profile of the Spanish diet in the last fifty years.

ration of supposedly weight-losing foods, giving way to a series of errors and myths about this topic.¹¹⁻¹⁴ Some of the most popular ones have been selected.

“Bananas make you gain weight” or “bananas and milk make you losing weight”.

If the banana makes you gain weight, the banana consumed with milk will make you gain even more weight since the caloric intake increases.

“Margarine has fewer calories than butter”

All the fats provide 9 kcal/g, so that margarine and butter will provide the calories according to the amount of fat they contain.

“Cheese, even if it contains fat, is excellent for a weight-losing diet because it contains a whole amount of proteins.”

The nutritional composition varies widely from one cheese to another, so that it is practically impossible to establish average values that would be representative for all of them. Generally speaking, we would say that for each 100 calories, 25 would come from proteins and the remaining 75 from fat. Once again, this would be a false believe.

“Drinking water during the meals makes you gain weight and while fasting it makes you lose weight.”

On the first place, water has no energy, and secondly, it lacks the capacity of dissolving the fat. Therefore, it would be impossible for it to have these effects, independently of when it is consumed (before, during or after the meal, or when fasting). Drinking water just before the meal would be justified due to the mild satiating effect that it produces, although this effect is very weak.

“White bread makes you gain weight and wholemeal bread makes you lose weight”.

Bread, either white or wholemeal, is a necessary food in a balanced diet given its high content in complex carbohydrates, and the energy provision is similar for both types of breads. It is not a particular food what makes you gain or lose weight, but the intake of a diet with a caloric intake higher than the individual needs.

“Light foods do not make you gain weight, they even make you lose weight”

According to the European Union regulations, a food termed “light” must have a caloric value per weight unit lower than 30% compared to the equivalent food or the reference food, but in no case it means that it does not contain energy. This misunderstanding makes that these foods are being consumed without any limit or control, forgetting that they are not weight-losing.

“Some fruits such as pineapple or grapefruit make you lose weight because they dissolve the fat”

It is no estrange to get about with people that attribute magical properties to certain foods, such as dissolving the body fat.

“Cucumbers and apples have negative calories because they need more energy than the ones they contain in order to be chewed and digested”

Certain foods, such as the apple, have been attributed negative energy contents by arguing that more energy is wasted to eat them than the energy they contain. One argument against would be that, considering that it would be necessary to chew for approximately 3 minutes to consume 1 kcal, and that an average apple contains some 80 kcal, it would be necessary to chew for 240 minutes for the apple to have negative calories. Of course it is rather difficult to imagine someone being able to chew an apple for at least 4 hours.

“If you sweeten your beverages with honey instead of sugar, you save calories”

In some diets for losing weight, this sweetener has been recommended instead of sugar because it supposedly has a lower caloric content. It is well known that the caloric content of 1 gram of sugars is always 4 kcal. Besides, honey has been attributed some healing properties, which may be related to some unknown substance, with an also unknown function, and with no recommendation about the amount to be consumed. Its composition is rather simple: 70% of sugars, and the remaining is mostly water.

“When we eat less, the stomach shrinks”

Another common error in the weigh-losing regimes is to think that the stomach shrinks when the food intake is reduced for a certain time. This belief is not true, as it is not true that the size of the hand or the eye decreases when reducing the food intake.

Recently, some other beliefs related with obesity, nutrition, and feeding, have appeared and diffused among the people, being accepted. These beliefs, which have been qualified as myths since there is no scientific evidence demonstrating their veracity¹⁵, and are described next:

- “Little but sustained changes in the diet or the physical activity have a big impact on long-term weight loss”.
- “The individual that considers losing weight has to set realistic goals because he/she could otherwise become frustrated and lose less weight”.
- “Losing too much weight abruptly is linked to worse outcomes in the long-term than doing it gradually”.
- “To start a good weight loss program, there should be a good initial predisposition in order to warrant a successful intervention”.
- “The physical education classes as we know them today are key factors for the prevention of paediatric obesity”.
- “Breastfeeding protects the children against obesity”.

— “During sexual intercourse, 100-300 kcal are burnt”.

Weight-losing substances: Miracle products

In the last decades, there has been a proliferation of a considerable number of weight-losing substances in the health care area that are advertised in a very striking way, such as “fat devouring molecules”, “it dissolves fat”, “natural substances”, “plant-derived”, “calories-burning”, “fat-absorbing”, and of course, as harmless without any contraindication.¹⁻³

Generally the products or dietary complements used to lose weight lack the effects they claim in the advertisements. In the best scenario, they have an indirect action by making psychologically easier to follow a hypocaloric diet and thus losing weight. Besides, they usually do not have the unwanted effects of pharmacological treatments, although they not always lack of secondary effects. Table I shows some examples of weight-losing complements.

In order to assess the effects of some of these weight-losing substances, Lydia Fernández, M^a Dolores García-Prieto and Salvador Zamora carried out an interventional study, which results are in the process of publication. The experimental design was as follows:

<i>Supplements</i>	<i>Components</i>
Peripheral satiating agents	Chitosan Fucus Spirulina <i>Garcinia gamboia</i>
Diuretics	Horse tail Bermuda grass Dandelion
Laxatives	alder buckthorn Rhubarb
Tranquilizers	Valerian Linden blossom
Lipolytics	Green tea Chromium picolinate
Digestive	Bitter fennel Pineapple
Stimulants of the central nervous system	Guarana Kola nut
Circulation invigorating agents	Crataegus oxyacantha Horse chesnut

A sample of 69 individuals with overweight or obesity was selected (58 women and 11 men), with a mean age of 35.4 years (15-64 years) that participated for 6 months in a weight-losing program aiming at achieving their healthy weight according to their gender, age and height, maintaining it through time, as well as incorporating healthy dietary and lifestyle habits.

The population was divided in two homogenous groups and both groups received a balanced and hypocaloric diet (1,500 kcal/day), according to the recommendations on energy and nutrients for the Spanish population.¹⁶ The dietary preferences and the buying power of the participants were taking into account. One of the groups additionally received a weight-losing supplement made of a mixture of satiating agents (chitosan, *Fucus*, Spirulina and *Garcinia gamboia*) and lipolytic agents (green tea and chromium picolinate).

In the group receiving the balanced and hypocaloric diet (without supplements), 54.5% of the participants achieved the 6-month goal of weight loss, approximately 9.0 kilos, with a concomitant reduction of the body mass index (BMI) and the waist circumference, being in all the cases statistically significant (fig. 2).

In the group receiving the hypocaloric diet and the mentioned supplement (satiating and lipolytic agents), 57.4% of the participants achieved the 6-month goal of weight loss, approximately 9.3 kilos. Similarly, the BMI and the waist circumference were reduced in a statistically significant way (fig. 2).

No statistically significant differences were observed between both groups. The supplements used to lose weight did not exert any effect in this sense, independently that they could have been of some psychological help for some participants by following more easily the proposed diet. However, the few differences between both groups in the number of individuals achieving the goal do not support an effect.

In conclusion, the results of this study show, once again, that when an individual eats a hypocaloric diet he/she will lose weight and that the supplements tested in this study, which are supposedly intended to lose weight, have not modify the weight loss produced by the hypocaloric diet. For none of the substances tried there are experimental evidences showing that they may act by decreasing the volume or the amount of adipose tissue. That does not exclude the importance that these substances may have to achieve the goals of weight loss as a psychological help by increasing the motivation or the adherence to the diet.

Miracle diets

In the current society, the increasing interest in feeding and nutrition and their relationship with health has given way to the proliferation of very diverse dietary regimens promising to work some sort of miracle in the organism (health, beauty, youth, good mood, etc.), although their scientific base is scarce or null. In most

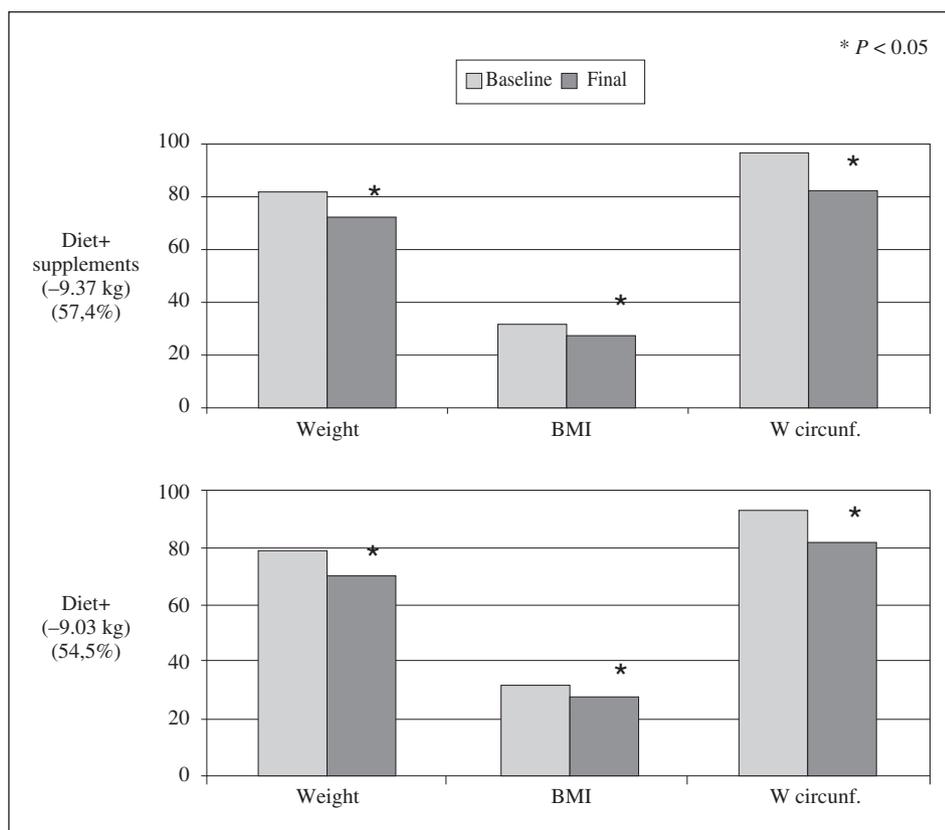


Fig. 2.—Effect of the weight-losing program on weight, body mass index (BMI), and waist circumference in both groups of participants (diet and Diet + Supplements).

of the cases, these dietary models, named as “miraculous diets”, or “miracle diets”, hide commercial interests or interests in the promotion of “popular people”. Some of these fraudulent recommendations, some of them harmless while others clearly harmful, have widely diffused and represent today a serious health problem in the developed world. One additional problem that implies the use of these diets is they favour a rapid gain of the lost weight (rebound or “yo-yo” effect).^{2-5,17-18}

From Dr. Hays’ theories of the dissociation of acid and basic foods in the thirties until today, Science has considerably progressed. Today we know that the enzymes work equally either the foods are consumed as differentiated groups or simultaneously. Even though, different types of dissociated diets constitute one of the weight-losing therapies more currently used.¹⁹

Besides being false, these theories induce to abandon such healthy habits as eating fruit for dessert, eat a dish of lentils with rice, or having ham and bread as an evening snack (these habits are even recommendable in weight-losing diets). Besides, these theories are against the digestive physiology: the stomach emptying is not immediate, it occurs very slowly and depends on several factors.²⁰

In the first place, the size of the particle: the ingested food does not leave the stomach until it reaches a size small enough to be attacked by the digestive enzymes. For this reason, the liquids get out of the stomach relatively quickly, with some exceptions, such as milk that

has to be coagulated in order to suffer the clorhydropepsic digestion in the stomach for the digestive process taking place adequately in the duodenum.

In the second place, another important factor conditioning the gastric emptying is the pH at the duodenal side of the pylorus. Until this side does not become alkaline due to bicarbonate of the pancreatic secretion, the sphincter does not open. At this time, a wave of highly acid digested product abandons the pyloric antrum, reaches the duodenum, and the pH of the duodenal side of the pylorus becomes acid closing again the sphincter, and so on, so that the process lasts for several hours. Therefore, it does not matter to take the fruit at the beginning or at the end of the meal; what matters is to consume fruits, and doing so when one likes it most.

According to the Spanish Agency on Food Safety and Nutrition (AESAN),¹⁸ a “miracle diet” can be recognized when one of the following effects is claimed:

- Rapid weight loss, more than 5 kg per month.
- They are easy to follow.
- They are completely safe, with no health risks.

Some examples of diets that offer miraculous weight losses without an apparent effort are:³

- Hyperprotein diets, such as the one attributed to the Dukan Clinic^{21,22} or the peach diet.
- Hyperfat diets, such as Dr. Atkins’.^{23,24}

- Dissociated diets, such as Montignac's.¹⁹
- Excluding diets.
- Psychological diets.
- The anti-diet.
- The Rafaela Carrá's diet.

There are some diets to lose weight that have no fundamentals at all and a null scientific base, such as:¹⁷

- Mono-diets, that is to say, diets based on the use of a single food, generally for one day in the week, among which we may find the banana diet, the grapefruit diet, the chicken diet, the rice diet, etc.
- Liquid diets, such as the milk diet, the beer diet, the juice diet, etc.
- The calendar diet in which every day of the month one must eat those foods starting by a particular letter.
- There are others related with the hours, for example, "all that we eat before 8 a.m. will not make us gain weight". It may be a good decoy for a sleepy-head to get up early, but it will not cheat our body.
- The diet of the "Ps" (potatoes, pasta, and bread (*pan* in Spanish)) recommends that these foods get excluded from the diet.
- The colours diet. It states that each colour has its own vibratory energy and it will vibrate with different parts of the body; hence, each organ of the body has a particular colour with which it relates. Each day the foods with a particular colour have to be eaten.

Given the fact that to talk about each particular diet would be difficult, we expose a brief summary of the most popular and frequently used ones, comparing their caloric profile with that of a balanced diet. As it may be observed in table II, the main characteristic of this type of diets is that the energy coming from carbohydrates has been dramatically reduced, increasing then the one coming from the other nutrients.

In the so called hyperprotein diets, most of the ener-

Table II
Energy content and caloric profile of the different kinds of diets

<i>Diets</i>	<i>Sugars (%)</i>	<i>Proteins (%)</i>	<i>Fats (%)</i>	<i>Energy (kcal/day)</i>
Balanced	55-60	10-12	25-35	
Hyperprotein	30-35	50-55 (80)	10-15	750
Dukan	19	40 (87)	41	880
	23	37 (117)	38	1262
	32	33 (124)	33	1500
Dissociated	10-15	25-30	50-60	Unlimited
Atkins	4	12-23	63-94	Unlimited

gy comes from this macronutrient and very little from lipids. In the case of the Dukan diet,^{21,22} there are some variants, always hyperproteic and hypoglycidic, and even dangerously hypocaloric with less than 1,000 kcal/day, and thus frequently unbalanced in micronutrients.

Hyperfat diets, the essential model being Dr. Atkins' diet, are practically voided of sugars and overtly hyperfatty, with reasonable or slightly higher amounts of proteins as compared to a balanced diet. Their main attraction is that the individual can eat all what he/she wants but carbohydrates, which are forbidden.^{23,24}

Finally, dissociated diets are basically hypoglycidic, hyperproteic (up to twice the energy coming from this macronutrient) and strongly hyperfat diets. They are a mix of all the above, the best propaganda for their use being the lack of restriction in energy intake: you can lose weight while eating all the calories you want.

The diets with no intake limitation, such as the dissociated and hyperfat diets, are based on a deceptive decoy. They are diets difficult to follow in the long term because they produce weariness, loss of the appetite, with a satiating feeling possibly due to the satiating power of proteins.

In general, the molecular bases and the mechanisms of action of all these miracle diets reside in halting the anabolic routes and trigger the catabolic paths to inhibit lipogenesis and stimulate lipolysis. However, this is not so easy or so specific. Normally all the anabolic processes will be impaired and, thus, not only the lipid metabolism will be impaired but also the water and saline metabolism, giving way to water and electrolytes losses. In all these cases, the aim is to generate a not too severe hypoglycaemia, to halt the action of insulin, and to start up the processes regulated by catabolic hormones (fig. 3).

When insulin release is stopped by hypoglycaemia, the big anabolic hormone is stopped, the synthesis of triglycerides is compromised, and thus fat accumulation is prevented. But not only this occurs, sugar-increasing hormones are released to maintain the glycaemia, which is a priority to ensure that glucose reaches the brain no matter the price, even by producing glucose from amino acids through the gluconeogenesis.

Under these circumstances, the energy comes exclusively from the amino acids, but in the absence of glucose, the oxidation of this substrate to produce energy is incomplete and ketonic acids (acetoacetic and β -hydroxybutiric) are produced instead of CO₂ and water.

As a whole, these processes lead to pH decrease in the internal milieu, originating a metabolic acidosis with the production of important amounts of ketonic compounds, putting in danger the physiology and even the survival of the organism. There have been reports of people dying from the use of this kind of diets. The levels of plasma lipids are notably increased, leading to impairments in coagulation and platelets aggregability.

It is usual that some people praise a particular method because of the extremely good result achieved: an astonishing and very rapid weight loss. Almost always

Diets	Changes in the internal Mielieu	Actions
Dissociated	Hipoglucemias ± severas ↓ Insulina ↑ Glucagón ↑ Glucocorticoides ↑ Adrenalina	Anabólicas
Miraculous, unbalanced Atkins, Zone, Dukan		Catabólicas
Sugar-free or very low in sugar		

Fig. 3.—Mechanisms of action of the different “miracle” diets.

the results are deceptive, or false. In general, rapid reductions in the body weight are due to important losses of water and electrolytes, through the sweat and urine, but not to fat loss. The main goal for losing weight is to reduce the amount of fat, any other thing is a fraud, or even a danger. Commercially speaking, this kind of diets may be very interesting since the patient, or better said, the client, comes back again and again to the office, feeling guilty; that is to say, in the best conditions to be fooled once again.

Final thinking

To end up this chapter, we would like to refer, in the first place, to one of the conclusions of the White House Conference (1969) on Feeding, Nutrition and Health, stating:¹

“It is likely that in the field of population health, there is no other area so affected by fraud and misleading information than nutrition. The consumer gets trapped with many and coarse imitations that cheat him big amounts of money, besides redounding against his health”.

As it can be seen, the current problems regarding the myths, errors and frauds in the use of products to lose weight and miracle diets were already present more than 40 years ago.

On the other hand, the Food and Drug Administration (FDA) has received a series of complaints related with the use of this kind of products or miracle diets including: nausea, vomiting, diarrhoea (liquid preparations), constipation (dry preparations), faints, muscle cramps, weakness or fatigue, irritability, intolerance to cold, decreased libido, amenorrhoea, hair loss, skin dryness, cardiac arrhythmia, recurrent gout, dehydration and hypokalaemia. The FDA commissioners have proposed the following label to be attached to protein supplements: “Protein diets with very low calories may cause serious diseases or death. Not to be used to lose weight or maintain the weight without medical supervision. Do not use for any purpose without medical advice if under any other medication. Not to be used in children, pregnant or breastfeeding women”.

The severity of the lesions and deaths due to the use of hyperproteic diets extremely low in calories is unclear. However, it is evident that there is a need of careful studies focused on the geographical influence, concurrent pathologies, age and other factors.

Sometimes, the warnings in this sense seem to be intentionally vague. For example, when it is indicated: “do not use or do not recommend for long-term use”, what duration are we talking about? One week, one month, one year? Is it the same for everybody? Young, adults, the elderly?

Finally, in our opinion, one of the big problems with the use of inappropriate feeding models is that, even when things are very badly done, they almost never have a consequence in the short term, so people think that there is nothing to worry about. And when something happens, it is already late. For example, it is difficult to relate the occurrence of osteoporosis or renal disease in the adulthood with a cause that might have been a nutritional defect during adolescence.

The best solution to all these problems and with a big social repercussion certainly to develop extensive and long term informational and educational campaigns on nutrition for the citizen.

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