Marc Schneeberger: “There are a heap of obesity-related diseases that could be prevented”

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Marc Schneeberger leads a research group at Yale University (USA). His work attempts to discover how the nervous system controls energy balance and metabolism, communicating with multiple peripheral tissues. His research focuses on better understanding how the brain controls energy metabolism, which is essential to combat the disease with pharmaceuticals. In 2023, he received the Princess of Girona Award in Life Sciences.

- **A chef, then a scientist?**

I've always known I wanted to research. When I was little, I wanted to help my dad, who had a restaurant. At home, any celebration was an excuse to go to eat in the restaurant where my father explored ideas and new recipes, not for the restaurant, but for home, where he prepared more sophisticated dishes. The truth is that for me it was not a great leap from food to research.

- **You also considered being a physicist or an astrophysicist. And now you study how to treat and prevent obesity.**

From an early age I was aware of the importance of diet and food, and the world of cooking in general. That sparked an interest in how our brain works, how the feelings related to eating and stopping eating are regulated. There are many feelings we associate with eating: pleasure, anger… When a person hasn't eaten for several hours, they feel they inhibit themselves in conversations and social situations so as to be able to eat. Eating, drinking and sleeping are the most animal instincts we have. There are certain vital processes inherent to human beings as animals, which is what we are, from babies who cry endlessly because they do not have food to adults.

- **So the brain is to blame for obesity?**

Ultimately, the deregulated process that leads us to obesity is no more than an increase in the intake of high-fat and high-sugar foods. Nowadays, we are surrounded by these foods, which generate addiction due to their high nutritional value for the brain. For our brain, having deposits of energy is beneficial; it allows us to go several days without eating and survive. In evolutionary terms we are not so far from the times when food was not permanently available for humans.
The society where this situation can best be seen is in Asia, specifically in China, a country where not so long ago there was no access to western foods, characterized by their high sugar and fat content. We have already seen that since their diet has become more westernized in the last 20 to 30 years, levels of diabetes, obesity and metabolic diseases are exponentially increasing, more than anywhere else.

- **There has been talk of an obesity pandemic since last century. There are more and more effective treatments, but the number of obese people continues to increase.**

That's true. On the one hand, we have realized that funding is to a great extent devoted to treating obesity, not preventing it. We are almost at pandemic levels, and it is estimated that 40% of the population will be obese. And we should not forget that this is a very large market for pharmaceuticals. That means private funding of the pharmaceutical industry is bound to find solutions for reducing weight or chronically maintaining a low weight. The market is huge.
In my opinion, I think that if we are talking about prevention, governments should promote educational strategies: education in schools, public information actions etc. In that way, society can take on the message that eating healthily is beneficial both for the mental development of our bodies and for our health. Ultimately, what constant exposure to high-fat and high-sugar diets promotes, apart from all of the associated diseases, is that we generate addictions to foods that are not nutritious and cause inflammation. The consequences related to not having healthy eating habits are harmful in many ways, both in socioeconomic terms and for health

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- **They say that an obese child will become an obese adult with health problems. Is that true?**

There is a direct correlation. The fact of being exposed to this type of food from an early age and during adolescence predisposes the organism. The clearest example is addiction to soft drinks with a high sugar content: when we drink them for a few days, we have the feeling that each day we need another. And the same happens with other high-sugar, high-fat products. They are products that give pleasure and that the brain detects as being highly nutritious, which means that if we are given a choice, our brains will make us choose this type of food. What we often ignore is that this type of food can also come eating 20 pieces of fruit a day, given its high sugar level. The important thing is to follow a balanced diet. In terms of prevention, there are adages that existed in our society as common sense, and it isn't so difficult to become more aware if we refer to them. I remember the Spanish saying "eat breakfast like a king, lunch like a prince and dinner like a pauper". The saying makes biological sense because, at the time of day when we are most active, we need more nutrients because of what we burn, whereas at bedtime, when our metabolisms stop, having a large dinner, as people often do, is a mistake. I think that most people are able to devote half an hour a day to thinking and changing these habits. And I don't mean we should spend 1 hour a day having breakfast, half an hour on lunch, etc.

- **How is Spain doing in this area?**

Until a few years ago, the figures for obesity were relatively low. But the situation has changed a lot. For instance, in areas like the Canaries, estimates place child obesity at 40%, and many autonomous communities have a rate of 20% or 30%. This means we have figures that are very similar to those of the USA, which is around 40%. Authorities must understand that prevention requires twofold action: doing physical exercise is good, but it must be accompanied with a balanced diet.

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- **How can the brain be trained to select the healthiest foods?**

That's the reason why we have to emphasize food education with programmes from an early age, at schools and at home. We must be aware of the importance of nutrition because of what it does to the brain, through the reward system, the same system that activates when drugs like cocaine are consumed; it causes an increase in dopamine signalling, a neurotransmitter that generates the feeling of pleasure. If a person manages to satisfy this need for nutrition with other types of healthy food, when the brain receives sufficient nutrients and is trained, it is able to make us follow a balanced diet. It would not predispose us to consuming high-fat or high-sugar foods.

- **And governments? Do taxes on certain types of food work?**

I don't think the taxes on sugar have changed anything. There is a controversy about investing in treatments, but not doing so in prevention. The message that society wants, at a certain level, is that I can eat what I want because it gives me pleasure, but without putting on weight. It is the aesthetics related to obesity that people don't want to experience.



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Often, we are not aware of the impact of subjecting our bodies to diets that are high in fats and sugars, even if we maintain our body weight. This high-fat diet means that we are in a constant situation of inflammation, with the circulation of inflammatory markers. The inflammation is there, even though our weight is stable. And that implies inflammation of the brain, development problems and cancer. That is to say, there are heaps obesity-related diseases that could be prevented. Now, by this I don't mean that we need to research treatments, because we need to treat the 40% of the population that is obese. But it is particularly important to be aware that where we can have a real, more effective impact is in prevention, so that future generations do not reach such high figures for obesity, and society becomes progressively healthier.

- **GLP1 inhibitors have become a fashionable drug. Are they the solution?**

The problem is, at a chronic level, I don't know if we will be able to maintain the weight. For our organism, for our brain, if there is deregulation of the hunger circuit and the brain understands that our body weight should be higher, when we finish the treatment, our weight will increase. The rebound effect also exists with these drugs.. And not everyone can afford the treatments. We cannot rely on the State to finance these drugs for 40% of the population; it would be reckless. So, for governments, it is still more effective to work on prevention. In terms of science, what we can do is contribute to showing the impact that diet has on the development of our brains. The current focus of our research is on child obesity in animal models. We want to try to establish an equivalence between child obesity in animal models to see what consequences obesity has on metabolism, neural function, the areas of the brain that are most sensitive to certain types of diet, what the consequences are for her future descendants if a mother is obese during her pregnancy, etc.
The goal is to understand what happens with a person exposed to obesity during their development, whether during infancy or adolescence, even though they later follow programmes of physical exercise and recover a healthy weight. We also want to know what will happen when they stop doing

that intense physical exercise. Is there a body weight memory? And returning to the traditional sayings we've heard so many times, I have to say, "you are what you eat" is true. We do not know the effects of processed foods with high levels of chemicals and additives aimed at the long-term conservation of a product. What is clear is that there has been an exponential increase in many diseases related with obesity, like cardiovascular disease, cancer Alzheimer's etc.

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