

## The Biology Behind ‘Food Addiction’

### How we interact with food

Our bodies have efficient regulatory systems matching energy intake (calories from food and drink) with energy expenditure (physical activity, metabolism, heat generation), thereby maintaining a relatively stable body weight and composition. But we don't just eat to maintain energy balance. Consumption of palatable food and drink is a rewarding experience, influenced by social setting, and it appears that the reward value of food can overwhelm the body's energy balance mechanisms that otherwise regulate feeding, leading to intake of calories beyond hunger and nutritional requirements. In our obesogenic environment, we are surrounded by inexpensive palatable foods that are high in sugar, fat and calories. Overconsumption of calories can lead to weight gain, obesity, and attendant chronic health conditions.

### Activation of reward systems

The reward circuitry in the brain, which is sensitive to natural and ‘artificial’ rewards, consists of a number of discrete neuroanatomical structures and chemical transmitter systems. These are familiar neurotransmitters: opioids, dopamine, GABA and serotonin (5-HT). In the context of food reward, research has shown, for example, that the activity of the endogenous, natural, opioid system is influenced by ingestion of palatable diets, and that changes in the activity

of the system in turn affect behaviour, feeding and, perhaps, diet preference. Similarly, both dopamine release and dopamine receptor levels are affected by palatable diets. From this it is apparent that dysfunction of these systems has the potential to contribute to overeating and the pathophysiology of obesity.

### Comparing food and addictive substances

A number of strands of evidence support the suggestion that ‘food addiction’ may underlie the inability of some people to control their consumption of palatable food. In particular, changes in the brain reward circuits induced by overconsumption of palatable foods, and in brain areas activated by food craving, are similar to those observed in drug addiction and drug craving. Addictive substances act on the same brain reward systems that evolved to reinforce natural, and advantageous, behaviours, and have subverted these systems, generating a deleterious outcome. However, whether food or food components can be considered to be addictive in this sense is a source of controversy within the scientific community. Food addiction is unlikely to be relevant to most types of obesity, which result from marginal overconsumption of calories over long periods of time. Conservatively, ‘food addiction’ is most likely to be relevant in instances of significant and regular overeating within the context of a clinical eating disorder resembling an addiction, i.e. binge eating disorder (BED). Patients with drug addiction or eating disorders that mimic food addiction (such as BED)

do share some character-traits, such as impulsivity. In particular, it will be important to establish how comparable the behavioural and neurobiological processes in chemical and food addiction really are, and whether similarities and differences can be exploited to benefit.



### Working with food reward

Understanding the brain mechanisms underlying food reward, and perhaps food addiction, may lead to the development of foods or drugs for the treatment of obesity. For example, foods with reduced energy density yet which retain palatability, or which stimulate enhanced release of gut satiety peptides, could help to control predisposition to overconsumption. Food design to enhance the feeling of pleasure or reward associated with food could help individuals to terminate a meal or a snack at a lower caloric intake.

## Contacts

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