Designer food, devices and diabesity

Obesity is a major risk factor for the development of type 2 diabetes, and the rising trend in obesity has led to a simultaneous increase in the prevalence of type 2 diabetes. Currently, the estimated diabetes prevalence worldwide is 366 million, projected to rise to 552 million by 2030 (Whiting et al, 2011), and closer to home, the number of individuals with diabetes is expected to have risen to 5 million by 2025 in the UK (Diabetes UK, 2012). The parallel increase of obesity and type 2 diabetes has led to the use of the term "diabesity" to describe people with both conditions (Gatineau et al, 2014).

As healthcare professionals, we are geared to manage diabesity in a certain way – correcting hyperglycaemia, while at the same time enabling weight management. In simple terms, weight management is achieved by reducing calorie intake and increasing physical activity. Increasing physical activity can only be achieved by increasing physical activity, and likewise, there are a very limited number of ways we can reduce calorie intake. Methods to reduce calorie intake include prescribing a combination of food groups that increase satiety and bringing about a calorie deficit by restricting food intake. Meal replacements, such as shakes or bars, can also be employed to bring about a calorie deficit.

When reduced calorie intake and increased physical activity do not succeed in the long term (i.e. weight regain), surgical methods can be employed to reduce calorie intake by restricting the amount of food eaten, or bringing about malabsorption of the food consumed or a combination of both. It is clear to all that none of these methods succeed in everyone and, hence, we are witnessing the mushrooming of different diets, some fads, with varied effectiveness.

Psychological intervention as a tool for weight management is now gaining more popularity with cognitive behaviour therapy, talking therapy, neuro-linguistic programming and hypnotherapy becoming more widespread. Clinical psychologists discuss disinhibition and develop the construct of restraint with clients to aid weight loss through behaviour change. However, there is still the potential issue of weight gain after initial weight loss, as with most interventions.

In need of innovation

With about 50% of the Western world being either overweight or obese, we are increasingly desperate to fund a solution for diabesity management. Desperation breeds innovation. As Benjamin Disraeli wrote in *Endymion* in 1880, "Desperation is sometimes as powerful an inspirer as genius". If we are struggling to modify behaviour using currently available tools, we should start to consider what other ways there are to change eating behaviour.

Designer food

"Designer foods" are one such way to succumb to the patient's behaviour and continue to provide food that people prefer. Designer food refers to food that has been designed to have some extra health benefits, usually through fortification or nutrification (e.g. designer egg, milk, grains, probiotics and designer proteins [Rajasekaran and Kalaivani, 2013]). Is designer food the way forward? Prescribing such foods could be a bridge towards a more definitive weight management programme.

How would you feel if you could still eat a big bar of chocolate, a large bag or two of crisps and well-done steak with chips and still feel the sense of having eaten everything but not gain weight. Would this style of intervention be beneficial in the long run? This may help the proportion of the diabesity population for whom conventional methods have failed to achieve a lasting success; are we succumbing to the fact that we cannot change the behaviour of all our patients? I feel in the current climate, this somewhat unorthodox view may be an important tool in diabesity management for a selected few who have been unsuccessful using traditional weight loss methods and interventions.

Advantages of the designer food approach are that it does not require a change in dietary habits and it can deliver the recommended amount of nutrients regularly. For example, fortification of omega-3 fatty acids in a designer egg not only offers the health benefits associated with omega-3 fatty acids, but also reduces the cholesterol content of the

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egg by replacing saturated fatty acid in egg yolk. Other examples of designer foods currently being investigated are designer broccoli and designer yoghurt, both of which may slowly encourage people who are adverse to vegetables and dairy to try these food groups. In the future, foods could be further personalised to the taste of the client and then printed at the client's home at a time when he or she is hungry. A 3D food printer uses freeze-dried powdered ingredients that contain micro-nutrients, which are combined with oils and water to produce finished wet foods. The wet food is printed and then heated before consumption.

Devices

Bariatric surgery is the most effective intervention currently available for weight management; however, there is a significant proportion of people who will not succeed in maintaining weight loss in the long run or will not be suitable for these procedures.

Several less-invasive devices are now being researched for weight management. Vagal nerve blocking therapy is an innovative weight loss treatment for obesity and its associated comorbidities. VBLOC™ therapy is delivered by a pacemaker-like device, which is designed to control both hunger and fullness by blocking the vagus nerve. The therapy is reversible and can be non-invasively adjusted or turned off when necessary.

The US Food and Drug Administration (FDA) has now approved VBLOC™ therapy based on a randomised clinical trial of 233 people with a BMI of 35 kg/m^2 or greater (FDA, 2014). After 12 months, the group with the active device had lost 8.5% more body weight than the controls, with about half (52.5%) of the active-device group losing at least 20% of their excess weight and 38% losing at least 25% (EnteroMedics, 2014).

The device is contraindicated for use in people with cirrhosis of the liver, clinically significant hiatal hernia, people for whom magnetic resonance imaging or diathermy use is planned, those at high risk for surgical complications and those who have permanently implanted, electrical-powered medical devices, such as pacemakers and implanted defibrillators.

There are several other devices at different stages of research including the Full Sense™ Device and gastric pacemakers. The Full Sense™ Device is placed via endoscopy in the distal oesophagus and proximal stomach. By applying pressure to this area it causes satiety without the need for the presence of food. Implantation of a gastric pacemaker involves surgically placing electric pacers into the stomach wall and then attaching pacing wires to a generator placed in the subcutaneous tissue of the abdominal wall. The increased stimulation is thought to increase gastric motility, but it may also change the tone of the gastric fundus and alter gut hormone secretions.

Drastic measures, which are now available in the field of weight management, are the AspireAssist and the tongue patch. AspireAssist reduces the amount of calories by allowing individuals to remove digested food directly from the stomach through a tube in the abdomen wall before calories can be absorbed in the small intestines. The tongue patch is a reversible procedure wherein a patch is sutured to the tongue. This makes the physical act of chewing solid foods difficult and painful, thereby limiting the individual to consuming only liquid foods. Currently, there are no long-term data on the tongue patch's effectiveness or side effects. We should not be surprised if we find that these techniques become routine for some groups of people who have failed to succeed with conventional interventions.

In order to manage diabesity, it is necessary to invest in more innovative techniques and devices as there will soon be a significant proportion of the population who are either resistant to, or have failed on, all conventional weight loss interventions available. ■

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