

DIETETICS

THE OFFICIAL MAGAZINE FOR ALL BDA MEMBERS TODAY

Tackling the

obesity

By Dr Margaret Ashwell OBE

problem



Author biography

Dr Margaret Ashwell OBE is an independent scientific consultant. She is a Visiting Research Fellow at Oxford Brookes University and has recently become a Advisory Board Member of the Global Stevia Institute, an educational resource for the industry and public focussed on educating health professionals, food and beverage manufacturers, public affairs leaders, and consumers about the benefits of incorporating a plant-based sweetener stevia into the diet.

The global epidemic of obesity

Rising prevalence of obesity is a worldwide health concern

Focussing on shape, not weight, and the use of stevia, a natural origin sweetener.

because excess weight gain is certain to lead to an increased burden from several diseases, most notably cardiovascular diseases, diabetes, and some cancers. A recent Lancet paper ^[1] has used a model to show, in the USA and in the UK, how the proportion of people with a body mass index (BMI) above 25 (overweight) is projected to rise up to 2020. These trends project 65 million more obese adults in the USA and 11 million more obese adults in the UK by 2030. This, in turn, would give rise to about 7 million more cases of diabetes, 6 million more cases of heart disease and stroke, and half a million more cases of cancer, for the USA and UK combined. The combined medical costs associated with treatment of these preventable diseases are estimated to increase by about 55 billion dollars per year in the USA, and

by about £2 billion per year in the UK by 2030.

Think about shape and not weight and focus on the 'apples'

There are many strategies for treating overweight and obese people including diet, exercise, drugs, behavioural therapy, surgery and many combinations of all these. But it is equally important to recognise those individuals who are most likely to become obese and to identify those who will have the greatest health risks when they do. To this end, it is easier to think in terms of shape and not weight.

It is now universally accepted that the health risks of obesity are more severe for those with central obesity (the 'apples') rather than those without (the 'pears'). Central obesity usually reflects extra large depots of intra-abdominal fat which

seem to be more metabolically active and promote diabetes, hypertension and other factors associated with cardiometabolic risk. However, the easiest way to know your shape is to calculate your waist circumference divided by your height (your waist-to-height ratio = WHtR). If your waist circumference is more than half your height, then you have WHtR greater than 0.5 and you should 'consider action', or 'take action' if it is over 0.6 ^[2]. This advice even applies to people in the group with normal weights as assessed by BMI (those with BMI between 20 and 25) ^[3].

If you apply this strategy to your patients, you will find this helps you to prioritise those patients who most need your help. Use the chart on page 2. The 'apples' whose WHtR is above 0.6 will need your help most, but even those with WHtR

between 0.5 and 0.6 should be alerted to the increase health risks they may face.

Legend to figure 1

The Ashwell ® Shape Chart is based on WHtR. It allows health professionals and/or their patients to match their waist circumference against their height- in inches or in centimetres- and to see into which category they fall. These are the four regions and what they mean to the patient:-

- If your shape is in the 'chilli' region (WHtR less than 0.4), you should "Take Care"
- If your shape falls in the 'pear' region (WHtR between 0.4 and 0.5), you have a "healthy OK" shape.
- If your shape falls in the 'pear-apple' region (WHtR between 0.5 and 0.6), you should "Consider Action".
- If your shape falls in the 'apple' region (WHtR above 0.6), your health is probably at risk. Why not talk with your dietitian and "Take Action"?

The Public Health Responsibility Deal

In March 2011, the UK Government launched its Public

Health Responsibility Deal (PHRD) in an attempt to reduce the costs of physical inactivity, alcohol misuse, and obesity which have been estimated to be as high as £8.7 billion. The Calorie Reduction Programme within the Food Network of the PHRD is focussed on changing the food environment so that it provides less stimulus for over-consumption and weight gain, but instead facilitates weight maintenance.

An Expert Group was therefore convened to estimate the level by which calorie intakes would need to fall to reduce the risk of continued excessive weight gain among the population, and to assess the risk this poses to micronutrient status and malnutrition among different population groups. In their first statement [4], this Expert Group noted that a number of food categories (for example, soft drinks, confectionery, preserves and savoury snacks) make a relatively high contribution to calorie intakes on a population basis (particularly in children), but, as a set of categories, provide relatively few micronutrients. The Expert Group will therefore be

advising the Food Network of PHRD to reduce the proportion of total calorie intake from these food categories.

One of the simplest ways to reduce calories from these foods and drinks is to replace the sugar in them, either totally or partially, with non-nutritive sweeteners (NNS). Each 100g sugar contains nearly 400 kcalories. If the PHRD's aim is to reduce personal consumption by 100 kcal per day, then only 25g sugar would need to be replaced by NNS - about 6 teaspoonfuls.

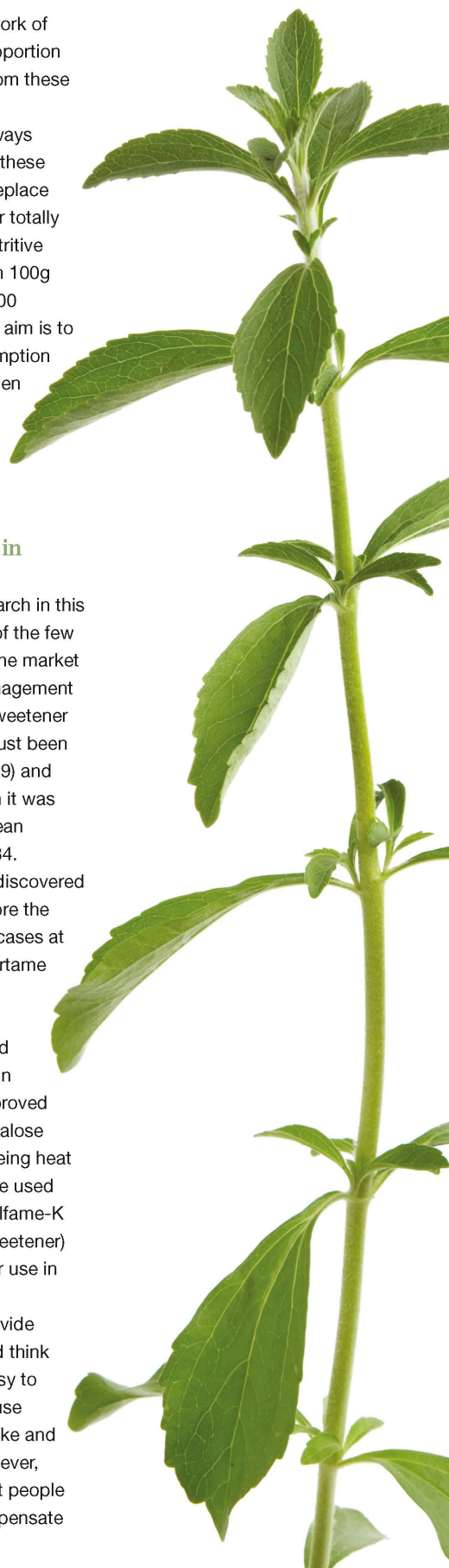
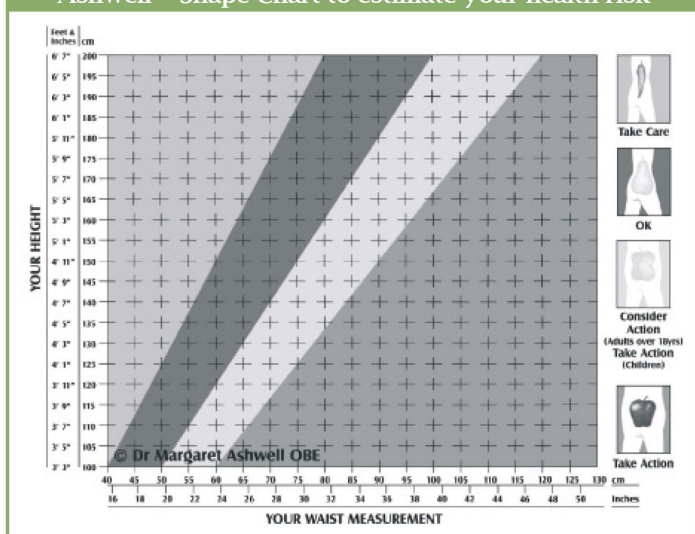
Role of sweeteners in caloric reduction

When I started my research in this area in the 1970s, one of the few product categories on the market to help with weight management was the non-nutritive sweetener (NNS). Cyclamate had just been banned in the USA (1969) and remains so even though it was approved by the European Commission (EC) in 1984.

Saccharin had been discovered in 1879 and was therefore the NNS of choice in most cases at that time. In 1984, aspartame was approved for use in foods by the EC; the NNS market was divided between it and saccharin until Sucralose was approved by the EC in 2000. Sucralose had the advantage of being heat stable so that it could be used in cooked foods. Acesulfame-K (another heat-stable sweetener) was approved by EC for use in foods in 1984.

Considering NNS provide zero calories, you would think that it would be very easy to demonstrate that their use would lower energy intake and cause weight loss. However, you cannot assume that people using NNS will not compensate

Figure 1 - Use of waist-to-height ratio in the Ashwell ® Shape Chart to estimate your health risk



(either consciously or not) by eating other calorific foods!

In 2006, we published a systematic review and meta-analysis to look at the evidence for the effect of aspartame on weight loss, weight maintenance and energy intakes in adults. It addressed the question of how much energy is compensated for and whether the use of sweetened foods and drinks is an effective way to lose weight [5].

We demonstrated that using foods and drinks sweetened with NNS, instead of sucrose, results in a significant reduction in both energy intakes (about 10%) and body weight; the estimated rate of weight loss was about 0.2kg/week. Some compensation for the substituted energy does occur but this is only about one third of the energy replaced and is probably less when using soft drinks sweetened with NNS. Of course these results and the compensation values are derived from short-term studies and more data are needed over the longer term to determine whether a tolerance to the effects of NNS is acquired.

What is stevia?

After 40 years of NNS on the market in Europe, we are now entering a new phase of NNS development – the natural NNS – in line with the drive for more natural products. This is where stevia comes in. Stevia is the first natural origin, no-calorie sweetener to be put into the market by the global food and beverage industry. It

is a sweetening ingredient that is up to 400 times sweeter than sucrose and it gained full EU approval in November 2011.

Stevia rebaudiana (Bertoni) is a plant, native to Paraguay, which has traditionally been used to sweeten beverages. Stevia is a genus of about 240 species of herbs and shrubs in the sunflower family (Compositae) and today, stevia is being grown in at least 16 countries across four continents. The sweet tasting components of the stevia plant are called steviol glycosides and they can be isolated and purified from the leaves. All steviol glycosides share a common molecular core, the diterpenoid structure, steviol. The only difference among various steviol glycosides is the number and arrangement of sugar molecules attached to the steviol core. Each steviol glycoside has a particular taste profile and sweetness intensity. The two major glycosides are rebaudioside A (RebA) and stevioside.

How is stevia sourced and produced?

In the same way that sugar is extracted from plants, so too, is stevia. Extracting and purifying the different steviol glycosides from the stevia leaves with water produces an ingredient with a taste similar to sugar. The water extracts are typically further purified and concentrated through techniques such as ion-exchange chromatography and/or membrane filtration.

Metabolism and safety of stevia

Steviol glycosides can be hydrolysed to steviol in the presence of certain gut bacteria. As an example, rebaudioside A is first metabolised by bacteria to stevioside and then through other steps to steviol, which is then

converted to steviol glucuronide and excreted from the body. Any released glucose is used by the gut bacteria as an energy source and is not absorbed.

Stevia has been used as an alternative sweetener in foods and beverages in Japan for more than 40 years and numerous clinical and safety trials have been performed there. There are more than 200 studies confirming the safety of stevia for subjects of all ages. Additionally, all major global regulatory organizations including the FSANZ [6]; Food & Drug Administration (FDA) [7], the World Health Organization (WHO) [8] and the European Food Safety Authority (EFSA) [9], have concluded that there are no safety concerns with stevia.

How much stevia can we safely consume?

The Acceptable Daily Intake (ADI) is the amount of a substance that can be consumed daily in the diet, over the course of a lifetime, without any health problems. Setting ADIs and assessing consumption of additives such as NNS according to their ADI is a way of ensuring that the actual intake of the NNS is way below the level that could be considered harmful to health; i.e the ADI is a guarantee of safety.

In the case of stevia, the ADI is based on evidence on genotoxicity, reproductive and developmental toxicity, toxicity, carcinogenicity, metabolism, glucose homeostasis and cardiovascular effects. Because the ADI is related to body weight, it can be used to define safety for adults and children.

The Joint Expert Committee on Food Additives (JECFA), and now EFSA [9], has set an ADI of up to 4mg steviol glycosides (as steviol equivalents) /kg body weight /day. The ADI is expressed as steviol equivalents to allow for intake of

the different glycosides on the basis that each unit of steviol glycosides produces about 0.3 to 0.4 units of steviol.

The ADI was set by reviewing many studies in humans, including those demonstrating that daily doses of steviol glycosides of up to 1000 mg/person/day were well-tolerated by people with normal glucose metabolism or people with type-2 diabetes. Conservative estimates of steviol glycoside exposure both in adults and in children suggest that it is not likely that the ADI would be exceeded at the maximum proposed levels [10].

How can your patients benefit from stevia?

Purified stevia is 100% natural, with no calories, up to 400 times sweeter than sucrose, heat stable, non-fermentable and non-cariogenic (i.e. does not promote tooth decay). In terms of sweetening compounds, it has a unique position because it lies right in between sucrose which is natural, but calorogenic, and other NNS which are non calorogenic, but not natural.

Stevia consumption is well tolerated by people with hypertension [11], type 1 and type 2 diabetes [12]. Studies in both laboratory animals and humans with type 1 and type 2 diabetes have found no changes in blood pressure, blood glucose or glycated haemoglobin (HbA1c). So, stevia can replace sweet carbohydrate calories in the diet of adults and children with diabetes.

But what happens next? Is there a danger that stevia might stimulate the appetite? Luckily, the answer to that question is no, certainly not in the short term. When given stevia or sucrose, both lean and overweight adults reported similar levels of hunger and satiety, and those given stevia did not increase their calorie

intake at the next meal. After consuming the meal, those given stevia actually had significantly reduced postprandial glucose and insulin levels compared to sucrose consumers [13].

Although there are no research papers yet to show the effectiveness of stevia in weight management (only those to demonstrate safety), there is no reason to believe that it should not be just as effective as the other NNS which were studied in the systematic review referred to previously[9].

In dietetic practice, it is very straightforward to ask your patients about their consumption of sweetened foods and beverages. For many of these, low calorie alternatives already exist. Why not suggest that they try them and point out that this is an easy way to save calories without saving on the sweetness? If they are keen to only use natural ingredients, you can tell them about stevia. Remember that 6 cups of tea or coffee sweetened with stevia instead of sugar will save them 100 calories a day.

Stevia is also suitable for use by people with phenylketonuria (PKU) who cannot use the NNS aspartame because it contains the amino acid, phenylalanine.

Where will you find stevia in foods and drinks?

Stevia is of natural origin and has zero calories. It is safe for all including diabetics and those with high blood pressure and it is tooth friendly. The fact that it has high solubility makes it ideal for diverse food applications. It is heat stable and suitable for cooking and baking. It also has an excellent shelf life. All in all, products sweetened with stevia can help offer more choice in the NNS market – particularly for those who like natural sweetness.

This means that the market will be extensive and that stevia will be found in a wide range of food and drinks.

Stevia is available to consumers in many ways. Sometimes it is the sole sweetener in the product, sometimes it is blended with other NNS, both options providing zero-calorie sweetness. On other occasions it is blended with sugar (eg as a table-top product, or in soft drinks etc) to reduce calories in these products. Today, stevia can be found in hundreds of food and beverage products from around the world (see Table 1).

Table 1:
Potential uses for stevia^[14]

- Soft drinks, teas, fruit juices
- Table-top sweeteners
- Granola and snack bars
- Flavoured milk and yogurt
- Ice cream
- Salad dressing
- Chewing gum
- Canned fruit and jams
- Desserts
- Alcoholic beverages

Conclusions

There is good scientific evidence that NNS can help people to reduce their energy input and to lose weight. Dietitians can recommend them to adults and children. To combat the global obesity epidemic, the UK Government is encouraging even small energy reductions and dietitians should recognise the importance of treating those with 'central obesity' and consider recommending stevia, the NNS of natural origin.

CPD

Worried about evidence for HPC? Free personalised assessment for this CPD

activity. This article is a tool to support members in maintaining their CPD, building on the continuous activities provided by the BDA as well as the campaign to support members as we approach another HPC audit.

The activity has been designed to meet the standards required to demonstrate effective CPD as it is grounded in critical appraisal, reflection, and evaluation. Your record of the CPD activity will not be formally assessed, the feedback will be provided in a reflective style that encourages you to advance your research knowledge and skills. Log on to the 'professional practice' section of the members' website to fill out your assessment form.

The first 100 received will be forwarded to our assessor for assessment, personal feedback and a certificate for your CPD portfolio.

CPD questions

1. What part can dietitians play in tackling the obesity epidemic?
2. Summarise three key points in this article that you would use to convince other dietitians of the role that NNS can play in helping to achieve the PHRD aim of reducing caloric intake.
3. List five benefits provided by NNS for the normal adult population.
4. What are the advantages of a natural sweetener? How do you think you can help your patients to benefit from stevia?
5. Which food categories do you think are in most need of low-calorie alternatives which would be of help to your patients?
6. What can I apply immediately to my practice and patient care?
7. What have I learnt from this article that I did not know before? **DT**



References

1. Wang YC, McPherson K, Marsh T, Gortmaker SL, Brown M. Health and economic burden of the projected obesity trends in the USA and the UK. *Lancet* 2011;378:815-25.
2. Ashwell M. Shape: the waist-to-height ratio is a good, simple screening tool for cardiometabolic risk. *Nutrition Today* 2011;46:85-89.
3. Ashwell M, Gibson S. Waist to height ratio is a simple and effective obesity screening tool for cardiovascular risk factors: Analysis of data from the British National Diet And Nutrition Survey of adults aged 19-64 years. *Obes Facts* 2009;2:97-103.
4. Department of Health. Statement of the Calorie Reduction Expert Group. 2011.
5. de la Hunty A, Gibson S, Ashwell M. A review of the effectiveness of aspartame in helping with weight control. *BNF Nutrition Bulletin* 2006;31:115-128.
6. Food Standards Australia New Zealand (FSANZ). Final Assessment Report application A540 steviol glycosides as intense sweeteners 2008.
7. Food and Drug Administration. GRAS exemption claim for Rebiana (Rebaudioside A). 2008.
8. JECFA (Joint FAO/WHO Expert Committee on Food Additives). Compendium of Food Additive Specifications. Monograph 5. Steviol glycosides. 2008; Available at: <http://www.fao.org/ag/agn/jecfa-additives/details.html?id=898>.
9. EFSA Panel on Food Additives and Nutrient Sources (ANS). Scientific Opinion on the safety of steviol glycosides for the proposed uses as a food additive. *EFSA Journal* 2010;8(4):1537. 2010;8:1537.
10. Renwick AG. The use of a sweetener substitution method to predict dietary exposures for the intense sweetener rebaudioside A. *Food Chem Toxicol* 2008;46 Suppl 7:S61-9.
11. Maki KC, Curry LL, Carakostas MC, Tarka SM, Reeves MS, Farmer MV, et al. The hemodynamic effects of rebaudioside A in healthy adults with normal and low-normal blood pressure. *Food Chem Toxicol* 2008;46 Suppl 7:S40-6.
12. Maki KC, Curry LL, Reeves MS, Toth PD, McKenney JM, Farmer MV, et al. Chronic consumption of rebaudioside A, a steviol glycoside, in men and women with type 2 diabetes mellitus. *Food Chem Toxicol* 2008;46 Suppl 7:S47-53.
13. Anton SD, Martin CK, Han H, Coulon S, Cefalu WT, Geiselman P, et al. Effects of stevia, aspartame, and sucrose on food intake, satiety, and postprandial glucose and insulin levels. *Appetite* 2010;55:37-43.
14. Mintel International Group Limited. *Stevia and Other Natural Sweeteners*. 2009.