Zero in on Stevia
In 2015, when the World Health Organization (WHO) issued guidelines with recommendations on daily sugar intake\textsuperscript{1}, they would start a change in how the world viewed sugar. Consumers started to look at ingredient labels more closely eyeing the sugar content in their favorite soda or yoghurt, too often shocked by what they discovered. By 2016, more than 34\% of global consumers were trying to avoid sugar, according to data from a Nielsen Survey\textsuperscript{2}. Knowledge about the correlation of sugar overconsumption and obesity and various diseases has pushed healthy eating trends across the globe. Consumers are now more than ever looking for non-artificial, clean label products that are low in added sugar.

Upcoming changes in labeling regulations in 2020 from the FDA\textsuperscript{3}, which will among other changes add a line for “added sugar” on ingredient labels, as well as the implementation of sugar taxes around the globe are two forces leading major food and beverage companies to focus on sugar reduction programs.

Though there are several Food and Drug Administration (FDA) approved artificial high-intensity sweeteners available in the market as a replacement for sugar, growing demand for nature-based, zero-calorie, non-GMO sweeteners from consumers has led to the rising popularity of stevia.

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\textbf{The Stevia Plant}

The stevia plant is native to Paraguay, South America, and is often referred to as ‘The Sweet Herb of Paraguay’. Steviol glycosides are a group of highly sweet diterpene glycosides isolated in only a few plant species, including the perennial shrub stevia rebaudiana. The leaf extracts of stevia are about 30 times sweeter than sugar, whereas steviol glycosides are typically 150–400 times sweeter.

\textsuperscript{1} World Health Organization, Guideline: Sugars intake for adults and children, 2015
\textsuperscript{2} Nielsen Global Health and Ingredient Sentiment Survey, Q1 2016
\textsuperscript{3} www.fda.gov/Food/GuidanceRegulation/

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Stevia and its leaf extract were sold as dietary supplements until the Joint FAO/WHO Expert Committee on Food Additives (JECFA) in 2008 approved the purified stevia leaf extracts with a 95% or greater steviol glycoside content as Generally Recognized As Safe (GRAS). Since 2008, US FDA has evaluated over 50 GRAS notifications and has agreed with the conclusions that steviol glycosides are GRAS based on the acceptable daily intake (ADI) that was established by JECFA. Since then, stevia extract has been approved around the globe. The stevia leaf predominantly contains Reb A, which is commonly referred to as the first generation of stevia. Reb A has been widely used in the food and beverage industry since 2008, appreciated for its non-caloric sweetness. Its lingering aftertaste however limits its adoption.

The Chemistry of the Stevia Leaf

The major constituents of stevia leaves are the potently sweet compounds namely stevioside and Rebaudioside A, along with several minor compounds including Rebaudioside C, Rebaudioside D, Rebaudioside E, Rebaudioside M, dulcoside A and rubusoside; all are glycosides of steviosol, the diterpene ent-13-hydroxykaur-16-en-19-oic acid. Furthermore, all these stevia sweeteners are non-caloric and do not contribute to glycemic response.
Of all the reported minor steviol glycosides so far, Rebaudioside M and Rebaudioside D (commonly referred to as Reb M and Reb D) are having relatively higher sweetness intensity with a sugar-like perception, almost no licorice and/or bitter aftertaste, making these two compounds distinct in overall taste profile. Reb M and Reb D are found in minute quantities in stevia, which led to the development of novel processes to manufacture commercial quantities. These novel processes are: fermentation, gluco-sylation and bioconversion.

Bioconversion Process
Sweegen in association with Conagen has developed a unique proprietary biocatalytic technology process using purified enzymes to produce desired nature-based stevia sweeteners. Conagen uses latest enzyme biology tools to improve the rate of catalytic efficiency, optimize production procedures, and ensure quality as well as safety of final high value products. Sweegen - in collaboration with Conagen - created new commercially innovative methods for simple, reliable and economical processes to produce Reb M and Reb D in commercial quantities.

Being one of the pioneers in bioconversion with intimate knowledge of metabolism including substrates, products, and co-factors, Conagen owns a unique Intellectual Property (IP) portfolio with at least 200 patents and patent applications. Conagen and Sweegen developed this technology using novel enzymes to convert stevia leaf extract to either Reb M or Reb D. Sweegen makes a difference in the competitive arena of commercialized Reb M and Reb D.
Bestevia: Reb M & Reb D - Key Facts

- Produced with stevia-based bioconversion technology
- 'Generally Recognized As Safe (GRAS)' by the FDA and in many other countries worldwide
- FEMA GRAS for use as flavors with modifying properties in all applications
- Non-GMO Project Verified
- Kosher and Halal Certified
- Stable under various temperatures and pH conditions
- For sugar replacement of up to 100%
- ≥ 95% pure

With its vastly superior taste, Sweegen’s non-GMO Reb M and Reb D have become critical sweeteners of choice for sugar reduction.

For more information about Sweegen’s next generation stevia sweeteners please contact Sweegen or Ingredion.

Ingredion is Sweegen’s exclusive global distributor in all markets (excluding Sweegen’s house accounts and in the People’s Republic of China, where it is a non-exclusive distributor). This collaboration enables both companies to benefit from each other’s strengths and to engage a diverse number of customers in the global food and beverage industry.