The Structure of Aerated Confectionery

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The perception of food texture is determined in large part by the microscopic structure of the product. Structure, and therefore texture, are influenced by factors such as ingredient selection and processing parameters. Just think of the variety of confections that can be made from the same basic ingredients: sugar, corn syrup, water and a hydrocolloid. For example, structure can be controlled by the corn syrup:sugar ratio partly through its effect on crystallization or graining.

A wide variety of the foods we eat on a daily basis have a component not listed on the label — air. For many years, cooks have appreciated the importance of air in their favorite recipes. The food industry has also capitalized on the effects of air in foods, but until recently air incorporation has been more of an art than a science. A recent review listed the properties that bubbles impart to foods: a reduction of product density, a change in rheology and texture, modification of appearance and mouthfeel, increased surface area, alteration of digestibility and shelf life due to increased porosity and modulated flavor intensity. Air bubbles, incorporated through a variety of means, allow us to enjoy ice cream, bread, soda, beer, soufflés, whipped cream and a host of other products. Bubbles are integral to many classic confectionery products—marshmallow, taffy, dinner mints, pulled sugar and nougat—and even chocolate is being aerated. Aeration is used extensively to produce a range of confectionery textures from crunchy or crisp, (e.g., honeycomb candy), to soft (e.g., marshmallows) by modifying the bulk density in the range from 0.2 to about 1.1 g/ml.

METHODS OF AERATION
There seem to be nearly as many methods of aeration as there are aerated food products. In carbonated or fermented beverages, carbon dioxide is injected directly or produced during the fermentation process. Popcorn and puffed cereal products are produced by heating the product to a point where the internal gases expand sufficiently to rupture the outer structure, releasing the pressure and causing the product to expand. In modern bread making and bakery applications, air bubbles incorporated into the dough by mixing expand during the proving process. Air cells incorporated through mixing in extruded products expand due to decreased pressure as the product leaves the die, and ice cream is foamed through mechanical dispersion of air into the freezing mix. A related method of air entrainment, known as whipping, involves beating the product vigorously to incorporate air. This method is used to produce aerated products including whipped dairy creams, meringues, cake batters and confections.