

The beverage industry says that the average American drinks one gallon (3.8L) of soft drinks each week. Considering that a 1995 census estimated the U.S. population to be 263,874,000 people, that translates into about one billion liters a week! This huge volume means a potentially large profit for soft drink manufacturers, who constantly try to entice you to change brands.

One such manufacturer is Clearly Canadian Beverage Corporation, headquartered in Vancouver, British Columbia. Clearly Canadian recently released a unique product they hope will gain a portion of the U.S. marketplace. Sold under the product name Orbitz, this "out-of-this-world" non-carbonated fruit-flavored soft drink is sure to get your attention. Floating in the clear liquid are colorful "orbs," gelatin-like spheres containing complementary flavors that float about in the beverage, seeming to defy gravity. It is this unique property that the manufacturer is counting on to grab the consumers' attention. Half the fun of Orbitz is playing with it before you drink it. No amount of twisting, turning, shaking, heating, cooling, etc., seems to affect its "gravity-defying" properties. But what keeps these flavor spheres suspended? There must be more to Orbitz than meets the eye.

On the basis of a first observation, it would seem that the phenomenon of the floating orbs is density related. If the colored spheres were to remain suspended in the beverage medium, then the spheres and the beverage should have nearly identical densities. Experimentation showed that the density of the orbs and the surrounding liquid are indeed nearly identical. Both have a density between 1.030 and 1.035 g/ml. But one would expect that a two-component system, even of almost identical densities, would separate during the days when the product was being transported from the manufacturing facility to the store shelf. Eventually, all the orbs should sink to the bottom or float to the top, but this never happens to Orbitz. The colored spheres seem to flaunt the law of gravity! Are the flavored spheres held back by something we can't see?

A simple check of the ingredients listed on the back of the Orbitz bottle shows that most are common ingredients found in many brands of soft drinks: water, high-fructose corn syrup, sugar, natural flavors, citric acid, sodium citrate, colors. But a couple are unusual. What are "xanthan and gellan gums"? Could these hold the answer to Orbitz's gravity-defying property?

Xanthan gum is a polysaccharide (many-sugar) gum produced by the bacterium *Xanthomonas campestris*. The primary chemical structure of this gum consists of a cellulose backbone with trisaccharide (three-sugar) side chains and repeating pentasaccharide (five-sugar) units. This giant polymer (its mol wt exceeds 106 g/mole) has been used in processed foods for years as a stabilizer and an emulsifying agent. (An emulsifying agent is a chemical agent that helps keep one substance evenly dispersed in another. In mayonnaise, egg yolk is the emulsifying agent that keeps the oil droplets dispersed in water. Otherwise, these two "unlike" chemicals would not mix.) Although xanthan gum is a free-flowing powder that dissolves readily in water, just a small amount will make the solution highly viscous. Orbitz is certainly not a highly viscous (viscosity is defined as "resistance to flow") solution, therefore it seemed unlikely that xanthan gum held the answers to our questions.

If there were to be a "chemical" answer to the question of how the colored gel spheres were suspended in the Orbitz beverage, it seemed as though gellan gum was the last hope. Gellan gum is a recent addition to the ingredients lists of many processed foods. This polysaccharide is made by *Pseudomonas elodea*, a bacterium common to the lily pond. According to food-processing experts, gellan gum provides many advantages over more traditional food additives. A gellan gum solution acts like a "gel" that holds particles in suspension but, unlike other gelling agents, it does not significantly increase the solution's viscosity.

Chemical engineers incorporated this "Fluid-Gel" technology into the manufacturing of Orbitz. The gellan gum provides a support matrix, something like a microscopic spider web, that holds the flavored spheres in position. An additional benefit of using gellan gum is that it has a visual clarity approaching that of water, and adding sugar promotes this clarity even more. It would seem that Orbitz and gellan gum are a match made in soft drink heaven! The colorful gel-like spheres that first catch our attention do not really defy gravity but are being held in place by a spider web-like support system that is invisible under normal viewing conditions. While the manufacturer claims the unique beverage is "out-of- this-world," we might better regard it as a phenomenon of misplaced worlds. The world of consumer marketing has just been invaded by *Pseudomonas elodea*, a chemically savvy bacterium from the lily pond!

From Chem Matters magazine

For more information: "From lily pond to the table." Food Processing Magazine, March 1995, p. 97.