CYCLODEXTRINS - NOVEL SOLUTIONS FOR THE FOOD INDUSTRY

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The food industry is increasingly focusing on innovative solutions to enhance its products with desired properties that have additional benefits.

Cyclodextrins offer new options here: they are not only suitable as dietary fiber, but can also help provide food and drink with health-promoting additives, protect sensitive ingredients, improve taste and odor, or positively influence the texture and consistency of food.
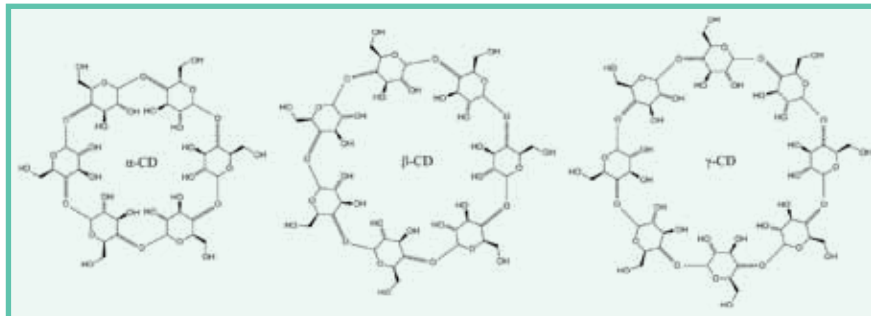
BIOENGINEERED CYCLODEXTRINS

Cyclodextrins are ring-shaped sugar molecules that have been known to science and research for over 100 years. According to the number of glucose units, a distinction is made between α-β- and γ-cyclodextrin: α-cyclodextrin consists of six, β-cyclodextrin of seven and γ-cyclodextrin of eight glucose units. Wacker bioengineers these from plant-based raw materials such as corn or potatoes with the aid of enzymes.

Cyclodextrin molecules' special feature is their ring shape. It creates an interior cavity, similar to a donut, in which cyclodextrins can take up other, primarily hydrophobic substances. In this way, cyclodextrins can bind ingredients, release active agents or stabilize sensitive substances and interfaces.

So, in the food industry, cyclodextrins have important functions - masking an unpleasant taste, stabilizing sensitive food ingredients such as vitamins or increasing the bioavailability of certain active agents. In addition, cyclodextrins can be used as soluble fibers and their emulsifying properties can be applied.

α-CYCLODEXTRIN AS DIETARY FIBER

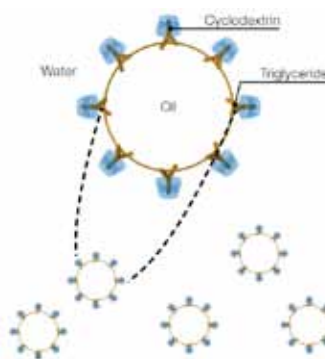Nutritionists recommend a daily consumption of 25 to 30 grams dietary fiber. In fact, most people in western industrial countries eat much less roughage. As food additives, dietary fibers are often inhibited by their poor solubility, viscosity-increasing effects or possible food discoloration.

α-Cyclodextrin offers a solution: as a water-soluble fiber, it does not lead to an increase in viscosity, is stable even at high temperatures and can be used at low pH. Since α-cyclodextrin does not have an E number, it can carry a "Clean Label." Furthermore, its clear solubility means that it can be used in beverages. According to a study by the University of Davis (California), as dietary fiber, α-cyclodextrin can have a beneficial effect on blood cholesterol and the glycemic index. α-Cyclodextrin is therefore particularly suitable as an additive to beverages, but also for other typical fiber applications, such as dairy products, bakery products and breakfast cereals.

α-CYCLODEXTRIN FOR OIL-IN-WATER EMULSIONS

Oil-in-water emulsions are the order of the day in the food industry. Many foods, such as salad dressings, mayonnaises, dessert creams or margarine contain both water and oil phases, which can only be mixed when emulsifiers are added. Traditional emulsifiers include mono- and diglycerides of fatty acids, the lecithins found in egg yolk, or proteins. However, animal-based emulsifiers can have some critical disadvantages - they can be sensitive to heat and acids, do not have a long shelf life, may contain cholesterol, and are potentially allergenic.

A new approach to oil-in-water emulsions is to use α-cyclodextrin. The interior of this donut-shaped molecule is lipophilic (fat loving), while its exterior is hydrophilic (water loving). Fatty acid groups can "slip" into the interior of the α-cyclodextrin and stabilize the interfaces of the otherwise immiscible oil and water phases of the emulsion.

Moreover, α-cyclodextrin enables the manufacture of emulsions with varying viscosities. So, the mouthfeel can be adjusted as required - from a fluidity similar to ketchup to a firm texture resembling sugar frosting.

As a natural degradation product of starch, α-cyclodextrin offers an alternative for producing oil-in-water emulsions that is not only free of cholesterol and allergens, but also plant-based. Hence, cyclodextrins are approved as food additives in numerous countries.

* Heiko Zipp, Director Business Team Nutrition Wacker Biosolutions.