

FEATURE SERVICE

September 2021

Nutraceuticals: Helpers for the Cardiovascular System

Some foods do more than just supply energy. Nutraceuticals are considered to have prophylactic and health benefits. Their ingredients are playing an ever more important role in improving consumers' nutrition. With its nutraceuticals, WACKER offers solutions for formulating effective food supplements – thereby supporting a healthy lifestyle.

It beats tirelessly – some 100,000 times a day: the heart is our body's engine and most important organ. It pumps our blood, delivering nutrients and vital oxygen throughout the body. If it fails in its job, the likely culprit is cardiovascular disease, still the number-one cause of death: nearly 18 million people throughout the world die from cardiovascular diseases. One particularly challenging aspect of this condition is that many people go a long time with little awareness that their cardiovascular health is at risk – these illnesses creep up on us with virtually no warning.

Reining in Cholesterol – and Protecting the Heart

With toothache or muscle tension, we are immediately aware that something is amiss and usually know what to do about it. Problems with the cardiovascular system, on the other hand, are difficult to self-diagnose. Preventive measures play an important role in keeping the cardiovascular system healthy - healthy eating, for example. This includes eating foods that are low in fat

in order to keep cholesterol values within the normal range. “Elevated LDL cholesterol values, in particular, are associated with an increased risk of coronary heart disease and arteriosclerosis,” says Rachela Mohr, who is responsible for scientific management in the Bioingredients business unit. “LDL stands for low-density lipoprotein; lipoproteins are fatty protein compounds. Functional ingredients, known as nutraceuticals, can have a positive impact on the concentration of LDL cholesterol – also commonly referred to as “bad” cholesterol – in our blood,” explains the expert in functional foods. In addition, the ingredients are also attributed with other preventive and health-promoting effects, which are a source of growth in the nutraceuticals market.

A Super Molecule from Olives

WACKER is leading this trend with a range of products – one of which is the hydroxytyrosol HTEssence[®], a secondary metabolite found in olives and olive leaves. Not only is this substance an effective antioxidant, it is also believed to positively affect blood pressure and to have anti-inflammatory properties. Two studies confirm that this ingredient from WACKER can influence the “bad” LDL cholesterol in the blood, and thereby make a contribution to maintaining heart health.¹

In order to obtain hydroxytyrosol directly from olives, however, it must first be extracted through a complex and expensive process. Another disadvantage is that the concentration of the desired natural compound in the resulting extract is very low. WACKER has been able to improve on that considerably: “The

¹ Siefert et al., 2018, Journal of Nutritional Medicine and Diet Care; Knaub et al., 2020, Journal of Nutrition & Food Sciences

company uses a patented, proprietary process to manufacture exceptionally pure, nature-identical hydroxytyrosol – with no undesirable byproducts, at a consistently high level of quality and with a defined concentration of active ingredient,” explains Rachela Mohr. “The substance is then present in spray-dried form as an odorless, water-soluble powder. As a result, the hydroxytyrosol is suitable for use in functional foods and nutritional supplements.”

**A Vital Substance for the
Body’s Engine**

Another molecule that supports health is coenzyme Q10. Remember that, as the most important muscle in the body, our heart needs a lot of energy, which is supplied by the mitochondria, the micro power stations contained in every cell. The coenzyme Q10 molecule, or CoQ10 for short, is one of the substances that play a key role in energy metabolism, which is why it is often compared to a spark plug: it delivers the spark needed for cellular energy production and is what allows the cell’s power plant to do its work in the first place. Our bodies generate the vitamin-like substance coenzyme Q10 themselves. However, the body’s own production decreases with age. Additional factors with adverse effects on CoQ10 levels are chronic disease and the use of certain medications. Nutritional supplements are playing an increasingly important role in compensating for this deficit and for making a supply of this important molecule available for the heart muscle and for energy metabolism in older individuals.

**Making Beneficial
Actives Accessible**

But taking coenzyme Q10 in our diet is no easy task. “The substance is fat-soluble, whereas the environment in the intestinal tract is aqueous. As a result, individual CoQ10

molecules combine to form larger structures that are very difficult for our cells to absorb,” explains Mohr. The experts at WACKER were therefore keen on increasing bioavailability. Their strategy was to formulate a new product – CAVAQ10[®] – by combining coenzyme Q10 with cyclodextrins, ring-shaped carbohydrates that WACKER bioengineers produce through the enzymatic degradation of starch. Their three-dimensional structure allows them to accommodate a lipophilic, i.e., fat-soluble, molecule in their inner cavity, provided that this molecule has the right size and shape – and CoQ10 does. The cyclodextrin shell, by contrast, is hydrophilic, i.e., has an affinity for water. These oligosaccharide rings thus encapsulate individual CoQ10 molecules, making them more readily dispersible. At the same time, they also separate the molecules from each other to create a molecular dispersion. In other words, cyclodextrins prevent agglomeration while ensuring that a relatively large number of molecules are available to the body’s cells. “This makes CoQ10 more likely to enter cells, thereby increasing bioavailability. In the case of CAVAQ10[®], bioavailability grows by a factor of 18 relative to traditional products,” explains Mohr.

**Stronger Together:
CAVACURMIN[®]**

The fact that cyclodextrins open the doors of our cells to health-promoting molecules is evidenced by a second example: curcumin. The biologically active component of turmeric is a true all-rounder when it comes to the range of its therapeutic and prophylactic powers. However, it does not readily dissolve in water, resulting in very poor bioavailability. The body actually eliminates up to 90 percent of curcumin taken orally. “Much as they do with coenzyme Q10, our cyclodextrins also help ensure

that the beneficial properties of curcumin can take effect in the body,” says Mohr. When the active compound in turmeric forms complexes with the oligosaccharides, its bioavailability is increased immensely. This was demonstrated in a clinical study in which CAVACURMIN[®], a product formulated by combining curcumin with cyclodextrin, was found to yield an almost 40-fold improvement in absorption.²

In addition, after taking CAVACURMIN[®], the metabolic bioavailability of tetrahydrocurcumin is about 40 times higher than after taking a standard curcumin extract³.

“Tetrahydrocurcumin is a curcumin metabolite credited with additional health-promoting properties. The metabolic bioavailability is the ratio of the in-vivo production of tetrahydrocurcumin to the amount of curcumin absorbed,” explains Mohr. “Since adding our cyclodextrins also increases the bioavailability of tetrahydrocurcumin, the complexation is even more valuable,” says Mohr.

Energizers for Muscles

A wide array of preventive benefits is attributed to secondary metabolites like curcumin, with the anti-inflammatory and antioxidant properties playing a prominent role in many applications: in exercise-related muscle injuries, for example, curcumin has been found to reduce inflammatory markers and to delay the resulting soreness. The affected muscles regenerate more effectively as well. What’s more, the active agent in turmeric helps control an insidious phenomenon known as “silent

² Purpura, Martin, et al., Analysis of different innovative formulations of curcumin for improved relative oral bioavailability in human subjects, *European journal of nutrition* 57.3 (2018): 929-938.

³ Hundshammer et al., Enhanced metabolic bioavailability of tetrahydrocurcumin after oral supplementation of a γ -cyclodextrin curcumin complex, *Journal of Functional Foods*, 79 (2021), 104410

inflammation,” in which inflammation goes undetected in the body. As with hypertension or high cholesterol, by the time we even notice gradual disorders like this, it is usually too late. That makes preventive measures all the more important for keeping our heart and muscles healthy.

About WACKER BIOSOLUTIONS

In the 1980s, WACKER, a globally active chemical company, took its first steps in the direction of biotechnology, to supplement its established portfolio of chemical products. Today, WACKER BIOSOLUTIONS, the Group’s biotech and life sciences division, offers tailor-made and innovative solutions and products for the food, pharma and agricultural industries, based on advanced production processes.

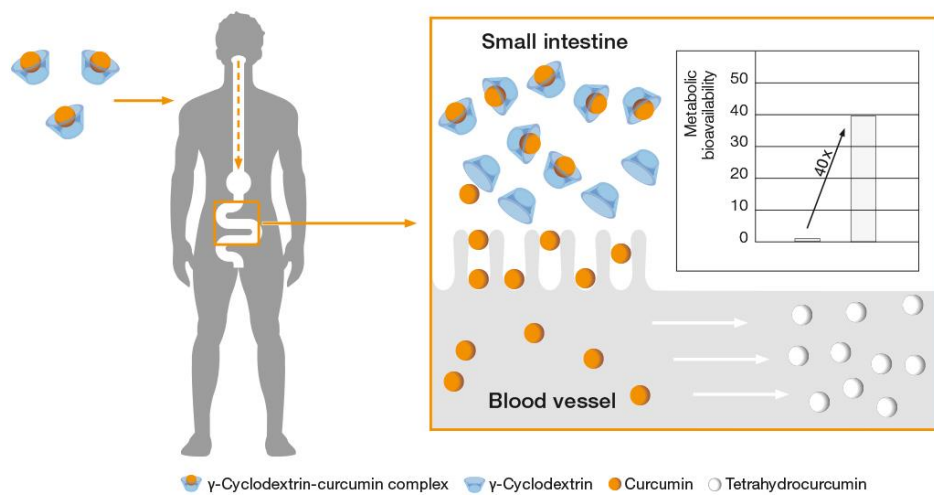
We supply the food industry with raw materials and additives for improving products and processes. Our product range comprises vegan L-cysteine produced by fermentation and bioengineered cyclodextrins - as well as highly effective antioxidants, as well as the manufacture of highly bioavailable complexes of lipophilic compounds such as curcumin or CoQ10. We understand our customers’ needs and offer not only food ingredient and dietary supplements, but also innovative solutions as a response to challenges in the food industry. Our focus is on the following market segments: bakery products, meaty aromas, beverages, dairy products, dietary supplements, chewing gum and sugar confectioneries.

WACKER operates 26 production sites worldwide, of which seven belong to WACKER BIOSOLUTIONS’ production network. The sites are located in Burghausen, Jena and Halle (Germany), Amsterdam (Netherlands), León (Spain), Eddyville and San Diego (USA). In technical competence centers, WACKER BIOSOLUTIONS develops products and applications tailored to its customers’ needs. To find solutions for every market tailor-made to the local requirements, the network of competence centers spans three continents - from Adrian in the USA, via Burghausen in Germany to Shanghai in China.



Preventive Benefits

Curcumin is extracted from turmeric. A wide array of preventive benefits is attributed to secondary metabolites like curcumin (Photo: WACKER).



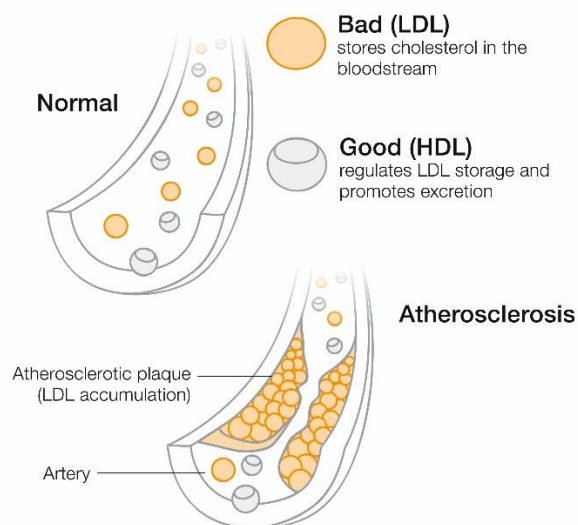
Higher Bioavailability

Ingestion of the curcumin-cyclodextrin complex CAVACURMIN® leads to 40 times higher metabolic bioavailability of tetrahydrocurcumin (Diagram: WACKER)



Stronger Together: CAVACURMIN®

CAVACURMIN® is a highly bioavailable curcumin powder, which is absorbed about 40 times more efficiently than pure curcumin extract. Cyclodextrins from WACKER help the curcumin to develop its positive properties in the body (Photo: WACKER).



Good and Bad Cholesterol

High LDL (low density lipoprotein) levels are one main factor for the occurrence of coronary heart disease and arteriosclerosis (Diagram: WACKER).



A Super Molecule from Olives: HTEssence®

HTEssence® is available as a water-soluble powder, making the resulting hydroxytyrosol suitable for use in functional foods and dietary supplements. (Photo: WACKER)

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The company in brief:

WACKER is a global chemical company with some 14,300 employees and annual sales of around €4.69 billion (2020). WACKER has a global network of 26 production sites, 23 technical competence centers and 52 sales offices.

WACKER SILICONES

Silicone fluids, emulsions, rubber grades and resins; silanes; pyrogenic silicas; thermoplastic silicone elastomers

WACKER POLYMERS

Polyvinyl acetates and vinyl acetate copolymers and terpolymers in the form of dispersible polymer powders, dispersions, solid resins and solutions

WACKER BIOSOLUTIONS

Biotech products such as cyclodextrins, cysteine and biologics, as well as fine chemicals and PVAc solid resins

WACKER POLYSILICON

Polysilicon for the semiconductor and photovoltaic industries