



## Black garlic: heart health without the odour

An extract of fermented garlic is scientifically proven to support the cardiovascular system

*The health benefits of garlic are widely known, but because of its equally well-known and somewhat antisocial malodorous side effects, most people shy away from consuming it in large quantities. Even when the dry extract is added to dietary supplements, the familiar odour is usually still present. However, when fresh garlic is fermented and becomes black garlic, it loses its undesirable odour yet retains its health benefits. Indeed, black garlic actually has greater antioxidant activity than its fresh counterpart. These factors alone make black garlic far more appealing than fresh – not only in terms of taste and smell as a food ingredient, but also for use in dietary supplements.*

Black garlic is already enjoyed in Asian countries where preparing food by fermentation is part of the culture. In Japan and Korea, for instance, whole fermented garlic cloves are eaten as a culinary snack, as well as being added to food as a health and flavour-boost-

ing ingredient. Pre-packed black garlic cloves and black garlic dietary supplements are also widely available. In the US, Canada and the UK, the ingredient is also growing in popularity.

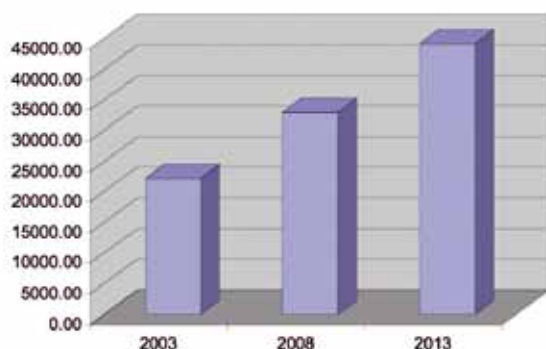
During fermentation, the pearly white cloves of fresh garlic (*Allium sativum*) gradually darken to their final black appearance, and the process converts the compounds found in fresh garlic into a whole new range of compounds. Compared to fresh garlic, black garlic is low in alliin and alliin, both of which are precursors of the substances responsible for the fresh bulb's characteristic smell. Whereas fresh garlic is pungent, black garlic has a mild, sweetish taste and smell which is similar to that of oven-roasted garlic.

**Proven health benefits >** Garlic's beneficial effects are supported by hundreds of studies which record its impact on various aspects of cardiovascular health. Published data show

that as well as having increased antioxidant potency compared to fresh garlic, black garlic has proven cardiovascular benefits. In addition to its positive impact on blood pressure and blood lipids, it has immunomodulatory activity, is able to retard arterial calcification, and even accelerates wound healing when applied topically.

With increasing numbers of cardiovascular diseases (CVDs) and deaths being recorded worldwide, supplements containing garlic compounds have become an integral part of the global nutraceutical market. There is also burgeoning demand for foods and drinks that support heart health, as has been recorded by market analyst Datamonitor (see Figure 1).

**Figure 1: Market value of heart health foods and drinks in Europe, the US, Russia, Brazil and Asia Pacific (US\$m)**



Source: Datamonitor, 2010.

The World Health Organization (WHO) estimates that CVDs claimed 17.1 million lives in 2004, representing 29 per cent of all global deaths.<sup>1</sup> Of these deaths, an estimated 7.2 million were due to coronary heart disease. The WHO predicts that the annual death toll from CVDs will reach almost 23.6 million by 2030, so the role for nutraceuticals, foods and drinks with heart and general cardiovascular health benefits is a key development area that is bound to grow in value and importance.

**Versatile applications** > Black garlic can play a key role here. It can be used in traditional nutraceutical supplements, such as tablets and capsules, and also in liquid applications with a heart health positioning, instead of or in combination with standard garlic. Due to its mild taste and good water solubility, it is also suitable for a variety of food applications – both savoury and sweet (including chocolate). A pure form could also be used at home as a healthy snack or as an ingredient for savoury food preparations.

Frutarom's own black garlic extract, EFLA<sup>®</sup>451, is produced by fermenting fresh garlic in a GMP (Good Manufacturing Practice) and ISO 9001:2008 certified manufacturing facility. As part of the company's EFLA<sup>®</sup> line, it is based on the philosophy that herbal extracts, as multicomponent systems, act in their entirety. All EFLA<sup>®</sup> ingredients undergo stringent pharmacological investigation for bibliographic data validation.

During the EFLA<sup>®</sup> production process, fresh garlic bulbs are stored under controlled humid conditions to allow the enzymatic degradation of sulphur components, which reduces the characteristic odour. During this auto-fermentation process, sulphur compounds become hydrophilic sulphur compounds.

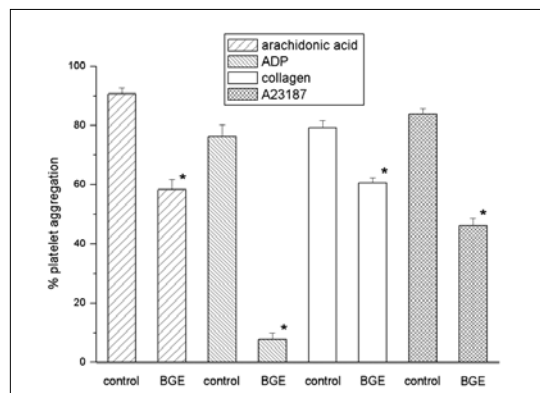
Black Garlic Extract EFLA<sup>®</sup>451 is presented as a free-flowing powder. It has an average drug:extract ratio of 6:1, calculated on freshly fermented cloves, a typical content of 0.01 per cent for alliin, and of about 0.002 per cent for allicin.

**Scientific validation** > A German study using Black Garlic Extract EFLA<sup>®</sup>451 has proven its significant ability to inhibit thrombocyte (platelet) aggregation caused by various organic triggers. Platelet aggregation has a negative effect on blood circulation because it increases the risk of blocked capillaries and blood clots, and can thus lead to thrombosis.

During the *in vitro* study, thrombocyte aggregation was investigated in stimulated platelet-rich plasma from 10 healthy volunteers. Platelets can be activated by different stimuli, including arachidonic acid, adenosin D-phosphate (ADP), collagen and the calcium ionophore A23187. Arachidonic acid and the calcium ionophore A23187 induce intracellular calcium release, while ADP and collagen may interact with cell membrane-specific receptors. Thrombocyte aggregation was measured in both the absence and presence of Black Garlic Extract EFLA®451 using a turbidimetric method of detection.

Black Garlic Extract EFLA®451 was shown to inhibit platelet aggregation in a concentration-dependent manner, with an  $IC_{50}$  of 5.3 +/- 1.2 mg/mL. The extract significantly inhibited platelet aggregation induced by all tested stimuli. A reduction of more than 80 per cent against ADP-triggered aggregation was observed (see Figure 2), with 10 mg/mL of extract. These results are comparable to those achieved with clopidogrel, an ADP-inhibiting pharmaceutical drug.

Figure 2



**In conclusion >** With its mild savoury smell and taste, Black Garlic Extract EFLA®451 is suitable for use in a variety of foods and food supplements. Products made from black garlic are free from the inconvenient downsides of fresh garlic, such as bad breath and body odour – even with prolonged intake. This makes them a valuable means of supporting the cardiovascular system. The recommended daily intake of EFLA®451 for adults is 660 mg, which is equivalent to 4.0 grams of the fermented bulb. Long term intake of the ingredient will not lead to the development of body odour, and there are no known safety or side-effect issues.

Frutarom provides a complete development package, which spans the entire process from raw material selection to finished product, and supports clients with creative ideas, as well as advice on regulatory and marketing matters.

#### Reference >

<sup>1</sup>World Health Organization, Fact sheet 317: Cardiovascular Diseases (CVDs), January 2011.

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