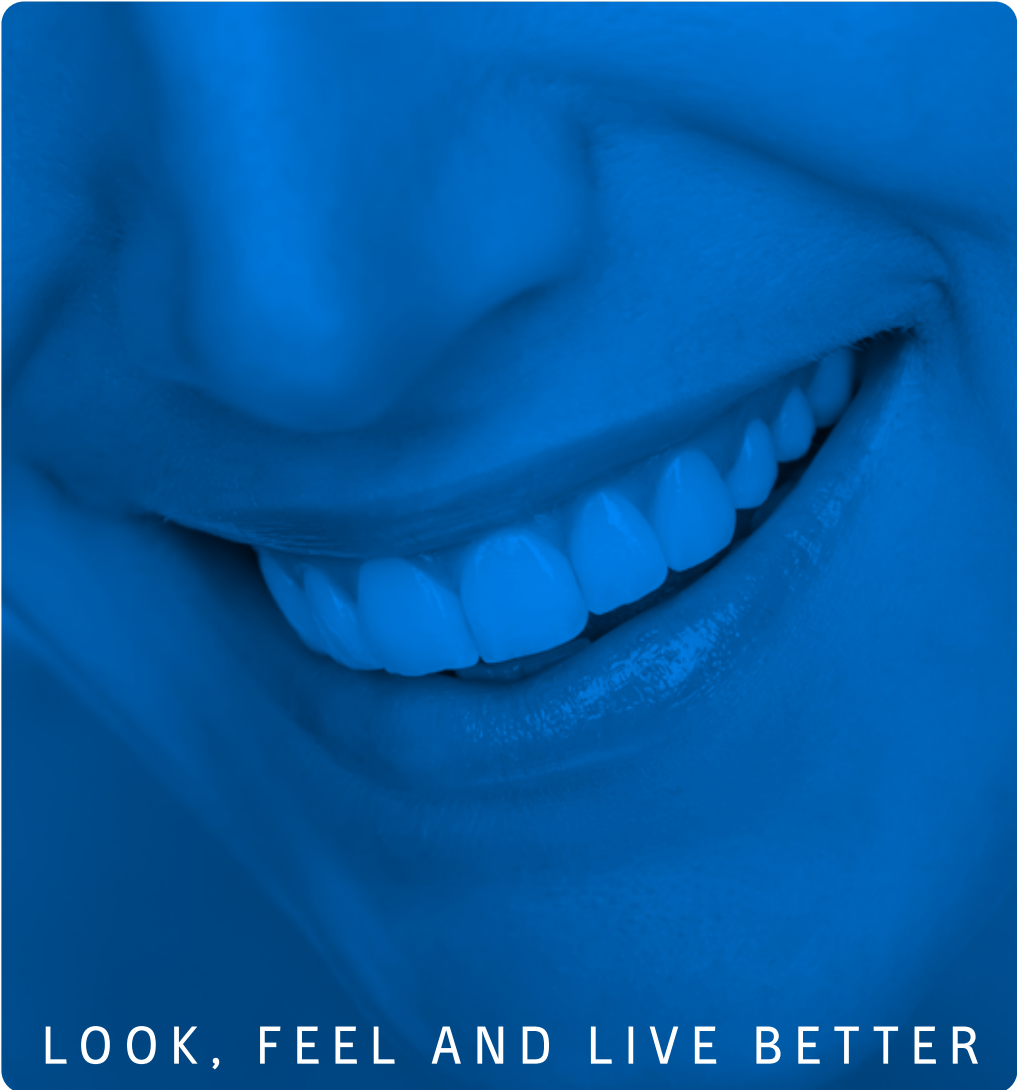


**PYCNOGENOL®**

Oral Care



LOOK, FEEL AND LIVE BETTER



## Oral Care

Oral health care represents an integral part of daily dental hygiene and is important to maintaining healthy teeth and gums. The oral cavity represents a complex eco-system (microflora) which is influenced by every meal, beverage and dental hygiene routines employed. Malodor represents a major hygiene concern to everyone. Microbial processing of food residues, especially those bearing sulphur, may develop putrescent odours in-between tooth-brushing periods.

Proficient oral health care involves more than brushing teeth. While a toothbrush with toothpaste helps to mechanically scrub off persistent food remnants and dental plaque deposits, much more is required to secure health of the gingiva (gums) and the teeth, both after and in-between meals.

### Pycnogenol®

Pycnogenol® standardised French maritime pine bark extract is a potent antioxidant and has been extensively researched for oral and dental health benefits for the past twenty years. Pycnogenol® is applied in various commercial products globally displaying numerous and complex health contributions to the oral cavity. Pycnogenol® is the sole pine bark extract manufactured strictly to US Pharmacopeia specifications and having a strong safety background and 50 years of research to its account.

### Pycnogenol® physical and olfactory characteristics

Pycnogenol® presents a mildly “dry” acidic taste has a moderately astringent mouth-feel sensation, and a subliminal pleasant innate aromatic odour. For

product formulations, Pycnogenol® can be easily combined with all fruit flavors, as well as with mint aromas. Pycnogenol® is water-soluble, which makes aqueous formulations, such as toothpaste and mouthwash products readily feasible.

### Pycnogenol® bacteriostatic efficacy in oral-health relevant microbiota

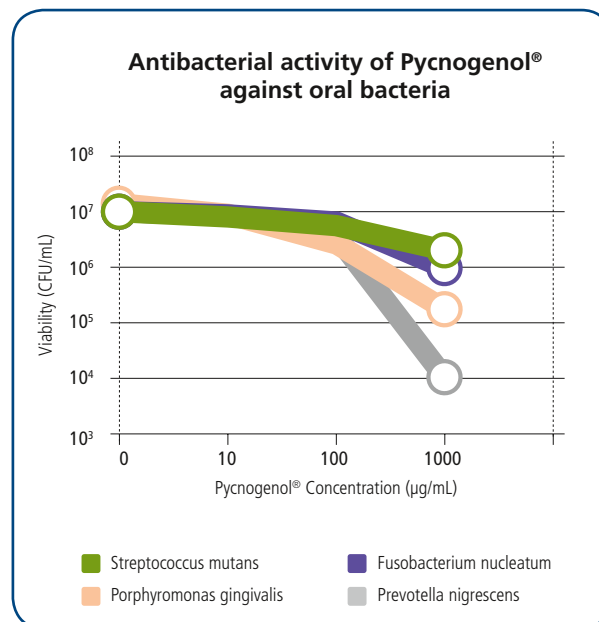
Torras et al. found that Pycnogenol® possesses marked bacteriostatic activity – which involves bacterial growth-limitation – against a broad range of microorganisms, including cariogenic and periodontopathic bacteria. The table below provides Pycnogenol® minimal concentrations for bacteriostatic efficacy. Pycnogenol® does not eradicate microbiota and does not affect oral micro-flora that contribute to oral health.



The bulk of the microorganisms that form the dental plaque are *Streptococcus mutans* and other anaerobes, though the precise composition varies. Examples of such anaerobes include *Fusobacterium* and *Actinobacteria*. *Streptococcus mutans* and other anaerobes are the initial colonisers of the tooth surface, and play a major role in the establishment of the early biofilm community. These microorganisms all occur naturally, are present in the oral cavity and are normally harmless. However, failure to remove plaque by regular tooth-brushing renders it harder and develops into tartar. This allows them to proliferate further contributing to building a thick layer, which can by virtue of their ordinary metabolism cause a variety of dental diseases for the host. Those microorganisms nearest to the tooth surface typically obtain energy by fermenting dietary sucrose; during fermentation, they begin to produce acids.

micro-organism species	minimal inhibition concentration
<i>Streptococcus mutans</i>	30 µg / mL
<i>Streptococcus glucans</i>	50 µg/ mL
<i>Actinobacillus actinomycetemcomitans</i>	230 µg/ mL
<i>Aggregatibacter actinomycetemcomitans</i> (previously <i>actinobacillus actinomycetemcomitans</i> )	
<i>Lactobacillus acidophilus</i>	50 µg/ mL
<i>Candida albicans</i>	50 µg/ mL
<i>Helicobacter pylori</i>	12.5 µg / mL

More recently, the efficacy of Pycnogenol® against oral bacteria that cause oral malodor and are involved in tooth and gum disease, was evaluated (Watanabe et al., 2018). Pycnogenol® dose-dependently reduced the number of bacteria for *Streptococcus mutans*, *Fusobacterium nucleatum*, *Prevotella nigrescens*, and *Porphyromonas gingivalis*.



*Streptococcus mutans* is the principal cause of dental caries (decay) characterized by acid demineralization of the enamel, which can progress to further breakdown of the more organic, inner dental tissue (dentin).

Organic acids released from dental plaque lead to demineralization of the adjacent tooth surface, and consequently to dental caries. Saliva is also unable to penetrate the build-up of plaque and thus cannot act to neutralize the acid produced by the bacteria and remineralize the tooth surface.

### Pycnogenol® inhibits plaque formation without compromising oral flora composition

Pycnogenol® exhibits pronounced bacteriostatic activity, which involves bacterial growth-limitation; however, Pycnogenol® does not appear to alter oral microbiota composition.

Plaque is a sticky, colourless film of bacteria that constantly grows on surfaces within the mouth. Bacterial plaque is one of the major causes for dental decay and gum disease.



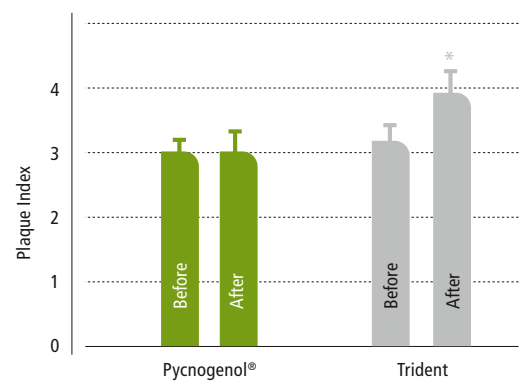
Plaque causes cavities when the acids from the plaques attack teeth after eating. With repeated acid attacks, the tooth enamel can break down and a cavity may form. Plaque that is not removed can also irritate the gums around the teeth, leading to gingivitis (red, swollen, bleeding gums), periodontal disease and tooth loss.

A controlled clinical trial demonstrated that Pycnogenol® significantly counteracts plaque formation as compared to a placebo control group [Kimbrough et al., 2002]. Dental student volunteers were equipped with plastic stints, which covered three of their teeth, in order to temporarily disrupt brushing of selected teeth during the two-week experimental period. The placebo group was equipped with sugar-free chewing gums. The Pycnogenol® group was given the same gums, yet fortified with 5 mg Pycnogenol® per piece. Study participants in both groups chewed six gums during a day, over a period of two weeks.

The study outcome clearly showed that the group chewing Pycnogenol®-containing gums, did not develop any plaque deposits on their stint-covered teeth,

as verified again by fuchsin plaque staining. The control group, which chewed sugar-free gum without Pycnogenol®, meanwhile presented with significant plaque accumulation at the end of the two-week investigational period.

**Plaque indexes of subjects taking Pycnogenol® chewing gums versus subjects taking Trident chewing gums as control.**



Asterisk denotes significant difference ( $p < 0.05$ ) compared with baseline value before the experiment.

**Pycnogenol® virtues in oral health**

**Without Pycnogenol®**

- bad breath (halitosis)
- gingival bleedings
- plaque accumulation



**With Pycnogenol®**

- bad breath arrested by diminished bacterial growth
- strengthening of gingival capillaries
- no plaque accumulation



### Pycnogenol® supports gingival health and integrity

The gingiva (gums) represents soft mucosal tissues inside the mouth. Gingivitis (gum disease) is an inflammation of the gums caused by a bacterial infection. If left untreated, it can become a more serious infection known as periodontitis. Gingivitis and periodontitis are major causes of tooth loss in adults, according to the American Dental Association.

Most people develop gingivitis when plaque stays on gum lines too long. This represents the biggest cause of bleeding gums. Pycnogenol®, a natural anti-inflammatory supplement with bacteriostatic properties contributes to gingival health and gingival integrity. In addition, Pycnogenol®-specific procyanidins physically bind to ruptured capillary walls, thereby contributing to stop small bleedings and stabilise fragile gingival capillaries. In this context, Pycnogenol® also sets the stage for the healing process of the vessel to set in. Pycnogenol® is repeatedly ascribed to strengthen fragile capillaries in different pathologies and promotes greater resistance to capillary ruptures too.

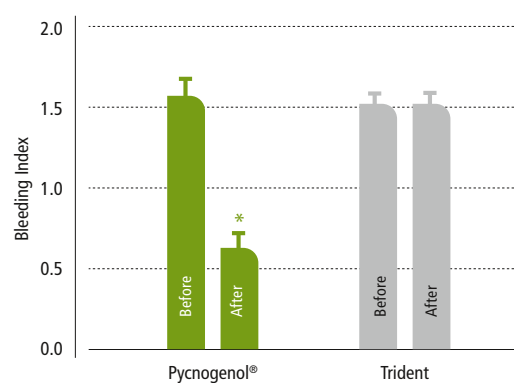
Pycnogenol® contributed to sealing and restoring the health and integrity of the gums. Because the large Pycnogenol® procyanidins physically bind to collagen, the main component of the gingiva connective tissue, which is exposed in compromised gingiva, it decreases bleedings, thus enabling the tissue to heal faster and better. Furthermore, Pycnogenol® has been shown in clinical studies to increase collagen synthesis, which is of great virtue for strengthening the gingiva.

A controlled, double-blind clinical study verified the benefits of Pycnogenol® for counteracting gingival bleedings [Kimbrough et al., 2002]. Forty healthy study participants wore plastic stints covering their teeth, in order to temporarily disable tooth brushing and disable any harm to the gums for the duration of the study.

Study participants chewed six sugar-free chewing gum pieces a day, chewing each gum at least 15 minutes. Gingival bleeding was estimated semi-quantitatively as 0, 1 or 2, representing, absence, moderate, or high plaque presence on subject's teeth.

In the clinical trial dental tissues of study participants were probed gently from different angles and bleeding appearance was validated scoring 0, 1 or 2, representing presence or absence of blood stains in each area of the mouth. Consumption of Pycnogenol® chewing gums for 14 days decreased mean gum bleeding intensity significantly from baseline mean score 1.5 to 0.6. No gum bleeding improvements were identifiable in the placebo-control group.

**Bleeding indexes of subjects taking Pycnogenol® chewing gums versus subjects taking Trident chewing gums as control.**



Asterisk denotes significant difference ( $p < 0.05$ ) compared with baseline value before the experiment.

### Pycnogenol® diminishes oral malodor (halitosis)

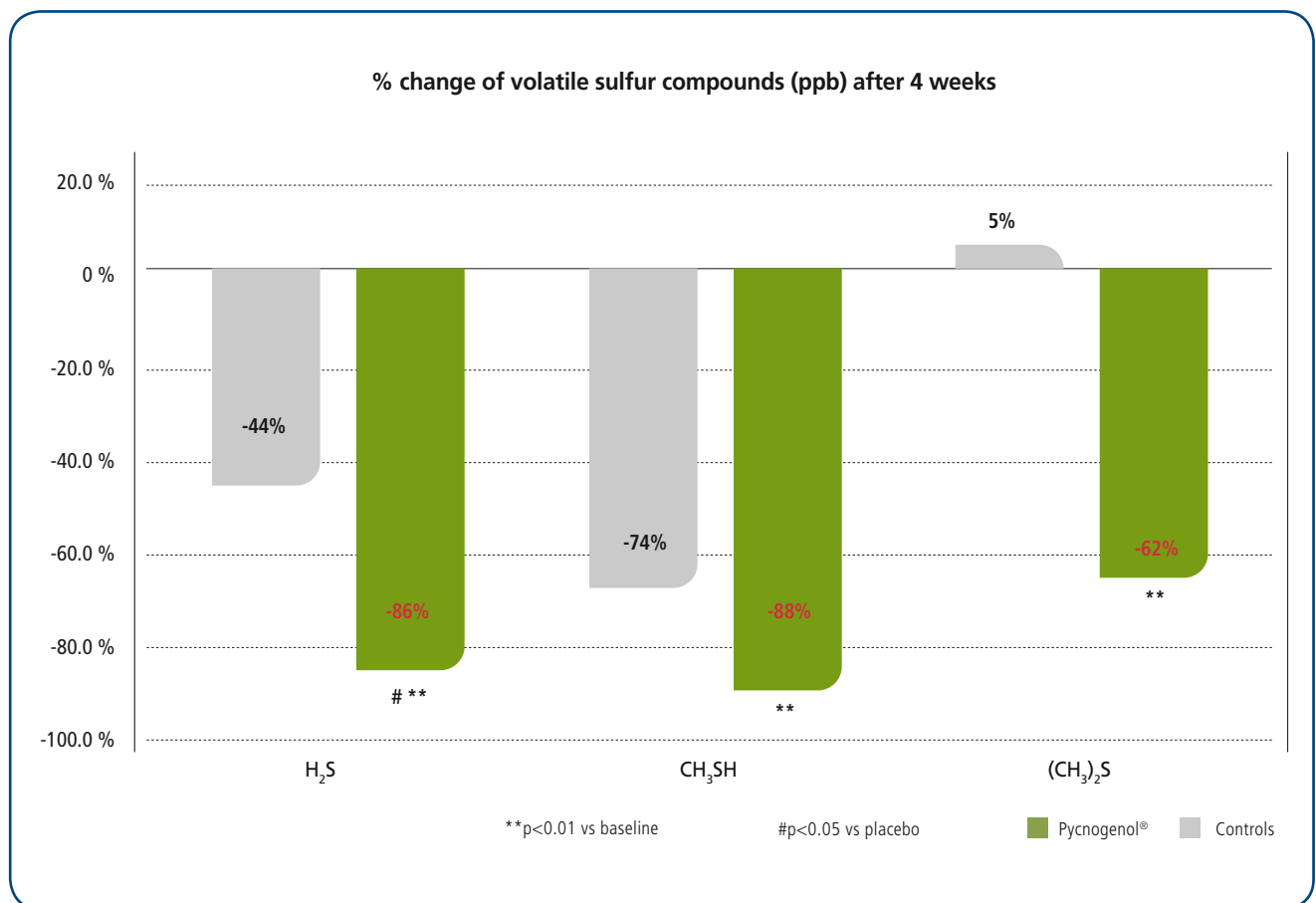
Residual food particles stuck between the teeth, the gingiva and the oral cavity, are degraded by oral bacterial colonisation, releasing unpleasant putrescent

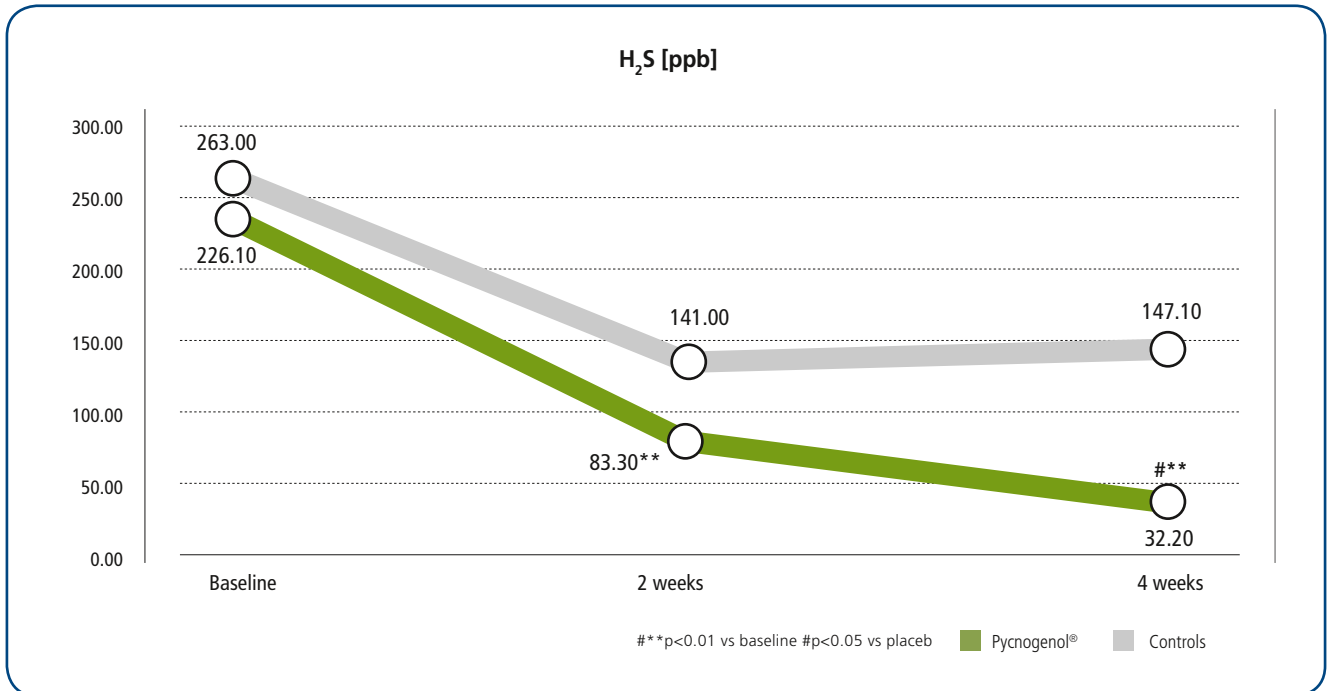
odours. The primary causative microorganisms of oral malodor are Gram-negative, anaerobic bacteria that are similar to the bacteria causing periodontitis. There is a relationship between the presence of periodontopathic bacteria, such as Porphyromonas gingivalis, Prevotella intermedia, Tannerella forsythia and Treponema denticola, in saliva and oral malodor.

Pycnogenol® naturally arrests microbial growth in the oral cavity at already very low concentration. A double-blind, placebo-controlled study proved that regular consumption of chewing gums, fortified with Pycnogenol®, significantly improved oral odours, as measured by employing gas chromatography analyses of study participants' breath. All three sulfur-bearing

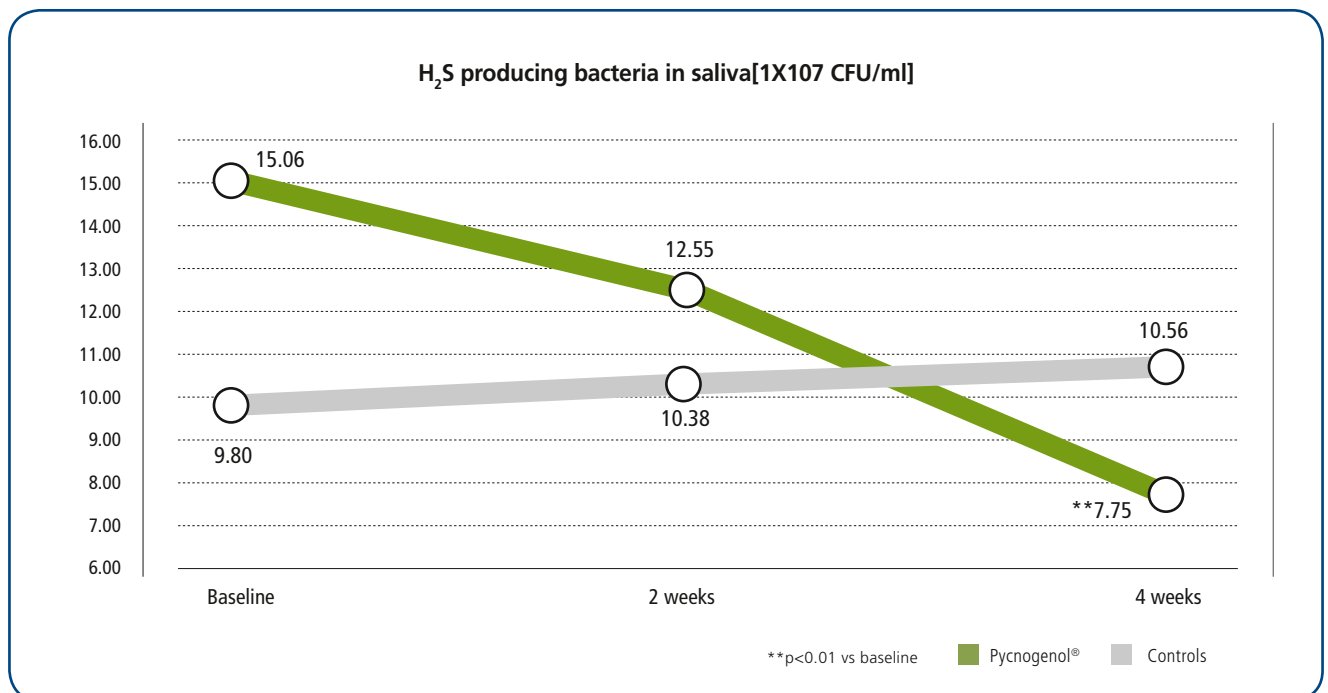
metabolite compounds causing oral malodor: hydrogen sulfide (H<sub>2</sub>S), methane thiol (CH<sub>3</sub>SH) and dimethyl sulfide (CH<sub>3</sub>)<sub>2</sub>S, rapidly dropped in exhaled breath from the moment study participants began chewing Pycnogenol®-containing chewing gums [Watanabe et al., 2017]. Extending consumption of Pycnogenol® chewing gums to a total of four weeks demonstrated further improvement of oral odours in study volunteers.

The parallel group, chewing placebo gums, presented with some oral breath improvement, related to the chewing process itself, thereby dislodging food remnants and increasing saliva flow. However, the improvement in the placebo chewing gums did not reach statistical significance.





Pycnogenol® formulated into chewing gums abolishes bad breath in a double-blind, placebo-controlled clinical trial [Watanabe et al., 2018]



The effects of Pycnogenol® gums on oral malodor were paralleled by the decrease of the salivary bacteria that produce volatile sulfur compounds responsible for oral malodors without affecting the total number of bacteria in the saliva. This shows that the Pycnogenol® gums used in the study contained an effective concentration to reduce the number of microorganisms that are responsible for malodor in saliva and that the oral microflora is preserved.

In conclusion, Pycnogenol® contributes to oral health by:

- Inhibiting bacterial growth of bacteria involved in caries, gingivitis.
- Inhibiting plaque formation
- Respecting oral flora composition
- Decreasing gum bleeding
- Diminishing oral malodor

## References

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*Rohdewald P, Beil W.*

In vitro inhibition of *Helicobacter pylori* growth and adherence to gastric mucosal cells by Pycnogenol®. *Phytother Res* 22: 685-688, 2008.

*Kimbrough et al.,*

Pycnogenol® chewing gum minimizes gingival bleeding and plaque formation. *Phytomedicine* 9: 410-413, 2002.

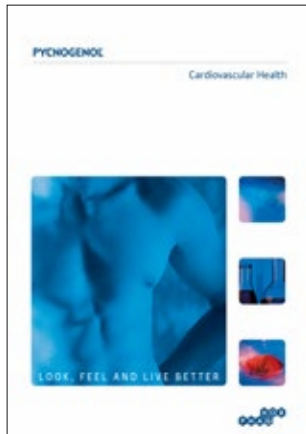
*Watanabe K, Hiramane H, Toyama T, Hamada N.*

Effects of French Pine Bark extract chewing gum on oral malodor and salivary bacteria. *J Nutr Sci Vitaminol* 64: 185-191, 2018.





The following Pycnogenol® application brochures are available too :



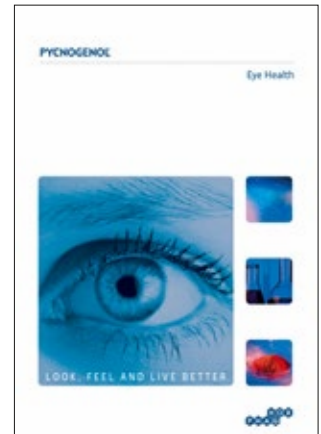
Cardiovascular Health



Cognitive Health



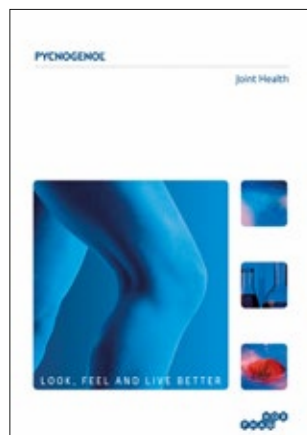
Diabetes Care



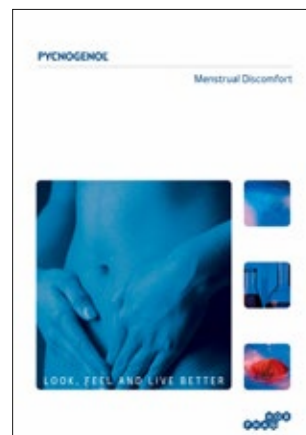
Eye Health



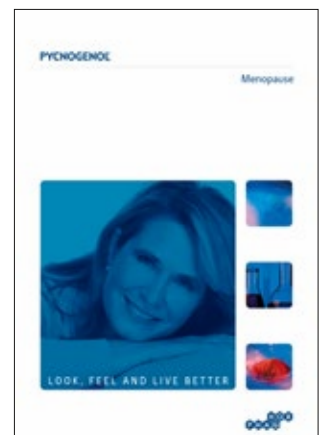
Healthy Veins



Joint Health



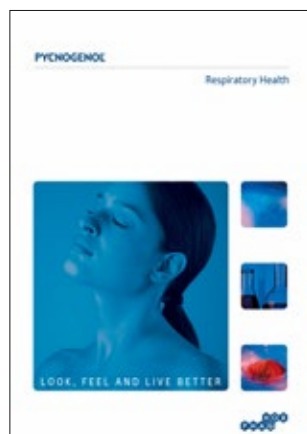
Menstrual Discomfort



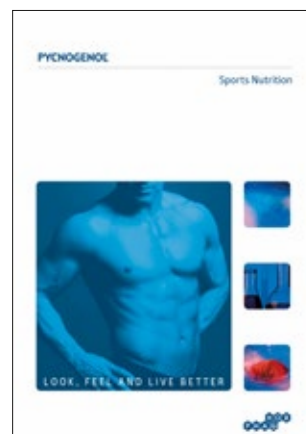
Menopause



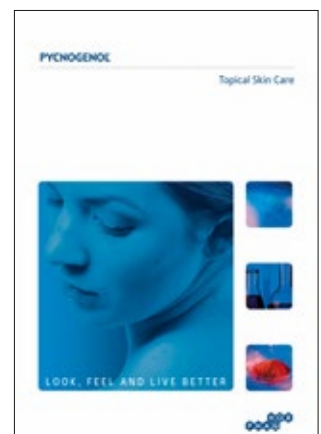
Oral Skin Care



Respiratory Health



Sports Nutrition



Topical Skin Care

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