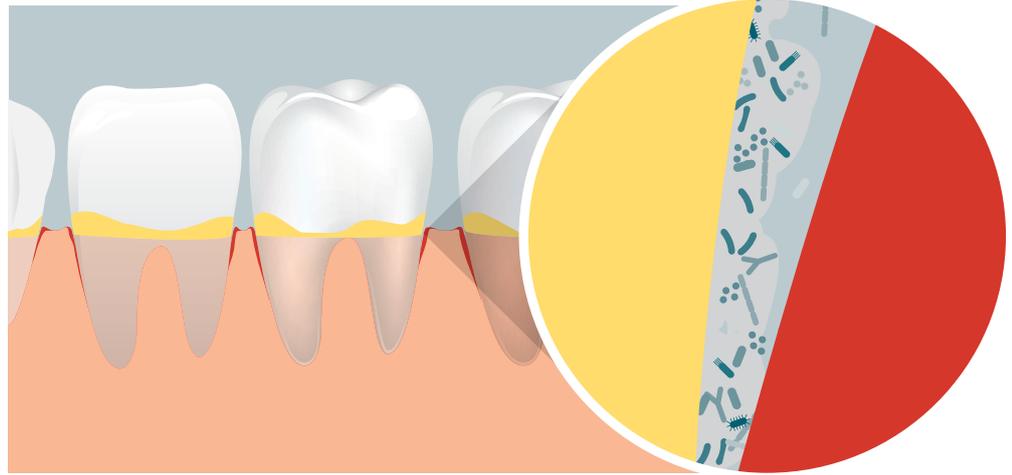


Improvement of oral health and prevention of gingivitis

Periodontal diseases and dental caries are one of the most prevalent health problems worldwide.^{1,2} Promoting a balanced microbiota in the mouth can improve oral, and thereby general health.

The mouth is one of the most heavily colonised parts of our bodies, harbouring an estimated 600+ different bacterial species.³ A balanced oral microbiota protects the mouth from infections and contributes to the maintenance of oral health.⁴ However, the oral microbiota can be easily disturbed by factors such as; poor oral hygiene, lifestyle choices including dietary habits and smoking, immunodeficiency, and time.^{5,6,7} These disturbances can cause dental caries (dental decay) and periodontal diseases, such as gingivitis (inflammation of the gingivae) and in more severe cases periodontitis (gum disease).⁸ Furthermore, an association has been found between the composition of the oral microbiota and systemic disease, such as cardiovascular disease and pregnancy complications.^{9,10}

Figure 1: Harmful bacteria assemble in a biofilm and cause inflammation of the periodontal tissue.



Oral diseases start with the growth of dental plaque, a biofilm formed by the accumulation of bacteria and their toxins together with saliva⁸ [see figure 1]. Current treatment of plaque and oral diseases involve mouthwashes and professional teeth cleaning, and in more advanced cases antibiotics or surgery.³ However, with ever increasing antibiotic resistance and their unwanted side effects such as antibiotic-associated diarrhoea, there is an increased

need for novel therapies that do not involve conventional antimicrobial agents. Probiotics have therapeutic potential in the management of caries and periodontal diseases, since they prevent dysbiosis by inhibiting growth of periodontal pathogens and modulating disease-associated inflammatory pathways. Several meta-analyses have found significant effectiveness for the use of probiotics in the management of oral health and gingivitis^{11,12}.

Strain selection

Winlove Smile is a multispecies probiotic formulation developed for the improvement of oral health and prevention of gingivitis. The formulation contains 9 specifically selected probiotic strains. Probiotic strains can exert health effects at different levels in the mouth [see figure 2]. The bacterial strains of Winlove Smile have been selected for their capacity to inhibit the growth of oral pathogens [level 1] and influence the immune system [level 3]. The strains have been screened for their capacity to:

- inhibit oral pathogens associated with development of gingivitis
- inhibit biofilm formation
- strengthen the immune system.

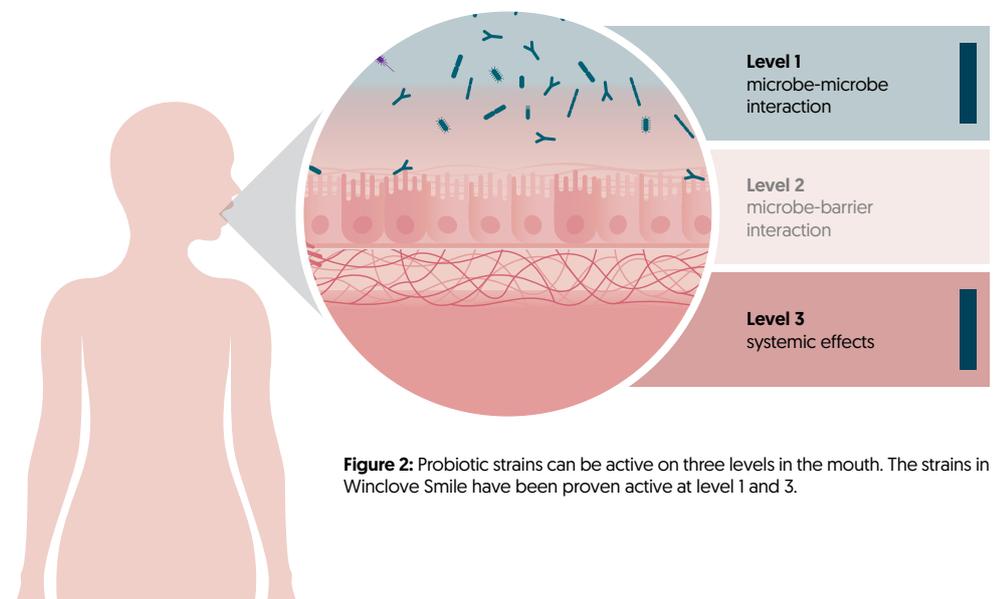
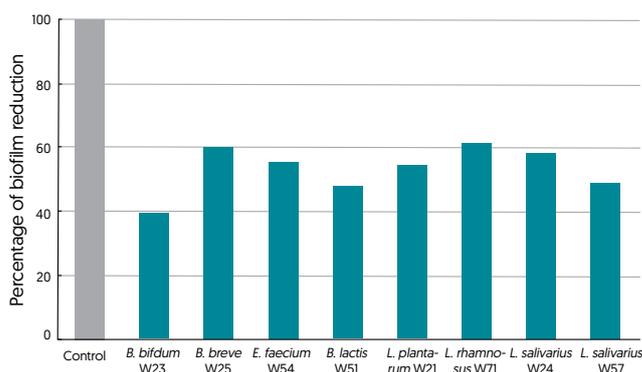


Figure 2: Probiotic strains can be active on three levels in the mouth. The strains in Winlove Smile have been proven active at level 1 and 3.

In vitro inhibition of biofilm formation

An important virulent factor in oral health is the formation of biofilms, also known as (dental) plaque. The effects of the probiotic strains in Winclove SMILE on biofilm formation were tested *in vitro* in a model with antibiotic vancomycin resistant *Enterococcus faecium*¹³ (see figure 3). The results show that biofilm formation of *E. faecium* was strain-specifically modulated. Nevertheless, supernatants of all probiotic strains had a diminishing effect on biofilm formation and showed a reduction between 37% - 62%.

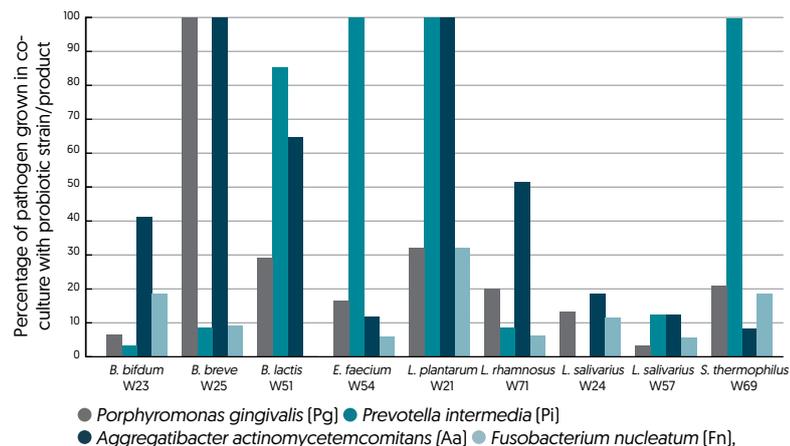
Figure 3: Inhibition of biofilm formation of *Enterococcus faecium* by bacterial strains of Winclove smile



In vitro inhibition of pathogens

Another selection criterion for the bacteria of Winclove SMILE is their ability to inhibit pathogens associated with development of gingivitis, these include: *Aggregatibacter actinomycetemcomitans* [Aa], *Fusobacterium nucleatum* [Fn], *Porphyromonas gingivalis* [Pg] and *Prevotella intermedia* [Pi]. The effect of the probiotics strains in inhibiting growth of these pathogens was tested *in vitro*. Figure 4 shows the inhibitory effects of the strains in Winclove SMILE.

Figure 4: Inhibition of *Aggregatibacter actinomycetemcomitans* [Aa], *Fusobacterium nucleatum* [Fn], *Porphyromonas gingivalis* [Pg] and *Prevotella intermedia* [Pi] by strains in Winclove Smile



Formulation details

Indication	Improvement of oral health and prevention of gingivitis.		
Colony forming units [CFU]	2,5 x 10 ⁹ CFU/gram.		
Bacterial strains	<i>B. bifidum</i> W23 <i>B. breve</i> W25 <i>B. lactis</i> W51	<i>E. faecium</i> W54 <i>L. plantarum</i> W21 <i>L. rhamnosus</i> W71	<i>L. salivarius</i> W24 <i>L. salivarius</i> W57 <i>S. thermophilus</i> W69
PROBIOACT® Technology	Protective and nutritional ingredients that improve the stability of the formulation, GI survival and metabolic activity of the bacteria.		
Recommended daily dosage	1 gram, twice daily. Dissolve the probiotic powder in water and use as mouth rinse which can be swallowed.		
Treatment period	For as long as desired/needed.		
Storage and stability	18 months stable at room temperature, no refrigeration needed.		
Available dosage forms	Dry powder which can be supplied as bulk, sachets, or fully packed (with your design).		
Safety and Quality Profile	All probiotic strains have the Qualified Presumption of Safety (QPS) status ¹¹ . Winclove is a NSF International Certified GMP Facility for manufacturing dietary supplements and is ISO 22000:2005 certified for the development and production of pre- and probiotics.		
Marketing	Private label		

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This information is intended for business professionals only, not for consumers. The formulations contained herein are concepts, not commercially available and not intended to diagnose, cure or prevent any diseases.

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