

InClover Smile® dental health for cats, clinical data

Studies show that 85% of domestic cats age four and older are affected by dental disease (1). Many feline dental problems result from bacterial build up (plaque) that, if left unchecked, turns to tartar. Oral diseases can be quite painful, resulting in difficulty eating, drinking, and grooming. Bacteria residing in the mouth may gain access to the bloodstream and cause damage to the heart, kidneys, and liver. Some oral diseases like stomatitis can be associated with feline retroviral diseases, such as feline leukemia (FeLV) and feline immunodeficiency (FIV). To combat these problems, inClover has developed a dental health chew supplement, Smile, for felines using a proprietary formula of green tea, catnip, propolis and prebiotics that work to reduce plaque buildup, support gum health and improve oral freshness.

Camellia sinensis (Green tea) has been shown to kill bacteria in the mouth and reduce the buildup of plaque and tartar (6)(7). It prevents the adherence of cariogenic bacteria namely *S. mutans*, *A. actinomycetemcomitans*, *P. gingivalis*, *P. intermedia* and *L. acidophilus* through the production of glucans and polyphenolic compounds (5)(3)(2). Polyphenols also assist in addressing the symptoms of gingivitis by stimulation of anti-inflammatory and antioxidant activities (4)(5).

Nepeta cataria (Catnip) is a natural bactericide that kills bacteria in the mouth both above and below the gumline. The nepetalactone found in the essential oils and flavonoids of *N. cataria* (8-12) have been reported to have antibacterial (8) (10) (12), antifungal (8)(14) and antioxidant activities (8). It has also been shown that the extract of *N. cataria* has an inhibitory activity on growth, enzyme production and adhesion of relevant bacteria (8) (13).

Formation of dental caries is caused by the colonization and accumulation of oral microorganisms and extracellular polysaccharides that are synthesized from sucrose by glucosyltransferase of *Streptococcus mutans* (14). Propolis (beeswax) has been shown to limit the enzyme activity and bacterial growth of *S. mutans* (14). Furthermore, several studies indicate that Propolis has antibiotic and antifungal properties (15-17)

Organic inulin prebiotic works to stimulate the growth of species of *Bifidobacterium*, a genus of bacteria considered beneficial to health (18)(19). Inulin fortifies the intestinal flora to maintain a healthy balance in intestine and as a result freshens breath from the inside out (20).

References

1. L. Verhaert I, C. Van Wetter. SURVEY OF ORAL DISEASES IN CATS IN FLANDERS. Vlaams Diergeneeskundig Tijdschrift, 2004, 73, 331-341
2. Banani R, Chowdhury, et al., /Journal of Natural Products, Vol. 6(2013): 44-55
3. Lambert JD, Yang CS. Mechanisms of cancer prevention by tea constituents. J Nutr. 2003;133(10):3262S-3267S.
4. Hamilton-Miller, J. M. (1995). Antimicrobial properties of tea (*Camellia sinensis* L.). *Antimicrobial Agents and Chemotherapy*, 39(11), 2375–2377.
5. Chan EW, Soh EY, Tie PP, Law YP. Antioxidant and antibacterial properties of green, black, and herbal teas of *Camellia sinensis*. *Pharmacognosy Res.* 2011;3(4):266-72.
6. C.J. Henley-Smith I, F.S. Botha, N. Lall. The use of plants against oral pathogens. *Microbiology*.
7. Hirasawa M, Takada K, Otake S. Inhibition of acid production in dental plaque bacteria by green tea catechins. *Caries Res.* 2006;40(3):265-70.
8. A. Adiguzel, H. Ozer, M. Sokmen et al., “Antimicrobial and antioxidant activity of the essential oil and methanol extract of *Nepeta cataria*,” *Polish Journal of Microbiology*, vol. 58, no. 1, pp. 69–76, 2009.
9. R. A. Malizia, J. S. Molli, D. A. Cardell, and J. A. Retamar, “Volatile constituents of the essential oil of *Nepeta cataria* L. grown in Cordoba Province (Argentina),” *Journal of Essential Oil Research*, vol. 8, no. 5, pp. 565–567, 1996.
10. L. Zenasni, L. Bouidida, A. Hancali et al., “The essentials oils and antimicrobial activity of four *Nepeta* species from Morocco,” *Journal of Medicinal Plants Research*, vol. 2, no. 5, pp. 111–114, 2008.
11. N. V. Handjieva, S. S. Popov, and L. N. Evstatieva, “Constituents of essential oils from *Nepeta cataria* L., *N. grandiflora* M.B. and *N. nuda* L.,” *Journal of Essential Oil Research*, vol. 8, no. 6, pp. 639–643, 1996.
12. C. Bourrel, F. Perineau, G. Michel, and J. M. Bessiere, “Catnip (*Nepeta cataria* L.) essential oil: analysis of chemical constituents, bacteriostatic and fungistatic properties,” *Journal of Essential Oil Research*, vol. 5, no. 2, pp. 159–167, 1993.
13. A. Nostro, M. A. Cannatelli, G. Crisafi, and V. Alonzo, “The effect of *Nepeta cataria* extract on adherence and enzyme production of *Staphylococcus aureus*,” *International Journal of Antimicrobial Agents*, vol. 18, no. 6, pp. 583–585, 2001.
14. Park YK, Koo MH, Abreu JA, Ikegaki M, Cury JA, Rosalen PL. Antimicrobial activity of propolis on oral microorganisms. *Curr Microbiol.* 1998;36(1):24-8.
15. Burdock GA. Review of the biological properties and toxicity of bee propolis (propolis). *Food Chem Toxicol.* 1998;36(4):347-63.
16. Miorin, P.L., Levy Junior, N.C., Custodio, A.R., Bretz, W.A. and Marcucci, M.C. (2003). Antibacterial activity of honey and propolis from *Apis mellifera* and *Tetragonisca angustula* against *Staphylococcus aureus*. *Journal of Applied Microbiology*, 95: 913–920. doi:10.1046/j.1365-2672.2003.02050.x
17. Kujumgiev A, Tsvetkova I, Serkedjieva Y, Bankova V, Christov R, Popov S. Antibacterial, antifungal and antiviral activity of propolis of different geographic origin. *J Ethnopharmacol.* 1999;64(3):235-40.
18. Gibson GR, Beatty ER, Wang X, Cummings JH. Selective stimulation of bifidobacteria in the human colon by oligofructose and inulin. *Gastroenterology.* 1995;108(4):975-82.
19. Wang, X. and Gibson, G.R. (1993), Effects of the *in vitro* fermentation of oligofructose and inulin by bacteria growing in the human large intestine. *Journal of Applied Bacteriology*, 75: 373–380. doi:10.1111/j.1365-2672.1993.tb02790.x
20. Gibson GR. Dietary modulation of the human gut microflora using the prebiotics oligofructose and inulin. *J Nutr.* 1999;129(7 Suppl):1438S-41S.