Sanguinaria-a plant extract is safe alternative than Triclosan - As an antiplaque agent

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Abstract
Triclosan is a polychloro phenoxy phenol., an antiplaque agent used in toothpaste and mouth rinse (Colgate Total, Janina Diamond Whitening Toothpaste, Breeze TM Triclosan Mouthwash, and Reach Antimicrobial Toothbrush). But it has questionable benefits in toothpastes and the negative effects on endocrine system, immune system, musculoskeletal system and environment. Also causes allergy and carcinogenesis. In context to that Triclosan, Sauguinarine is a safe alternative (mouthwash Viadent (USA) Perioguard (UK) Sanguinarine, alkaloids, main a bioactive component of bloodroot, Sanguinaria Canadensis L., is a member of Papaveraceae family. It has antiseptic, anti-inflammatory and antiplaque agent. Part of its appeal would be that it is a *natural therapeutic product*, as distinct from a *'synthetic' or 'artificial'* chemical.

Keywords: Sanguinaria, Triclosan, Bloodroot, Gingivitis, Plaque.

Introduction
The Prevalence of gingivitis in adults in the UNITED STATES exceeds 50%and approaches 100%in some population group.[1] Plaque considered the key factor contributing to gingival inflammation that, if left untreated may progress to periodontitis.

Triclosan is used as antiplaque agent in toothpaste as well as mouth rinse [Colgate Total, Janina Diamond Whitening Toothpaste, Breeze TM Triclosan Mouthwash, Reach Antimicrobial Toothbrush]. Chemically it is a polychloro phenoxy phenol.[2] The negative effects of Triclosan on the environment and its questionable benefits in toothpastes[3] have led to the Swedish Naturskyddsföreningen to recommend not using Triclosan in toothpaste.[4]

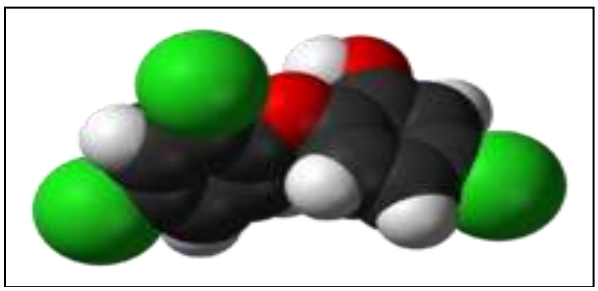

Fig. 1:

Acute Effects
Triclosan has also been associated with a higher risk of food allergy.[5] Other studies have linked Triclosan to allergic contact dermatitis in some individuals.[6] The American Dental Association published a response to the concerns stemming from the Virginia Tech study stating that the study is not relevant to toothpaste.[7] Manufacturers of a number of Triclosan containing toothpaste claims that it it active ingredient continues to work for up to 12 hours after its use.

Chronic Effects
On Endocrine
A 2006 study concluded that low doses of Triclosan act as an endocrine disruptor in the North American bullfrog.[8] The hypothesis proposed that Triclosan blocks the metabolism of thyroid hormone because it chemically mimics thyroid hormone. A study between 2003 and 2006 concluded that Triclosan affects the immune system and showed a positive association with allergy or hay fever diagnosis.[9] Another 2009 study demonstrated that Triclosan exposure significantly impacts thyroid hormone concentrations in the male juvenile rats.[10] Triclosan is also showing up in dolphins near South Carolina and Florida in concentrations known to disrupt hormones, growth, and development in other animals.[11] *On Muscle contraction*-It impairs excitation-contraction coupling in cardiac and skeletal muscle function in mice.[12] *carcinogenesis*-Triclosan can combine with chlorine to form chloroform,[13] which the United States Environmental Protection Agency classifies as a probable human carcinogen.

Link to Dioxin
Dioxin is highly carcinogenic and cause weakening of immune system, altered sex hormones, miscarriage, cancer. [14]Triclosan is listed as 'could be' and 'suspected to be' contaminated with dioxin in EPA's draft Dioxin Reassessment.

Resistance
Escherichia coli and *Staphylococcus aureus* develop low-level resistance to Triclosan at its lower bacteriostatic concentrations because of FabI mutations, which results in a decrease of triclosan's effect on ENR-NAD^+ binding[15,16] It also gain low-level resistance to Triclosan is to over express *FabI*.[17] *Pseudomonas aeruginosa* have innate resistance to Triclosan at low, bacteriostatic levels,.[18] *Bacillus* genus, have alternative *FabI* genes

(*FabK*) to which Triclosan does not bind and hence are less susceptible.

Fig. 2:

Environmental Effects

Triclosan effluents affect both the structure and the function of algal communities in stream ecosystems. Because of its lipophilic nature and resistance to degradation, Triclosan in waterways is readily available for absorption, bioaccumulation by aquatic organisms in environment.[19]

In context to that Triclosan is a safe alternative is Sanguinarine. Part of its appeal would be that it is a natural therapeutic product, as distinct from a 'synthetic' or 'artificial' chemical.

Sanguinarine has antiseptic, anti-inflammatory and antiplaque agent.[20] Sanguinarine is a benzophenanthridine alkaloid derived from rhizomes of Sanguinaria Canadensis L. It is a cationic molecule which converts from an iminium ion form at pH less than 6 to an alkanolamine form at pH greater than 7. Sanguinaria extract is composed of Sanguinarine and five other closely related alkaloids. The safety profile of both Sanguinarine and sanguinaria extract provide a broad margin for their safe use in oral health products. Sanguinarine has broad antimicrobial activity as well as anti-inflammatory properties.[21] It has been incorporated into dentifrices and mouthwash Viadent (USA) Perioguard (UK). Bloodroot is a member of Papaveraceae family. It is a native spring wildflower that grows in rich wood lands of North America

Uses

Currently it is being studied for use as an anticancer agent. Mainly it has commercial success in toothpaste and mouthwash as an anti-plaque agent.The United States FDA has approved the inclusion of Sanguinarine in toothpaste as an antibacterial or antiplaque agent.[22,23]

In a short-term double-blind cross-over study of plaque re-growth and gingivitis lasting two weeks for each experimental period, using a mouth rinse which was a 0.03% solution of sanguinaria extract. They controlled the study with a placebo with similar taste and color. Plaque indices were 40% lower and gingivitis scored 25% lower with the sanguinaria rinses compared with the controls. Normal tooth brushing was suspended during the trial period, and with some of the subjects there was a slight discoloration of the teeth and dorsum of the tongue. [Wennstrom and Lindhe (1985)]

In a six-month double-blind parallel study, assessed gingivitis and plaque in subjects using Viadent dentifrice together with a mouth rinse with sanguinaria extract and zinc chloride. The negative controls used the same products but without the sanguinaria extract or zinc chloride. Plaque and gingivitis scores in the sanguinaria extract group were 21% and 25% lower than those in the control group at the end of 6 months."Bleeding on probing" assessments also showed a reduction in the test group compared with controls. No opportunistic overgrowth of pathogens was found, but there were reductions in numbers of the organisms associated with gingivitis, which may have accounted for the reduction in gingivitis. [Harper *et al.* (1990a)(1990b)]

This report represents the findings of an Expert Panel on the safety of Sanguinaria extract used in Viadent oral rinse and toothpaste products and represents an independent review of the Sanguinaria extract toxicological data base. The Panel concluded that the data base on Sanguinaria extract is substantial and indicates that Sanguinaria extract is safe in its present use in Viadent products based on a large margin of safety between levels of human exposure and levels found to produce minimum effect or to be without adverse effect in animals.[24]

Short- and long-term testing of sanguinaria toothpaste and oral rinse used individually have yielded both positive and negative results. This review evaluates the results of a number of clinical trials testing the regimen use of sanguinaria products for periods ranging from 14 days to six months. Review of these trials establishes the clinical efficacy of the two products in combination. The regimen produces positive reductions in plaque, gingival inflammation and bleeding parameters for up to six months with no adverse hard tissue effects and only one reversible adverse soft tissue effect observed among the 260 subjects tested. In addition, no adverse microbiological shifts in the normal oral flora were observed.[25]

In vitro studies indicate that the anti-plaque action of sanguinaria is due to its ability to inhibit bacterial adherence to newly formed pellicle, its retention in plaque being 10-100 times its saliva concentration, and due to its antimicrobic properties. The MIC of Sanguinarine ranges from 1 to 32 micrograms/mL for most species of plaque bacteria. Long term use of sanguinaria-containing toothpaste and oral rinse products does not predispose users to detrimental shifts in oral flora. Electron microscopic studies of bacteria exposed to Sanguinarine demonstrate that bacteria aggregate and become morphologically irregular. Sanguinarine-containing slow release polymer systems are currently being developed for use in periodontitis treatment applications.[20]

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Conflict of Interest: None.

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