Study shows Stevia Kills Lyme Disease Pathogen Better Than Antibiotics

January 23, 2016 by Sayer Ji

update: I was unaware when i posted this piece that the stevia that was used in the study is the own stevia I used in my treatment (you can get my free book here on my Lyme treatment where I talk about it) I suppose I should have posted the book when I published the article, but better late than never.

The stevia used in the study is Nutramedix brand Stevia. I got an email from our dear friend Lee Cowden MD and we even talked to Nutramedix owners. So hats off to them. end of update.

Lyme disease is exceedingly difficult to treat, due to its well-known shape-shifting (pleomorphic) abilities, with conventional antibiotics often failing to produce a long-term cure. Could the commonly used natural plant Stevia provide a safer, and more effective means to combat this increasingly prevalent infection?

A promising new preclinical study has revealed that whole stevia leaf extract possesses exceptional antibiotic activity against the exceedingly difficult to treat pathogen Borrelia Burgdorferi known to cause Lyme disease. The study found,

Stevia whole leaf extract, as an individual agent, was effective against all known morphological forms of B. burgdorferi."

At present, the CDC acknowledges that at least 300,000 are infected with Lyme disease, annually, with the conventional standard of care relying on antibiotics that are not only toxic but increasingly coming under scrutiny for addressing only surface aspects of the infection, often leaving antibiotic-resistance Lyme disease deep within the system to continue to cause harm.

1. burgdorferi has a complex life cycle, and can exist in radically different forms: spirochetes, spheroplast (or L-form which lacks a cell wall), round bodies or cyst form (which allows for dormancy and escaping PCR detection), and highly antibiotic-resistant biofilms. This pleomorphic property makes conventional treatment exceptionally difficult because while some conventional antibiotics are effective against forms with a cell wall such as spirochetes, they are ineffective against those without a cell wall. This enables B. burgdorferi to change form to evade eradication through conventional means. Also, biofilm formation creates a significant barrier against most conventional antibiotics, even when used in combination, and has

been recently suggested to be the most effective mechanism of resistance.

The new study was published in the *European Journal of Microbiology & Immunology* and titled, "Effectiveness of Stevia Rebaudiana Whole Leaf Extract Against the Various Morphological Forms of Borrelia Burgdorferi in Vitro," and conducted by researchers from the Department of Biology and Environmental Science, University of New Haven, West Haven, CT.

The researchers directly compared an alcohol extract of a whole stevia leaf product commonly found on the U.S. retail market to conventional antibiotics, and assessed their respective abilities to kill the various forms of Borrelia burgdorferi, including so called "persister" forms.

The study pointed out that, according to the CDC, about 10-20% of Lyme disease patients treated with antibiotics for the recommended 2-4 weeks experience adverse health effects, such as fatigue, pain, or joint and muscle aches. In some of these patients, the adverse effects last for more than 6 months. These patients are often labeled with "chronic Lyme disease," or "post treatment Lyme disease syndrome." While the adverse effects of antibiotics, including their destruction of beneficial microbes in the gut, may account for this syndrome, another possibility is that the drugs drive antibiotic-resistant forms of the disease deeper into the system, resulting in enhanced disease-associated malaise.

Given the well-known challenges of eradicating B. burgdorferi through conventional antibiotics, the researchers explored the potential for stevia as an antimicrobial.

Stevia is not normally considered an anti-microbial agent, but all plants possess in-built phytochemical defense systems which protect them against infection, and which by consuming them, we ourselves can sometimes harness and benefit from. The researchers elaborate on this point:

The leaf extract of Stevia possesses many phytochemicals, which include austroinullin, β-carotene, dulcoside, nilacin, rebaudi oxides, riboflavin, steviol, stevioside, and tiamin with known antimicrobial properties against many pathogens [40, 42, 43]. The role of these compounds is mainly to protect the plant from microbial infection and adverse environmental conditions [38–43]."

The researchers explored Stevia's potential effectiveness against B. burgdorferi cultures, comparing it to three common antibiotics sometimes used to treat Lyme's disease: doxycycline, cefoperazone, daptomycin, as well as their combination.

The study results were summarized as follows:

The susceptibility of the different forms was evaluated by various quantitative techniques in addition to different microscopy methods. The effectiveness of Stevia was compared to doxycycline, cefoperazone, daptomycin, and their combinations. Our results demonstrated that Stevia had significant effect in eliminating B. burgdorferi spirochetes and persisters. Sub-culture experiments with Stevia and antibiotics treated cells were established for 7 and 14 days yielding, no and 10% viable cells, respectively compared to the above-mentioned antibiotics and antibiotic combination. When Stevia and the three antibiotics were tested against attached biofilms, Stevia significantly reduced B. burgdorferi forms. Results from this study suggest that a natural product such as Stevia leaf extract could be considered as an effective agent against B. burgdorferi."

Notably, the study found that the most antibiotic resistant form of B. burgdorferi, the biofilm form,*actually increased* in mass when individual antibiotics were administered. Stevia, on the other hand, reduced the biofilm mass on both tested surfaces (plastic and collagen) by about 40%.

It is also interesting to note that the stevoside extract, by itself, was not found to be an effective antimicrobial agent against B. burgdorferi; nor did it have any effect on resistant cells. Mass market stevia products, including Coca-cola's Truvia (ironic branding, considering it does not have the truly therapeutic property of whole stevia), would not, therefore, have the medicinal property associated with the whole herb extract. This speaks, of course, to the well known principle in natural medicine that the activity of the whole can not be reproduced through a part, nor is the therapeutic activity of the whole identical to that of the sum of its parts.

While this is only a preliminary study and should not be interpreted to mean the consumption of whole stevia extract will result in clinical improvements comparable or superior to conventional antibiotics, it opens the door to future research on the topic. That said, anyone who is considering natural ways to prevent Lyme's disease infection, or to support as an adjunct therapy conventional treatments of the disease, could utilize this safe, food-based substance as a potential means of support and synergy. Certainly, there is little if any indication that stevia could cause harm, unlike

conventional treatments. See our stevia research section here for more information.

For more research on natural interventions for Lyme's disease visit our research page on the topic:Lyme disease research.

- See more at: http://www.healthnutnews.com/study-shows-stevia-kills-lyme-disease-pathogen-better-than-antibiotics/#sthash.AyEtqTg9.dpuf

Synergistic Effect of *Stevia rebaudiana* and Doxycycline on the Different Morphological Forms of *Borrelia burgdorferi*

Priyanka A.S Theophilus M.S., Arun V Timmaraju B.S., Maria J Victoria B.S., David F. Luecke B.S., Eva Sapi Ph.D

Lyme Disease Research Group, Department of Biology and Environmental Sciences,

Introduction

Borrelia burgdorferi is the Lyme disease causing bacterium, which is transmitted by deer ticks.[1] The primary treatment for this disease is administration of antibiotics. Unfortunately, studies shows that *Borrelia* can be resistant to antibiotics.[1,2] It has been proposed that the resistance might be due to the formation of different defensive forms, namely cysts and the recently proposed biofilm form.[1,2] Therefore there is an urgent need to discover new antimicrobial compounds with unique mechanism on the three forms of *Borrelia*[3] *Stevia rebaudiana*, is one of the most potent member of the *Asteraceae* family and is commonly called as Sweet leaf.[3,4] The bioactive compounds in Stevia are the phytochemicals namely austroinullin, β-carotene, dulcoside, nilacin, rebaudi oxides, riboflavin, steviol, stevioside and tiamin which posses reported antimicrobial properties against *Candida albicans, Vibiro cholerae, Escherichia coli, Cryptococcus neoformans, Salmonella typhi,*[3] *Pseudomonas aeruginosa, Bacillus subtilis* and *Staphylococcus aureus.*[4]. The purpose of this study is to investigate the potential antimicrobial effect of Stevia with with or without doxycycline in an attempt to eliminate the different morphological forms of *Borrelia* and

Methods

Borrelia burgdorferi B31 strain was cultured in BSK-H media (Sigma) supplemented with 6% rabbit serum (Pel-Freez) without additional antibiotics. The culture was maintained at 33°C with 5% CO_2. The antimicrobial sensitivity of spirochetal and cyst forms was tested by staining the cells with BACLIGHT Live/Dead viability stains (Life Technologies) and analyzing the results by fluorescence microscopy. To initiate biofilm growth, $5x10^6$ cells/ml suspensions of *Borrelia* cultures were grown on 48 well microplates plates (BD Falcon). Quantitative analysis on biofilm was performed following MTT viability assay protocol. *Stevia rebaudiana* extract (Nutramedix) was used at different dilutions.[3-5] As a positive control 25 µg/ml of doxycycline (Doxy) and as a negative control 1:100 dilution of 25% grain alcohol was used in every experiment. The two-sample paired t-test statistical analyses were performed using GraphPad Prism 6.00 for Mac (La Jolla, CA, USA).

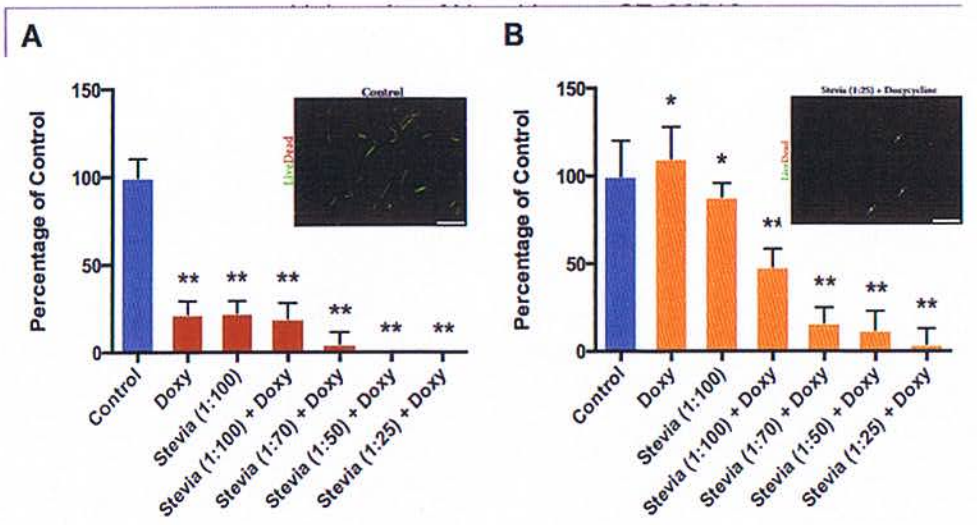

Figure 1: The susceptibility of spirochete and cyst forms on *Borrelia burgdorferi* B31 strain to various dilutions of Stevia combined with 25 µg/ml doxycycline. **Panel 1A** Synergistic effect of various dilutions of Stevia in combination with 25 µg/ml Doxycycline (Doxy) on the spirochete form of *Borrelia burgdorferi*.
Panel 1B Synergistic effect of various dilutions of Stevia in combination with 25 µg/ml Doxycycline (Doxy) on the cyst form of *Borrelia burgdorferi*. Doxycycline (25 µg/ml)(Doxy) and 25% Grain Alcohol (1:100 dilution) were used as controls. Data were considered significant at p value<0.05. * indicates p values≤ 0.05 and ** indicates p values≤ 0.01. Images represent BacLight viability staining on B31 strain of *Borrelia burgdorferi* after 72-hour

Quantitative and Qualitative analysis of *Borrelia burgdorferi biofilm* after 72 hours of treatment with different antimicrobial agents

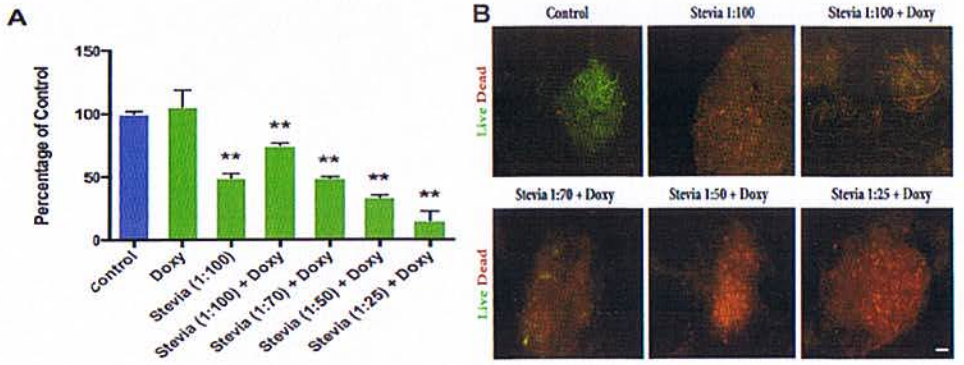

Figure 2: MTT and Baclight assay on the biofilm form biofilm form of *Borrelia burgdorferi B31* treated with various dilutions of Stevia in combination with 25 µg/ml Doxycycline. Panel 2A Effect of Stevia (various dilutions) in combination with Doxycycline (25 µg/ml) on the biofilms of *Borrelia burgdorferi*. Doxycycline (25 µg/ml)(Doxy) and 25% Grain Alcohol (1:100 dilution) were used as controls. Data were considered significant at P<0.05. * indicates P≤ 0.05 and ** indicates P≤ 0.01. **Panel 2B** Representative images of *Borrelia burgdorferi* B31 biofilm after 72 hours of treatment stained with SYTO 9 green-fluorescent nucleic acid stain (live cells) and propidium iodide, a red-fluorescent nucleic acid stain (dead cells).

Results/Discussion

It is apparent that all dilutions of Stevia display a synergistic effect with doxycycline in bringing a marked reduction in all the three forms of *Borrelia burgdorferi*. Stevia (1:100 dilution) shows 77% reduction in the spirochete form and 12% reduction in the cyst form. On the other hand, doxycycline show similar effects to that of Stevia (1:100 dilution) in reducing the spirochete form but showed a distinct increase in the cyst form. There is a synergistic effect observed when Stevia (1:100 dilution) is combined with 25µg/ml doxycycline. There is a remarkable 81% decrease in the spirochete form and 52% decrease in the cyst form. Moreover, the best result was with Stevia (1:25 dilution) and doxycycline with 100% and 96% elimination of both the spirochete and the cyst form respectively. When quantitative effects of this novel combination were evaluated on *Borrelia* biofilm form, it is noted that the best result was with Stevia (1:25 dilution) when combined with 25µg/ml doxycycline, which reduced the biofilm form by 85%. The significant reduction of *Borrelia* biofilm with

Conclusions

In summary, our results suggest that Stevia might be the promising agent to combat all the three forms of *Borrelia burgdorferi* when combined with doxycycline.

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