

## Comparison between the effect of Jaman and Biotene solutions on some of the dental plaque bacteria

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### Original Article

#### Abstract

**BACKGROUND AND AIM:** Bacterial plaque is a biofilm which is related to its host and its exact role is proved in caries and periodontal disease. These days people brush their teeth and use mouthwash. In this research the effect of Jaman solution (Hezar Co., Iran) was compared with Biotene mouth rinse in an in-vitro study.

**METHODS:** Biotene mouth rinse (Laclede Co., US) contains 4 antibacterial enzymes. Four different bacteria such as *Streptococcus (S.) salivarius*, *S.sobrinus*, *S.sanguis* and *Actinomyces viscosus* were cultured in the lab. The effects of Jaman, Biotene and penicillin on these bacteria were tested by using disc diffusion method.

**RESULTS:** The antibacterial effects of Jaman and Biotene did not show any significant differences. Both of Jaman and Biotene showed significant differences with blank disc and penicillin.

**CONCLUSIONS:** According to the results, the antibacterial effect of Biotene is not better than Jaman.

**KEYWORDS:** Biotene, Jaman, Mouth Rinse, *Streptococcus*, *Actinomyces*

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Gingivitis and dental caries can be initiated by bacterial plaque. Hence gingivitis and caries cavity provide a suitable environment for changes in the plaque ecology. Controlling plaque is not quite effective through mechanical methods such as brushing by many people.<sup>1,2</sup> Therefore, the necessity of applying anti-plaque compounds along with mechanical methods is required. Thus, the anti plaque compounds can be entered into mouthwash formula.<sup>3,4</sup>

Mouthwashes can be purchased by people without the permission of physicians. Therapeutic effects of these mouthwashes

varies a lot, including anti-plaque, anti-hemorrhage, anti-inflammatory, antibacterial and so on. Side effects from synthetic medicines such as chemical mouthwash caused a bulk of research to be conducted on medicinal plant resources.<sup>5</sup>

In this study, antibacterial effects of Jaman plant solution (Hezar Co., Iran) have been compared with the antibacterial effects of Biotene chemical mouth rinse (Laclede Co.,US) by using disc diffusion method in vitro. Plant solution of Jaman is made in Hazar manufacturing company with verification No 10/70/962 in Kerman University of Medical Sciences, Iran, and

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contains plant extracts of thyme and pennyroyal. It contains antibacterial and analgesic effects, especially for toothache, according to its indications written in the brochure. In a study, thyme and *Mentha longifolia* essential oil was extracted using the method of distillation with steam. Thyme essential oil (Tx-porlock) produced the inhibition zone of *Escherichia coli* (*E.coli*) with 17mm diameter at a dilution of one-sixteenth and the inhibition zone of *Staphylococcus aureus* with 22mm diameter at a dilution of one-eighth. The non-diluted essential oil of *Mentha longifolia* created *E.coli* inhibition zone with 12mm diameter and the inhibition zone of *Staphylococcus aureus* with 23mm diameter.<sup>6</sup>

Biotene solution contains strong antibacterial effects according to its properties written in the brochure. Biotene solution contains an antibacterial enzyme such as active components of lysozyme, lactoferrin, Glucosidase and Lactoperoxidase.<sup>7</sup> Biotene mouthwash has no saccharin instead; it has been sweetened by Xylitol.<sup>7</sup> Some of the clinical studies have evaluated the anti-caries effect of Xylitol and its beneficial replacement effects in chewing gum instead of sucrose.<sup>8</sup> Xylitol is not metabolized to acid in pure bacteria culture medium (in vitro) and in dental plaque (in vivo). The long term use of xylitol in chewing gum causes the reduction of dental plaque formation, suppress *Streptococcus Mutans* and reduce adhesion of the plaque.<sup>9</sup> Adding 10% Xylitol to toothpaste containing the enzyme without sodium lauryl sulfate has an inhibitory effect on the number of *Streptococcus Mutans* in saliva and plaque. This effect is probably duo to dose-dependent.<sup>10</sup> The aim of the present study was to evaluate the anti-bacterial effect of Jaman solution.

### Methods

This research was done in the laboratory of microbiology. Four different kinds of bacteria were used. The bacteria were prepared as lyophilized. Ampoule which contained

bacteria was broken in sterile condition. Then, 0.3 to 0.4ml from the sterile liquid medium (liquid blood medium) was added to the dry material in the ampoule. After equalizing its suspension, it was transferred to the specific medium for each bacterium. The media were incubated for 48 hours at 37°C. After this period of time, the grown bacterial colonies were ready for disc diffusion test and 3-5 colonies were removed from each plate containing microbe and transferred to test tube containing 2ml of saline normal solution so that microbial suspensions would be prepared. The darkness of the suspension was like that of the standard solution of barium sulfate [with the concentration of 0.5 McFarland, 0.2 BAL cell / ml ( $3 \times 10^8$ )]. Physiologic saline and in some cases, colonies emulsion were used to adjust darkness. Then, the microbial suspension was added to the surface of plates containing medium by using a sterile swab. Then, the discs immersed in Biotene and Jaman solutions for 5 seconds and was placed on the plate surfaces. Blank disc that was empty and penicillin disc were placed on the plate surfaces as negative and positive controls, respectively. The plates were incubated at 35°C for 16 to 18 hours. The above stages were repeated twice for each sample and the mean of the both evaluations was recorded as the final result. This method was used in the same researches.<sup>4,5</sup>

In the disc diffusion method, when the medicinal compound penetrates in agar from the disc borders, its concentration is progressively reduced to the extent that it has no more power to prevent bacterial growth; therefore, bacterial growth stops in the penetrating zone of drug compound. So, the diameter of the inhibition zone specifies the relative susceptibility of bacteria to specific drug compound.

### Data Analysis

A Kruskal-Wallis test was conducted to explore the difference between groups and for two-way comparisons Mann-Whitney test was used. Data management and analysis were

performed by SPSS software, version 15.

## Results

The results are shown in table 1 and figure 1. In this study, blank disc did not have an antibacterial effect and Biotene did not have any effect on *Actinomyces Viscosus*. There was no significant difference between Biotene and Jaman effects ( $p = 0.89$ ) but penicillin had a higher effect compared to Biotene and Jaman ( $p < 0.01$ ). Table 1 indicates the diameter of inhibition halation. With regard to *Streptococcus Sobrinus*, there was no statistically significant differences between Jaman and Biotene solutions ( $P = 0.997$ ) as well as between Biotene and blank disc ( $P = 0.305$ ), Jaman and blank disc ( $P = 0.255$ ), however, there was a significant difference between Biotene and penicillin ( $P < 0.05$ ) as well as Jaman and penicillin ( $P < 0.05$ ). Regarding *Streptococcus Sanguis*, there was no significant difference between Biotene and Jaman solutions ( $P = 0.078$ ), but there was a significant difference between Biotene and blank disc ( $P < 0.05$ ), Jaman and blank disc

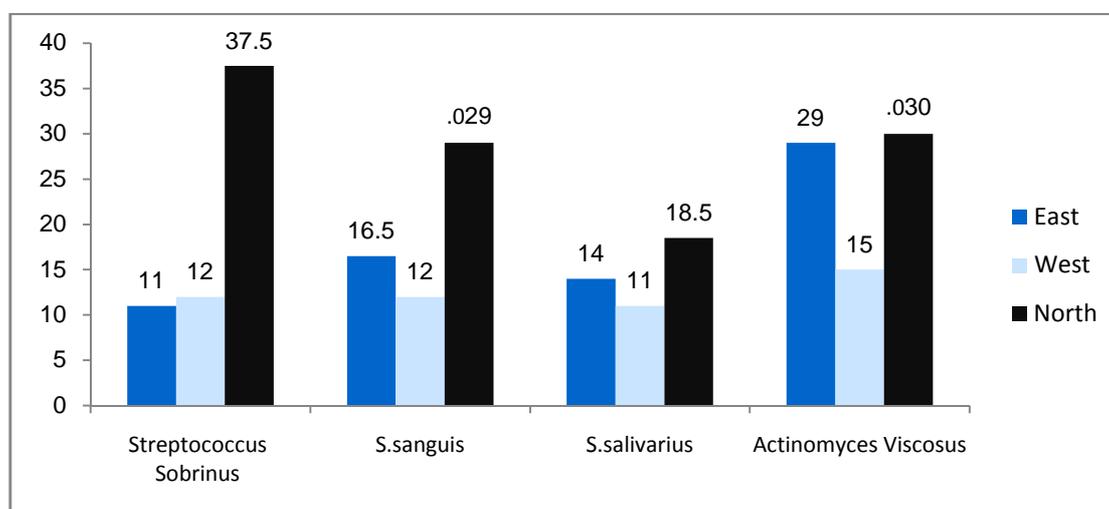
( $P < 0.05$ ), Biotene and penicillin ( $P < 0.05$ ) and Jaman and penicillin ( $P < 0.05$ ). With respect to *Streptococcus Salivarius*, there was no significant difference between Biotene and Jaman solutions ( $P = 0.697$ ). This was also true for Biotene and penicillin ( $P = 0.434$ ), Jaman and penicillin ( $P = 0.148$ ) but there was a significant difference between Biotene and blank disc ( $P < 0.05$ ) and Jaman and blank disc ( $P < 0.05$ ).

With regard to *Actinomyces Viscosis*, the difference between Biotene and Jaman was significant ( $P < 0.05$ ). This also was true for Jaman and Blanc disk ( $P < 0.05$ ), Biotene and penicillin ( $P < 0.05$ ), Jaman and penicillin ( $P < 0.05$ ); however, there were no significant differences between Biotene and blank disk ( $P = 1.000$ ).

In total, there were no significant differences between Biotene and Jaman solutions ( $P = 0.528$ ). However, there were significant differences between Biotene and penicillin ( $P < 0.05$ ), Jaman and Penicillin ( $P < 0.05$ ), Biotene and blank disk ( $P < 0.05$ ), and Jaman and blanc disk ( $P < 0.05$ ).

**Table 1.** The average size of the inhibition zone growth for the bacteria (mm)

Bacteria	Blank disc	Biotene	Jaman	Penicillin
Sterptococcus Sobrinus	0	11.0	12.0	37.5
S.sanguis	0	16.5	12.0	29.0
S.salivarius	0	14.0	11.0	18.5
Actinomyces Viscosus	0	0.0	15.0	30.0
Mean	0	10.4	12.5	28.7
Std.Error	0	2.4	0.6	3.0



**Figure 1.** Comparison between the size of inhibition zone growth around the disks (mm)

## Discussion

In this study, there was no significant difference between Biotene and Jaman however, Biotene did not have any effect on *Actinomyces viscosus*.

In an evaluation, Biotene mouthwash did not result in a significant reduction in the rate of *Streptococcus mutans*, *Actinomyces viscosus* and *Candida albicans*.<sup>11</sup> Also, in this study, it was revealed that the Biotene solution had no effect on *Actinomyces viscosus*.

Biotene toothpaste contains Lactoperoxidase and Glucosidase that they also exist in Biotene mouthwash. In order to compare this toothpaste with placebo toothpaste, Biotene toothpaste was used for 2 weeks in vivo study. It was found that there was no significant change in salivary flow, peroxidase activity and the number of *Streptococcus mutans*, lactobacilli and anaerobic flora bacteria.<sup>12</sup>

In another study, patients asked to use Biotene toothpaste (containing Lactoperoxidase system) with Biotene mouthwash (containing lysozyme and lactoferrin) for 4 weeks. The myeloperoxidase activity and the amount of Hypothiocyanate, lysozyme and lactoferrin in saliva did not change but there were significant changes in the reduction of salivary pH, peroxidase activity and protein content. Hypothiocyanate concentration of saliva increased in the patients with low salivary flow, but their salivary microorganisms did not change.<sup>13</sup> In a study, oral balance gel and Biotene toothpaste were compared with a placebo. None of these products changed the rate of stimulated and non-stimulated saliva. The number of *Streptococcus mutans*, *Lactobacillus* and *Candida* species did not change, however, the symptoms of mouth dryness improved and the improvement in the perceived taste of food was statistically significant.<sup>14</sup>

Biotene mouth rinse also contains benzoic acid and sodium benzoate that are able to

increase cell mutation in the presence of light.<sup>15</sup> The antimicrobial and antifungal effects of Biotene mouth rinse on *Streptococcus mutans*, *Lactobacillus acidophilus* and *Candida albicans* by using agar-well diffusion method was done in vitro. Biotene showed anti-bacterial effects against the Strep, and *Lactobacillus* but no effects on *Candida*.<sup>16</sup> A clinical study showed that Biotene mouth rinse was less effective on *Streptococcus mutans* than 0.1% Octenidine dihydrochloride and 0.12% Chlorhexidine digluconate mouth washes.<sup>7</sup>

Jaman solution contains extracts of thyme and pennyroyal, but no research has been recorded on it. Thyme has antibacterial effects and also causes the relief of toothache.<sup>17</sup> Pennyroyal has a lethal effect against some strains of fungi and bacteria, rubbing the burned plant on gums have been known beneficial.<sup>6,18</sup>

A research was done on two different species of thyme (*Thyme eriocalyx*, *Thyme x - porlock*). The test was performed by various concentrations of thyme oil on *Aspergillus Parasiticus* by using disc diffusion method. *Thymus eriocalyx* stopped fungal growth, especially on concentrations of dilution of one, one-second and one-fourth. *Tx-porlock* showed the same result when it was not diluted. Minimum fungicidal concentration test and minimum inhibitory concentration test was done. Two thyme species oil showed the effect of fungistatic on concentrations of one-eighth and fungicidal on concentrations of a quarter. *Tx-porlock* showed fungistatic effects on the concentration of one-sixteen.<sup>19</sup>

In this research, Biotene had the maximum and minimum effects on the *Streptococcus Saguis* and *Actinomyces Viscosis* bacteria, respectively. Jaman had the maximum and minimum effects on the *Actinomyces Viscosis* and *Streptococcus Salivarius* bacteria, respectively.

In general, when the antibacterial effects of Jaman and Biotene were compared, no statistical significant differences were shown but the effect of Jaman and Biotene on

Actinomyces Viscosis were different.

wash solutions.

### Conclusion

Since the thyme and pennyroyal extracts are bactericidal, they could be used in the mouth

### Conflict of Interest

Authors have no conflict of interest.

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