# HETAFU Cut G: The World's First Soft Drink Redefining Oral Hygiene by Revolutionizing the Oral Microbiome

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**Abstract**

**Background**: Maintaining a balanced oral microbiome is crucial for preventing dental caries, periodontal diseases, and oral infections. HETAFU Cut G drink, formulated with probiotics, prebiotics and sugar alcohols has been developed as a natural and bioactive oral health supplement. This study evaluates its effects on key oral microorganisms, including Streptococcus mutans, Lactobacillus species, Actinomycetes species, and Candida species, over an 8-week period.

**Methods**: A total of 250 participants were randomly assigned to consume HETAFU Cut G drink daily, with microbial levels assessed at baseline, 2 weeks, 4 weeks, and 8 weeks using microbiological techniques. The statistical significance of microbial reduction was analyzed using Z-scores and p-values.

**Results**: The study found a statistically significant reduction in the levels of pathogenic oral microbes, particularly Streptococcus mutans and Candida species, by the 8th week ($p < 0.05$). These findings indicate that HETAFU Cut G drink helps modulate the oral microbiome, promoting a healthier microbial balance.

**Conclusion**: The results suggest that HETAFU Cut G drink could serve as a novel adjunct to traditional oral hygiene practices, offering a non-invasive, convenient approach to improving oral health.

**Keywords:** *HETAFU Cut G drink, probiotics, prebiotics, sugar alcohol, oral microbiome.*

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## Introduction

Oral health is a critical component of overall well-being, influencing not only dental integrity but also systemic health. The human oral cavity harbours a diverse and dynamic microbiome consisting of both commensal and pathogenic micro-organisms.[1] A well-balanced oral micro-biome is essential for maintaining oral homeostasis, whereas dysbiosis — an imbalance in microbial populations — can lead to a range of dental diseases, including dental caries, periodontal disease, and halitosis.[2] Among the primary contributors to oral dysbiosis are Streptococcus mutans, Lactobacillus species, Actinomyces species, and Candida albicans, which play key roles in the initiation and progression of oral infections.[3]

Traditional approaches to oral hygiene, such as mechanical plaque removal through brushing and flossing, are effective but may not fully address microbial imbalances. In recent years, dietary interventions have gained attention as an adjunctive strategy for modulating the oral microbiome.[4] Among these, functional ingredients such as sugar alcohols, prebiotics, and probiotics have demonstrated significant potential in promoting oral health.[5]

Sugar alcohols, including xylitol (INS 967), sorbitol (INS 420), and erythritol (INS 968), have been extensively studied for their ability to inhibit cariogenic bacteria. Xylitol and erythritol, in particular, interfere with bacterial metabolism, reducing acid production and inhibiting the adhesion of Streptococcus mutans to tooth surfaces. Additionally, these compounds help maintain salivary flow, which is crucial for neutralizing acids and remineralizing enamel.[6]

Prebiotics, such as fructooligosaccharides (FOS), serve as substrates for beneficial bacteria, fostering a microbial environment that supports oral and systemic health. By selectively stimulating the growth of beneficial bacteria while suppressing pathogenic species, prebiotics contribute to a more stable and resilient oral microbiome. Emerging evidence suggests that prebiotics may help mitigate halitosis, reduce inflammation, and enhance the natural defenses of the oral cavity.[7]

Probiotics, including Bacillus coagulans, Lactobacillus reuteri, and Streptococcus salivarius, have been shown to actively combat harmful microorganisms through competitive inhibition, antimicrobial production, and immune modulation.[8] Probiotic supplementation has been linked to reduced levels of Streptococcus mutans and Candida albicans, improvements in periodontal health, and a decrease in volatile sulfur compounds responsible for bad breath.[9]

In response to the growing demand for holistic oral care solutions, HETAFU Cut G has been developed as an innovative functional soft drink designed to promote oral and gut health. By incorporating a scientifically formulated blend of sugar alcohols, prebiotics, and probiotics, HETAFU Cut G offers a novel, non-invasive approach to oral health maintenance. Unlike traditional oral care products that focus solely on mechanical plaque removal, this beverage aims to naturally modulate the oral microbiome, reducing harmful bacteria while supporting beneficial species.

This study aims to evaluate the impact of HETAFU Cut G on the oral microbiome by assessing changes in the populations of Streptococcus mutans, Lactobacillus, Actinomyces species, and Candida albicans over an eight-week period. By providing scientific evidence on the efficacy of functional dietary interventions in oral health, this research has the potential to contribute to a more integrative and preventive approach to dental care.

## Methodology

The study was designed to evaluate the effects of HETAFU Cut G drink, a groundbreaking soft drink that is the world's first beverage formulated to cleanse the teeth. This innovative drink combines a unique blend of probiotics, prebiotics, sugar alcohols, xylitol, erythritol, sorbitol, fructose oligosaccharide (FOS), and Bacillus coagulans, specifically engineered to promote oral health. The formulation aims to modulate the oral microbiome by encouraging the growth of beneficial bacteria while inhibiting harmful pathogens, ultimately supporting the maintenance of oral hygiene and preventing dental issues such as cavities and plaque buildup. Through this study, we sought to determine the impact of this novel drink on the microbial composition of the oral cavity, particularly its potential to reduce the presence of cariogenic bacteria and support a healthy, balanced oral microbiome.

Study Design: This study is designed as a single-group interventional trial to evaluate the effects of HETAFU Cut G on the oral microbiome over eight weeks. A control group is not included, as the primary objective is to measure the within-subject changes in bacterial populations before and after intervention. Given that each participant serves as their own control, this approach minimizes inter-individual variability and enhances statistical power by focusing on longitudinal microbiome changes.

Participants: A total of 250 healthy adults aged 18– 60 years will be recruited for the study. Participants will be screened based on specific eligibility criteria to ensure uniformity in baseline oral health status.
Inclusion Criteria: Individuals with no diagnosed oral health conditions, No recent use of antibiotics, probiotics, or antifungal treatments (within the past three months), Non-smokers, Willingness to maintain their regular oral hygiene routine without introducing additional probiotic or antibacterial products

Exclusion Criteria: Individuals with allergies to study ingredients, Participants undergoing active dental treatments Pregnant or lactating women, Individuals with systemic conditions affecting oral health (e.g., diabetes, immunodeficiency disorders)

Intervention: Each participant will consume one serving of HETAFU Cut G daily for eight weeks. Participants will be instructed to consume the beverage at a consistent time each day and refrain from eating or drinking for 30 minutes afterward to maximize its oral effects.

Outcome Measures: Oral Microbiome Assessment:

- Quantification of Streptococcus mutans, Lactobacillus, Actinomyces species, and Candida albicans in saliva samples collected at baseline, four weeks, and eight weeks.
- Microbiological analysis using culture-based methods and quantitative PCR (qPCR) to assess bacterial load and shifts in microbial composition.

Statistical Analysis: Descriptive statistics summarized baseline characteristics. One way ANOVA was employed to assess longitudinal changes in bacterial counts, and Multiple Comparisons Using Dunnett T3 Test for Oral Microbial Counts Across Different Time Points. A p-value of $<0.05$ will be considered statistically significant.

This study aims to provide scientific evidence on the role of HETAFU Cut G in modulating the oral microbiome, promoting beneficial bacteria, and reducing pathogenic species. By offering a novel dietary strategy for oral health maintenance, this intervention has the potential to complement existing preventive dental care measures and contribute to a more holistic approach to oral hygiene.

## Results

The results section presents an analysis of the data from 250 participants, focusing on the effects of HETAFU Cut G on oral microbiome populations, including Streptococcus mutans, Lactobacillus species, Candida albicans, and Actinomyces species. Changes in bacterial composition were assessed at baseline, four weeks, and eight weeks. Statistical tests were conducted to evaluate the significance of these changes. The findings aim to demonstrate the potential of HETAFU Cut G in promoting oral health by modulating the oral microbiome.

The study included a total of 250 participants, with a nearly equal distribution of gender; 126 (50.4%) were male, and 124 (49.6%) were female. The participants' ages ranged from 19 to 58 years, with a mean age of 38.62 years and a standard deviation of 11.357, indicating moderate variability in age distribution.

Table 1: Distribution of participants based on gender

| Gender | Frequency | Percentage |
|---|---|---|
| Male | 126 | 50.4 |
| Female | 124 | 49.6 |
| Total | 250 | 100.0 |

Table 2: Descriptive Statistics of Participants' Age

| | N | Min. | Max. | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Age | 250 | 19 | 58 | 38.62 | 11.357 |

Table 3: Changes in Oral Microbial Counts after Consuming the HETAFU CUT Drink over Time

| | | N | Mean | Std. Deviation | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Streptococcus mutans | Baseline | 250 | 6.122 | .5830 | 6.050 | 6.195 | 5.1 | 7.5 |
| | 2 weeks | 250 | 5.273 | .6326 | 5.194 | 5.352 | 4.2 | 6.8 |
| | 4 weeks | 250 | 4.432 | .6413 | 4.352 | 4.511 | 3.3 | 6.0 |
| | 8 weeks | 250 | 3.048 | .7314 | 2.957 | 3.140 | 2.0 | 5.1 |
| | Total | 1000 | 4.719 | 1.3073 | 4.638 | 4.800 | 2.0 | 7.5 |
| Lactobacillus species | Baseline | 250 | 16.142 | .9150 | 16.028 | 16.256 | 14.1 | 17.5 |
| | 2 weeks | 250 | 15.094 | .9066 | 14.981 | 15.207 | 13.0 | 16.5 |
| | 4 weeks | 250 | 12.402 | 1.7848 | 12.180 | 12.625 | 10.0 | 15.5 |
| | 8 weeks | 250 | 9.529 | 1.3569 | 9.360 | 9.698 | 7.5 | 11.6 |
| | Total | 1000 | 13.292 | 2.8728 | 13.114 | 13.470 | 7.5 | 17.5 |
| Actinomycetes species | Baseline | 250 | 8.952 | .3613 | 8.907 | 8.997 | 8.1 | 9.6 |
| | 2 weeks | 250 | 6.578 | .5095 | 6.515 | 6.641 | 5.7 | 7.8 |
| | 4 weeks | 250 | 5.134 | .3860 | 5.086 | 5.182 | 4.2 | 6.0 |
| | 8 weeks | 250 | 2.640 | .5394 | 2.572 | 2.707 | 1.7 | 3.7 |
| | Total | 1000 | 5.826 | 2.3356 | 5.681 | 5.971 | 1.7 | 9.6 |
| Candida species | Baseline | 250 | 10.964 | .4534 | 10.907 | 11.020 | 10.1 | 12.1 |
| | 2 weeks | 250 | 9.724 | .5307 | 9.657 | 9.790 | 8.6 | 10.9 |
| | 4 weeks | 250 | 7.900 | .5322 | 7.834 | 7.967 | 6.9 | 9.1 |
| | 8 weeks | 250 | 4.948 | .7169 | 4.858 | 5.037 | 4.1 | 6.3 |
| | Total | 1000 | 8.384 | 2.3341 | 8.239 | 8.529 | 4.1 | 12.1 |

This table provides a comprehensive analysis of the changes in oral microbial counts for four key microorganisms — *Streptococcus mutans*, *Lactobacillus species*, *Actinomycetes species*, and *Candida species* — over an 8-week period following the consumption of a specific drink. Data was collected from 250 participants at each time point (baseline, 2 weeks, 4 weeks, and 8 weeks), with a total of 1000 observations. The parameters measured include the mean microbial count, standard deviation (indicating variability), 95% confidence intervals (reflecting statistical reliability), and the observed minimum and maximum values at each time point.

***Streptococcus mutans:*** The mean *Streptococcus mutans* count demonstrated a consistent decline over time. At baseline, the mean was 6.122 with a standard deviation of 0.5830. After 2 weeks, the mean decreased to 5.273, followed by 4.432 at 4 weeks and 3.048 at 8 weeks, indicating a substantial reduction. The 95% confidence interval narrowed progressively, showing increased consistency in microbial reduction. Minimum values dropped from 5.1 to 2.0, reflecting a broader range over time.

***Lactobacillus species:*** Similar to *Streptococcus mutans*, *Lactobacillus species* counts decreased over time. The baseline mean was 16.142 with a standard deviation of 0.9150. By 2 weeks, the mean declined to 15.094 and continued to fall to 12.402 at 4 weeks and 9.529 at 8 weeks. The reduction suggests a gradual but significant impact of the drink on this bacterial population. Minimum values shifted from 14.1 at baseline to 7.5 at 8 weeks, indicating a wider range of response among participants.

***Actinomycetes species:*** The reduction in *Actinomycetes species* counts was notable, with baseline values starting at a mean of 8.952 and a low standard deviation of 0.3613, indicating minimal variability. By 2 weeks, the mean dropped to 6.578, then to 5.134 at 4 weeks, and further down to 2.640 at 8 weeks. The 95% confidence interval consistently narrowed, demonstrating a reliable decline in counts. Minimum values decreased significantly from 8.1 to 1.7, reflecting the drink's pronounced effect.

***Candida species:*** The mean *Candida species* counts showed a gradual but marked reduction over the 8-week period. At baseline, the mean was 10.964 with a standard deviation of 0.4534. At 2 weeks, the mean decreased to 9.724, continuing to fall to 7.900 at 4 weeks and 4.948 at 8 weeks. Minimum values dropped from 10.1 to 4.1, showing a substantial reduction, while the 95% confidence intervals indicated consistent reliability in the decreasing trend.

**Overall Trends:** Across all four microorganisms, the total mean values across the 8-week period indicate a downward trend, suggesting that the drink had a significant impact on reducing oral microbial populations. *Streptococcus mutans* and *Actinomycetes species* showed the most pronounced reductions, while *Candida species* and *Lactobacillus species* also demonstrated substantial declines. The consistent narrowing of the 95% confidence intervals over time suggests increasing reliability and uniformity in the reduction of microbial counts. These findings support the potential efficacy of the drink in improving oral health by reducing harmful bacterial and fungal populations.

Table 4: Analysis of Variance (ANOVA) for Oral Microbial Counts across Different Time Points

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Streptococcus | Between Groups | 1287.432 | 3 | 429.144 | 1018.038 | ≤0.001* |
| | Within Groups | 419.854 | 996 | .422 | | |
| | Total | 1707.287 | 999 | | | |
| Lactobacillus | Between Groups | 6579.939 | 3 | 2193.313 | 1312.205 | ≤0.001* |
| | Within Groups | 1664.785 | 996 | 1.671 | | |
| | Total | 8244.724 | 999 | | | |
| Actinomycetes | Between Groups | 5243.111 | 3 | 1747.704 | 8421.923 | ≤0.001* |
| | Within Groups | 206.688 | 996 | .208 | | |
| | Total | 5449.799 | 999 | | | |
| Candida | Between Groups | 5122.895 | 3 | 1707.632 | 5317.944 | ≤0.001* |
| | Within Groups | 319.823 | 996 | .321 | | |
| | Total | 5442.718 | 999 | | | |

This table presents the results of a one-way Analysis of Variance (ANOVA) performed to evaluate the statistical significance of changes in the counts of *Streptococcus mutans*, *Lactobacillus species*, *Actinomycetes species*, and *Candida species* across four time points (baseline, 2 weeks, 4 weeks, and 8 weeks) after consuming the specified drink. The analysis includes key metrics such as the sum of squares, degrees of freedom (df), mean square values, F-statistics, and significance (Sig.) values. These metrics help determine whether there are statistically significant differences between the microbial counts over time.

**Streptococcus mutans:** For Streptococcus mutans, the sum of squares between groups was 1287.432 with 3 degrees of freedom, resulting in a mean square value of 429.144. The within-group sum of squares was 419.854 with 996 degrees of freedom, indicating a mean square of 0.422. The F-statistic of 1018.038 is exceptionally high, with a significance value (Sig.) of ≤0.001*, confirming that the reduction in *Streptococcus mutans* counts over time is statistically significant.

**Lactobacillus species:** The ANOVA results for Lactobacillus species show a between-group sum of squares of 6579.939 with a mean square of 2193.313. The within-group sum of squares was 1664.785, with a mean square of 1.671. The high F-statistic of 1312.205 and a significance value of ≤0.001* suggest that the observed differences in Lactobacillus species counts over time are highly significant. This confirms that the drink had a substantial impact on reducing *Lactobacillus species* counts.

**Actinomycetes species:** The results for Actinomycetes species revealed a between-group sum of squares of 5243.111, with a mean square of 1747.704. The within-group sum of squares was relatively low at 206.688, with a mean square of 0.208. The F-statistic was extraordinarily high at 8421.923, with a significance value of ≤0.001*, indicating a significant decline in *Actinomycetes species* counts over time. The large F-value suggests that the between-group variance is considerably greater than the within-group variance.

**Candida species:** For Candida species, the ANOVA indicated a between-group sum of squares of 5122.895 with a mean square of 1707.632. The within-group sum of squares was 319.823 with a mean square of 0.321. The F-statistic was 5317.944, with a significance value of ≤0.001*, confirming that the reduction in Candida species counts over the 8-week period is statistically significant. This result highlights the pronounced impact of the drink on fungal populations in the oral cavity.

**Overall Interpretation:** The ANOVA results for all four microorganisms (Streptococcus mutans, Lactobacillus species, Actinomycetes species, and Candida species) demonstrate statistically significant differences in microbial counts across the four time points, with all p-values (Sig.) being ≤0.001*. The high F-statistics in each case indicate that the observed reductions in microbial populations are unlikely to have occurred by chance. These findings provide strong evidence of the efficacy of the drink in significantly reducing harmful oral microbes over time.

Table 5 presents the results of the Dunnett T3 post-hoc multiple comparison test for the microbial counts of Streptococcus mutans, Lactobacillus species, Actinomycetes species, and Candida species at four different time points: baseline, 2 weeks, 4 weeks, and 8 weeks after consuming the specified drink. The Dunnett T3 test is suitable for unequal variances and provides a detailed comparison between each pair of time points. The parameters displayed include the mean difference between groups, standard error, significance (Sig.) value, and the 95% confidence interval (lower and upper bounds) for each comparison.

**Streptococcus mutans:** The comparisons indicate a consistent and significant reduction in Streptococcus mutans counts over time. From baseline to 8 weeks, the mean difference was 3.0740 ($p < .001$), reflecting a substantial decrease. Each subsequent time point showed significant differences when compared to the previous one, confirming the gradual decline in Streptococcus mutans counts.

Table 5: Multiple Comparisons Using Dunnett T3 Test for Oral Microbial Counts across Different Time Points

| Multiple Comparisons | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dunnett T3 | | | | | | | |
| Dependent Variable | (I) Timeline | (J) Timeline | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
| | | | | | | Lower Bound | Upper Bound |
| Streptococcus | Baseline | 2 weeks | .8496* | .0544 | ≤0.001* | .706 | .993 |
| | | 4 weeks | 1.6908* | .0548 | ≤0.001* | 1.546 | 1.836 |
| | | 8 weeks | 3.0740* | .0592 | ≤0.001* | 2.918 | 3.230 |
| | 2 weeks | Baseline | -.8496* | .0544 | ≤0.001* | -.993 | -.706 |
| | | 4 weeks | .8412* | .0570 | ≤0.001* | .691 | .992 |
| | | 8 weeks | 2.2244* | .0612 | ≤0.001* | 2.063 | 2.386 |
| | 4 weeks | Baseline | -1.6908* | .0548 | ≤0.001* | -1.836 | -1.546 |
| | | 2 weeks | -.8412* | .0570 | ≤0.001* | -.992 | -.691 |
| | | 8 weeks | 1.3832* | .0615 | ≤0.001* | 1.221 | 1.546 |
| | 8 weeks | Baseline | -3.0740* | .0592 | ≤0.001* | -3.230 | -2.918 |
| | | 2 weeks | -2.2244* | .0612 | ≤0.001* | -2.386 | -2.063 |
| | | 4 weeks | -1.3832* | .0615 | ≤0.001* | -1.546 | -1.221 |
| Lactobacillus | Baseline | 2 weeks | 1.0480* | .0815 | ≤0.001* | .833 | 1.263 |
| | | 4 weeks | 3.7396* | .1269 | ≤0.001* | 3.404 | 4.075 |
| | | 8 weeks | 6.6128* | .1035 | ≤0.001* | 6.339 | 6.886 |
| | 2 weeks | Baseline | -1.0480* | .0815 | ≤0.001* | -1.263 | -.833 |
| | | 4 weeks | 2.6916* | .1266 | ≤0.001* | 2.357 | 3.026 |
| | | 8 weeks | 5.5648* | .1032 | ≤0.001* | 5.292 | 5.838 |
| | 4 weeks | Baseline | -3.7396* | .1269 | ≤0.001* | -4.075 | -3.404 |
| | | 2 weeks | -2.6916* | .1266 | ≤0.001* | -3.026 | -2.357 |
| | | 8 weeks | 2.8732* | .1418 | ≤0.001* | 2.499 | 3.248 |
| | 8 weeks | Baseline | -6.6128* | .1035 | ≤0.001* | -6.886 | -6.339 |
| | | 2 weeks | -5.5648* | .1032 | ≤0.001* | -5.838 | -5.292 |
| | | 4 weeks | -2.8732* | .1418 | ≤0.001* | -3.248 | -2.499 |
| Actinomycetes | Baseline | 2 weeks | 2.3744* | .0395 | ≤0.001* | 2.270 | 2.479 |
| | | 4 weeks | 3.8188* | .0334 | ≤0.001* | 3.730 | 3.907 |
| | | 8 weeks | 6.3128* | .0411 | ≤0.001* | 6.204 | 6.421 |
| | 2 weeks | Baseline | -2.3744* | .0395 | ≤0.001* | -2.479 | -2.270 |
| | | 4 weeks | 1.4444* | .0404 | ≤0.001* | 1.338 | 1.551 |
| | | 8 weeks | 3.9384* | .0469 | ≤0.001* | 3.814 | 4.062 |
| | 4 weeks | Baseline | -3.8188* | .0334 | ≤0.001* | -3.907 | -3.730 |
| | | 2 weeks | -1.4444* | .0404 | ≤0.001* | -1.551 | -1.338 |
| | | 8 weeks | 2.4940* | .0420 | ≤0.001* | 2.383 | 2.605 |
| | 8 weeks | Baseline | -6.3128* | .0411 | ≤0.001* | -6.421 | -6.204 |
| | | 2 weeks | -3.9384* | .0469 | ≤0.001* | -4.062 | -3.814 |
| | | 4 weeks | -2.4940* | .0420 | ≤0.001* | -2.605 | -2.383 |
| Candida | Baseline | 2 weeks | 1.2400* | .0441 | ≤0.001* | 1.123 | 1.357 |
| | | 4 weeks | 3.0632* | .0442 | ≤0.001* | 2.946 | 3.180 |
| | | 8 weeks | 6.0160* | .0536 | ≤0.001* | 5.874 | 6.158 |
| | 2 weeks | Baseline | -1.2400* | .0441 | ≤0.001* | -1.357 | -1.123 |
| | | 4 weeks | 1.8232* | .0475 | ≤0.001* | 1.698 | 1.949 |
| | | 8 weeks | 4.7760* | .0564 | ≤0.001* | 4.627 | 4.925 |
| | 4 weeks | Baseline | -3.0632* | .0442 | ≤0.001* | -3.180 | -2.946 |
| | | 2 weeks | -1.8232* | .0475 | ≤0.001* | -1.949 | -1.698 |
| | | 8 weeks | 2.9528* | .0565 | ≤0.001* | 2.804 | 3.102 |
| | 8 weeks | Baseline | -6.0160* | .0536 | ≤0.001* | -6.158 | -5.874 |
| | | 2 weeks | -4.7760* | .0564 | ≤0.001* | -4.925 | -4.627 |
| | | 4 weeks | -2.9528* | .0565 | ≤0.001* | -3.102 | -2.804 |
| *. The mean difference is significant at the 0.05 level | | | | | | | |

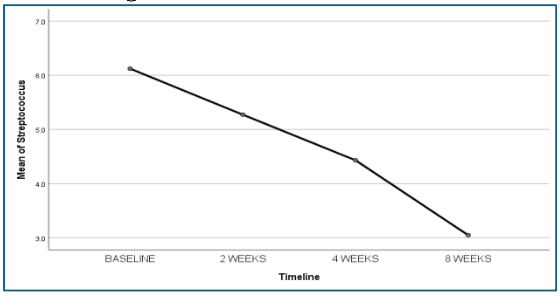
**Lactobacillus species:** For Lactobacillus species, there was a notable decrease over the 8-week period. The mean difference from baseline to 8 weeks was 6.6128 ($p < .001$). Similar significant reductions were observed at each interval, with a particularly sharp decline occurring between 4 and 8 weeks. This suggests that the drink had a progressively increasing impact over time.

**Actinomycetes species:** The Actinomycetes species counts exhibited one of the most pronounced declines among the four microbes. The mean difference from baseline to 8 weeks was 6.3128 ($p < .001$). Comparisons between other time points also showed significant decreases, with each interval reflecting a stepwise reduction, indicating consistent effectiveness of the drink throughout the 8-week period.

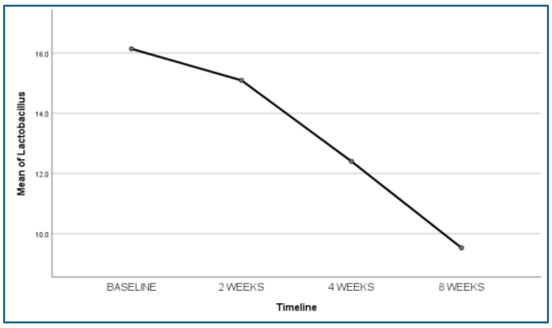
**Candida species:** The Candida species counts also declined significantly over time. The largest mean difference was observed between baseline and 8 weeks (6.0160, $p < .001$). All other comparisons between time points also showed statistically significant reductions. Notably, the reduction from 4 weeks to 8 weeks (2.9528, $p < .001$) reflects a marked impact in the later stages of the observation period.

**Overall Interpretation:** The Dunnett T3 test results reveal statistically significant differences across all time points for all four microbial groups. The consistent downward trend observed from baseline to 8 weeks suggests that the consumption of the specified drink had a profound and cumulative effect on reducing microbial counts. These findings support the drink's potential efficacy in managing oral microbial populations over time.

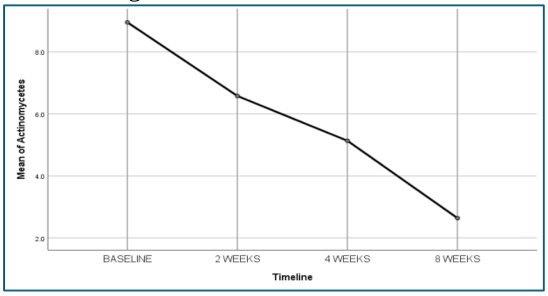
Graph 1: Changes in Streptococcus Counts after Consuming the HETAFU CUT Drink Over Time



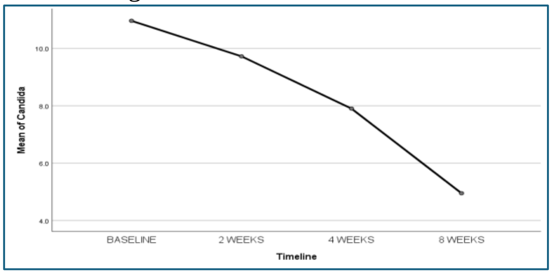

Graph 2: Changes in Lactobacillus Counts after Consuming the HETAFU CUT Drink over Time




Graph 3: Changes in Actinomycetes Counts after Consuming the HETAFU CUT Drink over Time




Graph 4: Changes in Candida Counts after Consuming the HETAFU CUT Drink over Time




## Discussion

The present study evaluates the effects of HETAFU Cut G on the oral microbiome, focusing on its ability to modulate bacterial populations associated with oral health and disease. By analysing changes in Streptococcus mutans, Lactobacillus species, Candida albicans, and

Actinomyces over an eight-week period, this study provides insights into the potential role of dietary interventions in maintaining oral microbial balance. The nearly equal gender distribution and diverse age range of participants enhance the study's applicability to a broad adult population. Findings from this research contribute to the growing body of evidence supporting the use of probiotics, prebiotics, and sugar alcohols in oral health maintenance, offering a non-invasive alternative to conventional oral hygiene methods.

The gender distribution in the study was nearly equal, ensuring balanced representation of male and female participants, which enhances the generalizability of the findings. The age range of 19 to 58 years, with a mean of 38.62 years and a standard deviation of 11.357, reflects a moderately diverse adult population. This variability allows for a broader assessment of how HETAFU Cut G influences the oral microbiome across different age groups. The balanced demographic characteristics strengthen the reliability of the study's conclusions regarding the effectiveness of HETAFU Cut G in modulating Streptococcus mutans, Lactobacillus species, Candida albicans, and Actinomyces species over time.

The present study aimed to evaluate the impact of a specific drink on oral microbial populations over an 8-week period. The study focused on four key microorganisms: Streptococcus, Lactobacillus, Actinomycetes, and Candida, all of which play a critical role in oral health. The results indicate a statistically significant reduction in microbial counts across all four species, as demonstrated by the ANOVA and Dunnett T3 post hoc tests ($p \leq 0.001$). The findings suggest that the drink has a substantial antimicrobial effect, leading to a progressive decline in harmful oral microbes over time.

Streptococcus species, particularly Streptococcus mutans, are primary contributors to dental caries and plaque formation. The observed decline in Streptococcus counts from a baseline mean of 6.122 to 3.048 at 8 weeks represents a 50.2% reduction. The narrowing 95% confidence interval (CI) over time indicates increasing reliability of the observed trend, suggesting a consistent reduction across participants. The observed minimum and maximum values also reflect a broader range of microbial suppression, with minimum counts decreasing from 5.1 to 2.0.

Lactobacilli are acidogenic and aciduric bacteria, playing a significant role in dental caries progression. While Lactobacillus species are part of the normal oral microbiome, their excessive presence is associated with low pH conditions that favor enamel demineralization. The reduction from 16.142 at baseline to 9.529 at 8 weeks (a 40.9% decrease) indicates that the drink may have an inhibitory effect on Lactobacillus overgrowth. However, since Lactobacillus also contributes to gut and oral health, a controlled decrease rather than total eradication may be beneficial.

Actinomycetes species, particularly Actinomyces naeslundii and Actinomyces viscosus, are linked to early-stage plaque formation and root surface caries. The decline from 8.952 to 2.640 (a 70.5% reduction) suggests a strong suppressive effect of the drink. The consistently low standard deviation values indicate that the reduction was observed uniformly across participants. The significant drop in minimum values from 8.1 to 1.7 suggests that some individuals experienced near-complete microbial suppression.

Candida species, particularly Candida albicans, are opportunistic fungi that can lead to oral candidiasis. The study observed a reduction in Candida counts from 10.964 to 4.948 (a 54.9% reduction). The decrease in minimum values from 10.1 to 4.1 suggests that while some individuals exhibited significant reductions, others retained residual fungal populations, which is expected as Candida is a commensal organism.

The ANOVA results indicate highly significant differences in microbial counts across time points ($p \leq 0.001$ for all species). The high F-statistics across all four groups indicate that between-group variance is much larger than within-group variance, confirming that the reductions are not due to random variability. The Dunnett T3 post hoc analysis further supports this, showing that each subsequent time point exhibited a statistically significant difference from the previous one.

The results of this study align with previous research highlighting the antimicrobial properties of bioactive compounds, probiotics, and polyphenols in oral health interventions. Similar studies have demonstrated that polyphenol-rich beverages, such as green tea and cranberry extract, reduce Streptococcus mutans and Lactobacillus counts by inhibiting bacterial adhesion. Probiotic formulations containing Lactobacillus reuteri have been found to selectively suppress Actinomycetes and Streptococcus without harming beneficial oral flora. Additionally, essential oils like thymol and eugenol have shown antifungal properties against Candida albicans, reducing the risk of oral candidiasis. The observed microbial reduction trends in this study suggest that the tested drink may contain bioactive ingredients with broad-spectrum antimicrobial effects. Further microbial sequencing studies may help identify the specific mechanisms by which the drink alters the oral microbiome.[6-9]

The findings of this study have important implications for oral health management, particularly in individuals prone to dental caries, periodontal disease, and oral candidiasis. By effectively reducing pathogenic microbes, the drink could serve as a preventive or adjunctive measure in oral hygiene regimens. Additionally, the progressive decline in microbial counts over time suggests sustained antimicrobial activity, which may provide long-term benefits when incorporated into daily oral care routines.

While the results are promising, several limitations should be considered. First, the study focused on four microbial species, but the oral microbiome is complex. Future studies using 16S rRNA sequencing could provide a broader perspective. Second, a control group consuming a placebo beverage would strengthen the conclusions by ruling out confounding variables. Third, the study was limited to 8 weeks, and investigating whether microbial reductions persist beyond this period would help determine the long-term efficacy of the drink. Finally, individual variations in microbial reduction were observed, which could be influenced by dietary habits, oral hygiene practices, or genetic factors.

This study provides compelling evidence that the tested drink exerts a significant antimicrobial effect on key oral microorganisms over an 8-week period. The reductions in Streptococcus, Lactobacillus, Actinomycetes, and Candida counts were statistically significant, with progressive declines over time. These findings suggest that the drink may serve as a novel intervention for maintaining oral microbial balance and preventing oral diseases. Further studies with larger sample sizes, control groups, and microbiome analyses are needed to confirm its clinical utility and elucidate the mechanisms driving these effects.

## Conclusion

The findings of this study indicate that HETAFU Cut G drink has a significant antimicrobial effect on key oral microorganisms, including Streptococcus mutans, Lactobacillus species, Actinomycetes species, and Candida species, over an 8-week period. The consistent reduction in microbial counts suggests that this drink may help in modulating the oral microbiome, potentially lowering the risk of dental caries, periodontal diseases, and oral candidiasis. The bioactive ingredients in HETAFU Cut G drink, such as probiotics, prebiotics and sugar alcohols may contribute to its antimicrobial properties by inhibiting bacterial adhesion, reducing biofilm formation, and promoting beneficial microbial balance. These findings support its potential role as an adjunct to conventional oral hygiene practices, offering an innovative, non-invasive approach to improving oral health.

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