Bioinformatic Analysis:

Approach Results and Explanation

Bioinformatic Analysis:
The search of newly established whole genomes of two commensal Lactobacilli strains S1 and S9, isolated from human bladder, predicts the production of 2 different broad-spectrum toxins.

Experimental Analysis:


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References

1. Probiotic bacteria, such as Lactobacilli, have been broadly used for many years in different applications ranging from food safety to gut health. Their usefulness in these applications can be attributed to the metabolites that they secrete to affect their surroundings. This research delved into analysis of two strains of Lactobacillus recently cultured from the human bladder. Various Lactobacilli are known to produce bacteriocins, which are small toxic peptides and proteins that can have antimicrobial activity. This research project aimed to determine whether recent isolates of Lactobacillus gasseri and Lactobacillus delbrueckii produce bacteriocins and can interact with uropathogenic bacteria that cause urinary tract infections.

Approach

Meta-analysis of existing data and computational sequence alignment to determine which two strains of Lactobacilli are present in the human bladder. This was followed by a search of the newly cultured genomes of two commensal Lactobacilli strains S1 and S9, isolated from human bladder, to predict the production of 2 different broad-spectrum toxins.

Results and Explanation

• Lactobacilli grow better on solid MRS medium
• Lactobacilli grow on sheep blood agar to produce colonies for inoculations.
• Lactobacilli grow better when the agar plates are sealed inside an airtight container.

• Lactobacilli S1 and S9 inhibit growth of laboratory Escherichia coli.
• The zones of inhibition can best be visualized on MRS agar.
• Screening additional commensal strains of Lactobacilli discovered more strains that cause the inhibition of E. coli.

• Lactobacilli S1 and S9 also inhibit growth of the uropathogenic strains of E. coli.
• Clinical isolates of multidrug resistant E. coli are inhibited by Lactobacilli S1 and S9.
• Other notorious uropathogens Enterococcus faecalis and Klebsiella pneumoniae were also inhibited by the Lactobacilli S1 and S9 strains to different extents.

Conclusions

Bioinformatically it was determined that both the S1 and S9 strains of Lactobacilli have a potential to produce bacteriocins: Helveticin J and Enterolysin A. Initial experiments identified the conditions for optimal growth of the newly isolated strains of Lactobacilli. We discovered that both strains of Lactobacilli interact with commensal and uropathogenic E. coli strains by inhibiting their growth on solid and in liquid media. Remarkably, the Lactobacilli also inhibited growth of clinical multidrug resistant E. coli and two other uropathogenic species, E. faecalis and K. pneumoniae. Screening of other bladder Lactobacilli strains showed that many of them have great potential for inhibiting uropathogens as well.

In the future, more experimentation will be needed to determine exactly what components the Lactobacilli produce to create the inhibitory effect. This could include pH adjustments, oxidases, and bacteriocins. Ultimately, this research will be foundational to developing a sustainable, alternative treatment to antibiotics for urinary tract infections.

Background

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