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Potential Emerging Zoonotic Foodborne Pathogen *Streptococcus gallolyticus* subsp. *gallolyticus*: Growth and Biocontrol in Dairy Matrices – A Preliminary Assessment

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INTRODUCTION & AIM

***Streptococcus gallolyticus* subsp. *gallolyticus* (*Sgg*) is an emerging zoonotic pathogen linked to infective endocarditis and colorectal cancer. It is naturally found in the intestinal microbiota of both animals and humans. While *Sgg* is less frequently isolated from foods, other SBSEC (*Streptococcus bovis/Streptococcus equinus* complex) members are more common in dairy products such as raw milk, cheeses and fermented drinks. All members exhibit pathogenic potential, raising food safety concerns (1).**

AIMs

- Assessment of **gastric acidity tolerance** of the human-derived ***Sgg* I** and ***Sgg* II** isolates currently available in our strain collection
- Tracking the time-dependent growth, viability, and acidification capacity of these strains in **sterile milk**
- Evaluation of the inhibitory activity of cheese starter cultures against this potential foodborne pathogen via **the spot test** method.

METHODS

This study investigated the growth dynamics and acidification potential of *Sgg* isolates inoculated at 10^5 CFU/mL into milk sterilized at 121 °C for 15 min, with viability and pH monitored at defined intervals over a 3-month storage period.

In addition, the survival capacity of *Sgg* isolates under simulated gastric juice conditions was assessed, with strains inoculated at 10^6 and 10^8 CFU/mL monitored at 0, 5, 10, 15, 30, 60, 90, and 180 minutes (2).

A total of 80 lactic acid bacteria (LAB) strains from our collection were screened for inhibitory activity against *Sgg* using spot inhibition assays (Figure 1). Effective Inhibition Ratios (EIR) were calculated, with values <0.5 considered weak, 0.5 - 1.5 moderate, and >1.5 strong inhibition (3).

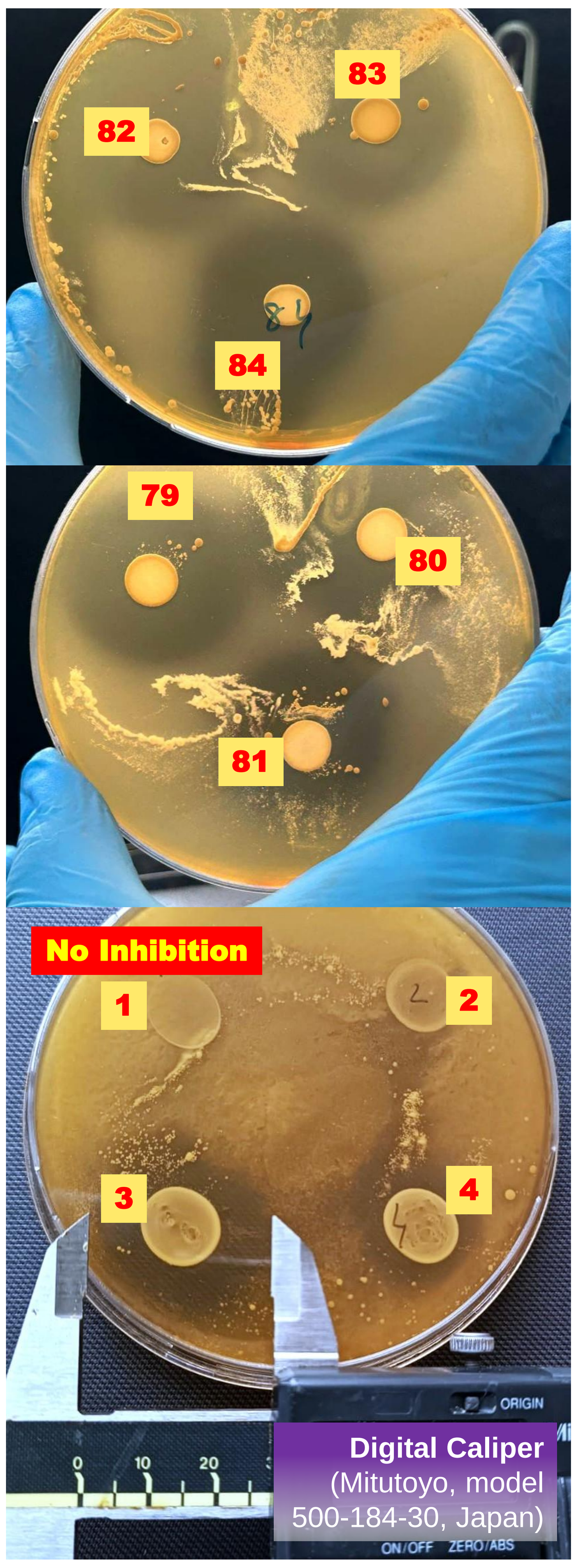

FIGURE 1. Spot Inhibition Assays Showing the Antagonistic Activity of LAB Strains Against *Sgg*

RESULTS & DISCUSSION

Microbial enumeration and pH tracking revealed rapid growth, reaching 11.2 $\log_{10}$ CFU/mL and causing a pH drop to 4.54. A biphasic growth pattern suggested metabolic adaptability and utilization of secondary substrates (Figure 2) (4).

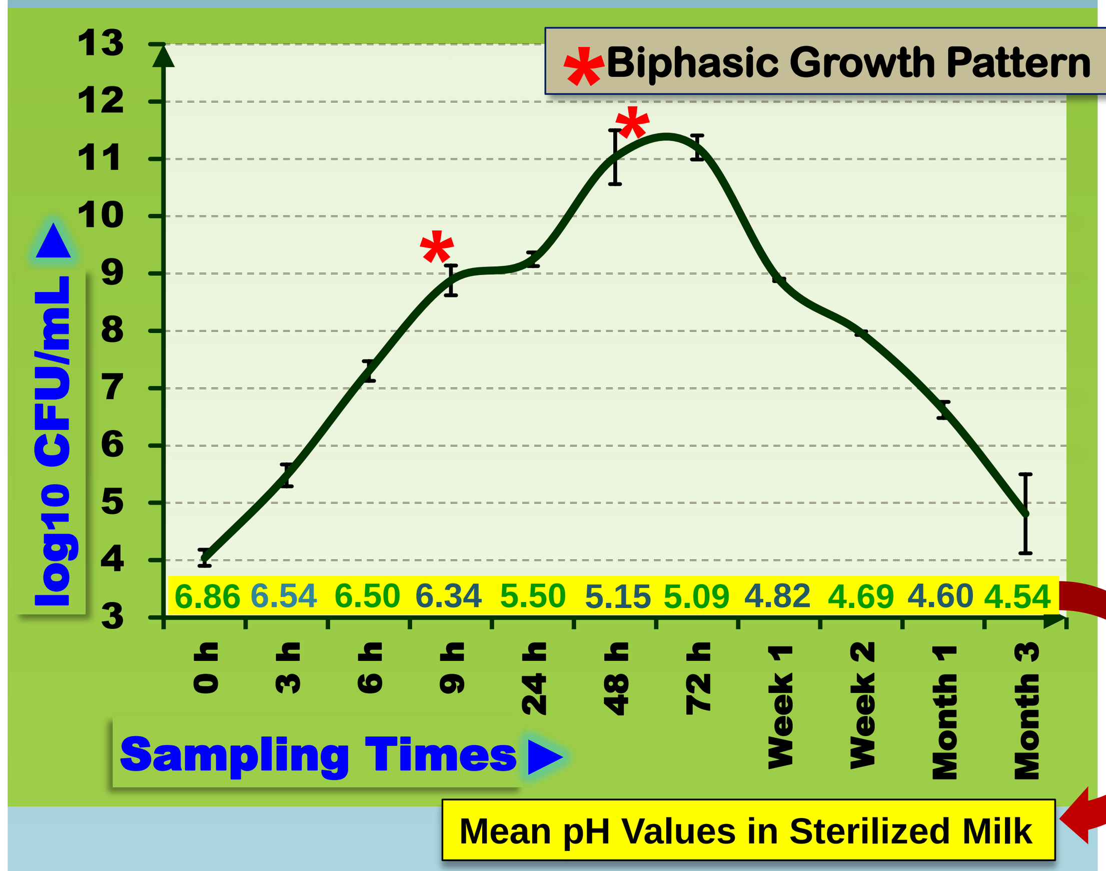

FIGURE 2. *Sgg* Growth and pH Changes in Sterilized Milk

In simulated gastric juice (pH 2.1 - 2.5), both isolates were completely inactivated within 5 minutes, suggesting limited acid tolerance. However, factors such as proton pump inhibitor use, age-related hypochlorhydria, or the strong buffering effect of cheese and milk may enable *Sgg* to survive gastric transit.

As shown in Table 1, 38 LAB strains exhibited strong inhibitory activity (EIR > 1.5) against *Sgg*.

Strains with inhibition ratios of 4 or higher will be considered as potential protective starter cultures and candidates for further evaluation.

CONCLUSION

These findings suggest that *Sgg* can thrive in milk environments and lower pH significantly, posing a potential risk if present in dairy products. However, selected LAB strains demonstrated promising inhibition and may serve as protective cultures. Further studies are planned to test selected LAB strains in cheeses to assess their protective efficacy under realistic production conditions.

TABLE 1. EIR Values of LAB Strains Against *Sgg*

No	Strain	EIR
1	*Lactobacillus fermentum*	No Inhibition
2	*L. fermentum*	No Inhibition
3	*Lacticaseibacillus rhamnosus*	1.25
4	*L. rhamnosus*	0.54
6	*Lactobacillus brevis*	0.75
8	*L. brevis*	0.33
9	*L. brevis*	2.28
11*	***L. rhamnosus***	**5.14**
12	*L. rhamnosus*	2.28
14	*L. rhamnosus*	3.42
15	*Lactobacillus delbrueckii*	2.28
16	*L. delbrueckii*	2.85
17	*L. fermentum*	0.53
18	*Lacticaseibacillus casei*	0.30
19	*L. casei*	0.64
20	*Lactobacillus parakefiri*	No Inhibition
21	*Lactobacillus paracasei*	0.42
22	*L. paracasei*	0.33
23	*L. rhamnosus*	2.00
25	*L. rhamnosus*	0.71
26	*L. paracasei*	0.57
27	*L. rhamnosus*	2.00
28	*L. paracasei*	1.33
29	*L. parakefiri*	No Inhibition
30	*L. paracasei*	0.50
31	*L. paracasei*	0.75
32	*L. paracasei*	No Inhibition
34	*L. rhamnosus*	0.16
35	*L. paracasei*	0.27
36	*L. rhamnosus*	0.45
37	*L. fermentum*	0.36
39	*L. delbrueckii*	2.28
40	*L. casei*	2.50
41*	***L. casei***	**2.85**
42*	***L. fermentum***	**2.57**
43	*L. fermentum*	2.00
45	*L. casei*	4.57
46	*L. casei*	4.28
47	*L. casei*	4.00
49	*L. fermentum*	2.85
52	*L. paracasei*	4.00
54	*L. paracasei*	5.00
56	*L. fermentum*	5.00
62	*L. casei*	4.40
63	*L. delbrueckii*	3.42
64	*L. fermentum*	4.28
67	*L. delbrueckii*	4.00
69	*L. delbrueckii*	4.85
70	*L. delbrueckii*	3.71
71	*L. delbrueckii*	3.42
72	*L. delbrueckii*	2.85
73	*L. delbrueckii*	2.57
79	*Lactobacillus plantarum*	2.85
80	*L. plantarum*	2.03
81	*L. plantarum*	1.88
82*	***L. plantarum***	**3.00**
83	*L. rhamnosus*	2.62
84	*L. paracasei*	3.57
85	*L. paracasei*	No Inhibition
86	*Pediococcus acidilactici*	2.10
87	*P. acidilactici*	No Inhibition
88*	***Lactobacillus bulgaricus***	**2.55**
89	*L. bulgaricus*	1.85

****The highest EIR values***

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