

**Study of growth interaction between
Streptococcus lactis and each of
Staphylococcus aureus and Escherichia coli
in liquid medium and processed cheese**

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Abstract: The bacterial growth interaction between Streptococcus lactis and each of Staphylococcus aureus and Escherichia coli in liquid medium and in processed cheese samples was studied. The inoculation of Streptococcus lactis into a culture of Staph. aureus or E.coli in liquid medium resulted in little or no effect for both bacteria after 6h of incubation at 37 C. The high inhibition for Staph aureus and less for E.coli occurred at 12 h of incubation at 37C. Staph.aureus was more sensitive than E.coli in mixed culture of Streptococcus lactis and Staph.aureus or E.coli in liquid medium processed cheese samples Streptococcus lactis caused high effect for Staph.aureus and low effect for E.coli after 24 h of incubation the mixed culture at 10 C. Decreased in PH and increased

in salting for cured in mixed culture caused more effects on the growth Staph. aureus and E.coli in mixed culture with Streptococcus lactis.

Introduction:

Some pathogenic bacteria are common contaminants of food raw materials and products. Contamination can occur at different stages of production such as during processing ripening and refrigeration of cheese and causing health hazards to human. In order to prevent microbiological spoilage of foods several methods are used for controlling spoilage. Chemical preservatives are used worldwide to protect foods against microbial deterioration and to inhibit the growth of some pathogenic bacteria and fungi (1).

Some articles referred to the health hazards of these compounds especially using of nitrite in cured meat because of forming carcinogenic compound (1:6). Few reports showed that some lactic acid bacteria possess antimicrobial activity (2:3). In (2) purified a substance from Streptococcus diacetilactis and Streptococcus citrovorum which possess antibacterial activity while (9) noticed inhibitory effects of some species of Streptococcus against Enterobacter and Hafnia. For many decades lactic acid bacteria are used mainly in various fermented foods and dairy products. Fermentation is one of the oldest ways of food processing (10).

The aim of this investigation is to examine the ability of *Streptococcus lactis* to delay or inhibit the growth of some food-borne bacteria in Nutrient broth and during cheese manufacturing.

Materials and Methods

1. Bacterial cultures: *Streptococcus lactis* cultures for these experiments were prepared by Freezing cultures growth for 48 h at 28 °C in brain heart infusion agar slants (Difco). Cultures of *Streptococcus lactis* were activated in 10 ml of sterilized milk and incubation at 37 °C for 18 h. Cultures of *Staphylococcus aureus* and *Escherichia coli* brought from Biology Dept. Basrah University. The cultivation for each bacteria were done in nutrient broth and incubated at 37 °C for 18 h. Growth was determined by serial dilution in 0.1% peptone water. Counting for *Staphylococcus aureus* and *Escherichia coli* were made every 6 h for 24 h on blood agar and MacConkey agar respectively.

The *Streptococcus lactis* source from microbiology laboratory Agriculture college. Basrah University.

2. Bacterial interaction in liquid medium:

Mixed cultures were prepared from 1% of *Streptococcus lactis* 0.1 ml of *Staphylococcus aureus* which they inoculated in liquid medium and incubated at 37 °C for 24 h. counting for *Staphylococcus aureus* was made every 6 h and the same method was used for the mixed cultures of *Streptococcus lactis* and *Escherichia coli* (4:3).

3. Bacterial interaction in processing cheese:

Raw cow milk was used for cheese manufacturing after milk pasteurization rennet and salt were added to milk 1 and 2 % of cheese starters (Sire.loctis) were added to cured Staph.aureus and E.coli also were added at concentration 3×10 for Staph.aureus and 8×10 for E.coli to cured and mixed well After finally processing the cheese samples were incubated at 10 c for 24 h. The count for Staph.aureus and E.coli in cheese samples were made according to (4)

The effects of pH and salt on the bacterial growth interaction were also studied

Results and Discussion:

1. Bacterial intraction between stre. lactis and Staph.aureus and E.coli in liquid medium:

The effect of Strelactis on the growth of Staph.aureus and E.coli are shown in table 1. The inoculation of 1% Stre.lactis into a culture of Staph.aureus or E.coli in liquid medium resulted in little or no effect for both bacteria after 6 h incubation at 37 C The log no. of Staph.aureus decreased from 3.38 for control (culture of Staph.aurens without Strelactis) to 3.10 CFU/ml and for E.coli from 3.61 to 3.60 CFU/ml. High reduction in the growth of Staph.aureus was observed in the mixed culture of Staph aureus and Strelactis during the 12 h of incubation at 37 Cand less effect for Ecoli. The log no. of Staph.aureus reduced

to 2.81 CFU/ml and to 3.49 CFU/ml for E.coli after 12h of incubation at 37 C with the culture of Stre lactis. During 18 and 24 h growth of Stre lactis with each bacteria in liquid medium caused high reduction in the growth of Staph.aureus more than E.coli. Table (1). The result obtained during this study showed that high sensitivity for Staph.aureus when it was inoculated with Stre lactis. The inhibitory effects of Stre lactis against the growth of Staph.aureus or E.coli in mixed culture may due to the inhibitory compound produced during the growth of Stre lactis was excreted in to medium (Coallierascah and Idiak. 1985). In addition pH decreased from 6.8 for control to 5.1 after 24 h of incubation in mixed culture of Stre lactis with Staph.aureus and from 6.8 to 5.80 in mixed culture of Stre lactis with E.coli. In general the results showed that a slight decrease in the growth of E.coli throughout 24 h of incubation with Stre lactis in comparison with the decrease in the growth of Staph.aureus. Other studies have indicated that Stre factis produces an inhibitor Substance during the growth and effect on the growth of some bacteria and fungi in mixed culture with Stre lactis (2:3). On the other hand the inhibitory effects of Stre lactis and Stre.cremoris against some bacteria such as Enterobacter and Hatnia species were noticed by (9).

The data (Table 2) for the effect of 2% Stre lactis on the growth of Staph.aureus and E.coli indicted that the inhibitory

effect for Staph.aureus or E.coli was increased when the size of inoculum in liquid medium for Stre.lactis increased from 1 to 2% in mixed culture.

The results showed that highly effective inhibition for Staph.aureus in mixed culture with 2% Strelactis after 12 h of incubation at 37 C. while little or no effect for Staph.aureus and E.coli before 12 h of incubation with Stre lactis. It was highly inhibition for Staph.aureus at 2% of Strelactis after 24 h of incubation at 37 C and moderate effects for E.coli. It appears that there was relationship between the sensitivity of bacteria to inhibitory compound produced during the growth of Stre.lactis in mixed culture and the gram character these facts were confirmed by many researchers who studied the effect of some compound and vegetable extracts (18:56) against gram positive and negative bacteria.

2. Growth interaction between Strelactis and Staph.aureus or

E.coli in processed cheese.

The effect of adding 1 and 2% of Strelactis culture to the growth of Staph.aureus and E.coli in processed cheese samples stored at 10 C for 24 h were showed in Table 3. The addition of 1% of Stre lactis culture to milk inoculated with Staph.aureus or E.coli after pasteurization caused no or little effect for E.coli and high inhibition for Staph.aureus was occurred. The inhibitory

effect was increased for Staph.aureus in mixed culture with Strelactis when the size of Stre lactis inoculum was increased from 1 to 2%. The addition of salt caused more effect to Staph.aureus in mixed culture with Strelactis. The log no. of Staph.aureus decreased from 3.30 CFU/g for control (culture of Staph.aureus without Strelactis and salt) to 3.20 CFU/g for samples that inoculated with 1% of Strelactis and 1% of salt and more reduction in the log no. of Staph. aureus was noticed in samples inoculated with 2% Strelactis and 2% salt which was 2.00 CFU/g Table 3.

From these results we obtain that using salt with inoculated cured of cheese with 2% Strelactis caused high inhibition for the growth of Staph.aureus and less on E.coli. In conclusion. we can use Stre lactis in order to prevent or inhibitor the growth of Staph.aureus more than E.coli in liquid medium or in cheese manufacturing and high inhibition was occurred by the addition of salt to cured.

Table 1. The effect of 1% Strelactis on the growth of Staph.aureus and E.coli in Nutrient broth.

Incubation period in hour	Log No. of bacteria / ml			
	Staph. aureus	PH	E.coli	PH
0	3.38	6.8	3.61	6.8
6	3.10	6.5	3.60	6.7
12	2.81	6.0	3.49	6.5
18	2.44	5.4	3.41	6.1
24	2.40	5.1	3.37	5.8

Table 2. The effect of 2% Strelactis on the growth of Staph.aureus and E.coli in Nutrient broth.

Incubation period in hour	Log. No of bacteria / ml	
	Staph.aureus	E.coli
0	3.16	3.86
6	3.11	3.76
12	2.25	3.65
18	2.15	3.60
24	2.10	3.54

Table 3. The effect of Strelactis on the growth of Staph.aureus and E.coli in cheese samples stored at 10 C for 24 hours.

Size of inoculum of <i>Stre.lactis</i>	Salt %	Log No. of bacteria / g	
		<i>Staph. aureus</i>	<i>E.coli</i>
0	0	3.36	3.80
1 %	1	3.20	3.58
	2	3.01	3.60
2 %	1	2.41	3.42
	2	2.00	3.40

References

- 1- Boer. E.D. and Nielsen. P.V.1995. Food preservatives . In introduction to food-borne fungi Edited by Samson et al. 1995.
- 2- Branen A.L. Go H.Cand Genske R.P. 1975 Purification and Properties of antimicrobial substances produced by streptococcus diacetylacris and Leuconostoc citrovorum J.Food Sci.446-450.
- 3- Coallier Ascah and Idziak. E.S. 1985. Interaction between Streptococcus lactis and Aspergillus flavus on Production of aflatoxin Appl. and Envir. Microbiology .163-167.
- 4- FDA 1978 Bacteriological analytical manual 5 th Ed Association of official chemists. Arlington. Va.
5. Mohammed S.H. 1995 The effect of vegetable extracts on the growth of different bacteria. Basrah. J.Agric. Sci. 55-65.
- 6- Mohammed S.H.2005. Sensitivity of some food borne bacteria and fungi to potassium sorbate (accepted for publication).
- 7- Mohammed S.H.2004 Inhibitory effect of some spices on growth and aflatoxin production by Aspergillus flavus in liquid media Board of the Jof missan researches 10-15.

- 8- Musa, T.N. and Mohammed. S.H. 1992 Inhibitory effect of harmala (Peganum harmala) extract on some pathogenic bacteria and microbial content of minced beef. Basrah J. Agric SCI. 189-195.
- 9- Rutzinski J.I. and Marth. E. H. 1980. Behaviour of Enterobacter species and Hafnia species in skim milk during fermentation by lactic acid bacteria. J. Food prot. 43:720 728.
- 10- Samson R.A. Hoekstra E.S. Frisvad J.C. and Filtenborg .Q.1995 Introduction to food borne fungi. CBS. The Netherlands.

وكل من بكتريا *Streptococcus factis* دراسة التداخل في النمو بين بكتريا حامض اللاكتيك
Escherichia coli والشريشا القولونية *Staphylococcus aureus* العنقوديات الذهبية
في الوسط الغذائي السائل وفي عينات الجبن المصنع

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الخلاصة: تم دراسة تأثير التداخل في النمو بين بكتريا حامض اللاكتيك *Sreprococcus lactis* وكل من بكتريا العنقوديات الذهبية *Stopfluences ummers* والشريشا القولونية *Esclerichia coli* في الوسط الغذائي السائل وفي عينات من الجبن الطري المصنع والمحفوظ على درجة حرارة ١٠ م لمدة ٢٤ ساعة اظهرت نتائج الدراسة قدرة بكتريا *Stre lactis* على تثبيت نمو كل من *Staph.aureus* وال *E.coli* بعد ١٢ ساعة من الحضانة في الوسط السائل على درجة حرارة ٣٧ م وكان التثبيط في نمو *Staph.aureus* أكثر مقارنة بـ *E.coli* في حين لم يظهر تأثيرا خلال *coli* وان *Staph.aureus* على نمو كل من *Strelactis* واضحا لبكتريا الت ساعات الأولى من الحضانة على درجة حرارة ٣٧ م في الوسط المسائل ، وازداد التثبيط لكلا نوعي البكتريا بزيادة فترة الحضانة وحجم اللقاح لبكتريا *Sire lactis* . أما في عينات الجبن المصنع فقد كان لتواجد بكتريا *Stue lactis* في المزرعة المختلطة مع ٣,٣٦ CFU/g من *Staph.aureus* تأثيرا واضحا في خفض اعداد *Staph.aureus* الى 2.00 EU بعد ٢٤ ساعة من الحضانة بدرجة حرارة ١٠ م . كما أن النسبة الملح تأثيرا واضحا في زيادة قدرة بكتريا *Sire. lactis* على تحديد نمو بكتريا *Staph.aureus*