

# 육회 중에 분포하는 미생물과 주요 식중독 세균의 조사

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Distribution of Microorganisms and Foodborne Pathogens in Yukae

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## Abstract

People can be exposed to various microorganisms when they eat *yukae* (seasoned raw meat) because *yukae* is eaten raw.

The purpose of this study was to find out microbial distribution in *yukae*. In this experiment, 5 restaurants serving *yukae* were chosen in Daegu area. Mesophilic microorganisms and coliforms were measured by Korean Food Standards Codex.

Analyses of *Salmonella* spp., *Listeria monocytogenes*, *Staphylococcus aureus* and *Escherichia coli* O157:H7 were conducted.

As results, mesophilic microorganisms ranged  $6.6 \times 10^3$ - $2.7 \times 10^5$  CFU/g and coliforms ranged  $8.9 \times 10^1$ - $2.1 \times 10^5$  CFU/g. *Salmonella* spp., *Listeria monocytogenes* and *Escherichia coli* O157:H7 were not detected in all 5 samples. However, *Staphylococcus aureus* was detected in 1 sample out of 5 samples. Hygiene practice during production, processing and cooking process is required.

Key words : *yukae*, microorganism, microbial safety

*Clostridium perfringens* *L.monocyto*  
*genes* 3 가  
 (Kim et al., 2004)  
*Staphylococcus*, *Streptococcus*,  
*Pseudomonas aeruginosa*가  
 (Lee and Park, 1998).  
 . 2000  
 49.1%가 가  
 (Kim et al.,2004).  
*Listeria monocytogenes*(*L.*  
*monocyto*  
*genes*), *Salmonella* spp., *Escherichia*  
*coli* O157:H7(*E. coli* O157:H7)  
 가 가 가  
 (Borch et al., 1996)  
*E.coli* O157:H7 (1997)  
 (Chung et al., 1999). , 2005  
 , ,  
 (KFDA, 2005). 가 가 Gill(1998)  
*E. coli* O157:H7, *Aeromonas*  
*sobria*, *Staphylococcus aureus*(*Staph.*  
*aureus*)가 (Jeong et al., 2002)  
*Bacillus cereus*, (Jung, 1999)

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*Salmonella* spp., *L.monocytogenes*,  
*Staph. aureus*, *E. coli* O157:H7



5

ice box

1

plate count agar(Difco, USA)

(KFDA, 2006)

1 mL

desoxycholate lactose agar(Difco)

35 24

colony forming unit(CFU/g)

(KFDA, 2006)

10g

pH

7.0

(NaCl 0.85%, peptone

0.1%, KH<sub>2</sub>PO<sub>4</sub> 0.03%, Na<sub>2</sub>HPO<sub>4</sub> 0.06%)

90mL

(KFDA, 2006)

0.1 mL

*Staph. aureus*

*Staph. aureus*

(KFDA,

10 g

10% NaCl 가

tryptic soy broth(Difco) 90 mL 가

35 16

mannitol salt-egg yolk



agar(Difco)	MacConkey sorbitol	coli O157:H7	
24 1	35		methylene
agar(Difco)	EMB	blue	
24 2	35oC	(FDA,1984).	
sorbitol agar	MacConkey		API 20E kit
coli O157:H7	E.		
	sorbitol		
EMB agar	E.		

5 2.3 × 10<sup>1</sup>-8.0 × 10<sup>4</sup> CFU/g

가

가 (Jay, 1978), 35 48 lactose 가

(Cha, 2004).

Table 1

6.6 × 10<sup>3</sup>-2.7 × 10<sup>5</sup> CFU/g 8.9 ×

10<sup>1</sup>-2.1 × 10<sup>5</sup> CFU/g

. Lee Park(1998)

1.3 × 10<sup>2</sup> CFU/g,

5.2 × 10<sup>2</sup> CFU/g

. Yook (1999)

10<sup>2</sup> CFU/g,

7.0 × 10<sup>2</sup> CFU/g

, Kim (2004)

*Enterobacter aerogenes*, *Klebsiella pneumonia*

(日本藥學會編, 1995).

가

10<sup>5</sup> CFU/cm<sup>2</sup>, mL , O157:H7 가 .

10<sup>2</sup> CFU/cm<sup>2</sup>, mL ( , 2002). (Borch *et al.*, 1996; Chung *et al.*, 1999).

(Newton and Rigg, 1979), Table 2 *Salmonella* spp.,  
 10<sup>7</sup> CFU/cm<sup>2</sup>(Zattola, 1972), *L. monocytogenes*, *E. coli* O157:H7  
 10<sup>8</sup> CFU/cm<sup>2</sup> (Egan and Grau, 1981) 5 1  
 . , 10<sup>8</sup>-10<sup>9</sup> CFU/g *Staph. aureus*가 .  
 (Aryes, 1960; Gill, Soriano(2001)  
 1983; James, 1972). *Staph. aureus*  
 , 가 . *Staph.*  
*aureus*  
 ( , *Staph.*  
 2004). *aureus*  
 , . 가  
 (Riemann *et al.*, 1972).  
*Salmonella* spp., *L. Staph. aureus*  
*monocytogenes*, *Staph. aureus*, *E. coli* 5log<sub>10</sub>CFUg<sup>-1</sup>

Table 1. Microbial counts of mesophilic microorganisms and coliforms

Microbial counts	Mesophilic	Coliforms
Sample	microorganism (CFU/g)	(CFU/g)
A	(2.7 ± 0.2) × 10 <sup>5</sup>	(2.1 ± 0.1) × 10 <sup>5</sup>
B	(1.3 ± 0.1) × 10 <sup>4</sup>	(1.7 ± 0.1) × 10 <sup>5</sup>
C	(6.6 ± 0.1) × 10 <sup>3</sup>	(3.5 ± 0.2) × 10 <sup>2</sup>
D	(3.0 ± 0.1) × 10 <sup>4</sup>	(8.9 ± 0.2) × 10 <sup>1</sup>
E	(1.3 ± 0.1) × 10 <sup>5</sup>	(9.1 ± 0.9) × 10 <sup>4</sup>

Each value is mean ± S.D. of three determinations.

pH 4.6 ,  
15 3-4  
(Rorvik and Granum,  
1999).

(Kim et al., 1990; Jablonski and  
Bohach, 1997). *Staph. aureus*

(Kim et al., 2005) 가 *Staph.*  
*aureus* 가

(Table 3).

A *Staphylococcus sciuri*(*Staph.*  
*sciuri*), *Micrococcus spp.*, *Enterobacter*  
*cloacae*(*E. cloacae*), *Pantoea spp.*가

B *Staphylococcus*  
*warneri*(*Staph. warneri*), *E. cloacae*,  
*Pantoea spp.*, *Listeria. welshimeri*(*L.*  
*welshimeri*)가 C

*Kocuria varians* *E. cloacae*가

D *Staph. sciuri*  
*Enterobacter sakazakii*

(*E. sakazakii*)가 E  
*Staph. warneri*, *Kluyvera spp.*, *E. coli*,  
*E. cloacae*가

*Salmonella spp.* MacConKey  
agar API 20E kit

*E. coli* ,  
*E. cloacae* . *E.*  
*cloacae* *E. coli* O157:H7

Table 2. Incidence of major pathogenic bacteria in yukae

Microorganisms	Sample				
	A	B	C	D	E
<i>Staph. aureus</i> <sup>1)</sup>	- <sup>1)</sup>	-	-	-	+ <sup>2)</sup>
<i>E. coli</i> O157:H7	-	-	-	-	-
<i>Salmonella spp.</i>	-	-	-	-	-
<i>L. monocytogenes</i>	-	-	-	-	-

<sup>1)</sup>Negative, <sup>2)</sup>Positive.

Table 3. Various microorganisms other than major foodborne pathogens isolated from *yukae*

Sample	Isolated microorganism
A	<i>Pantoea</i> spp.
	<i>Micrococcus</i> spp.
	<i>Enterobacter cloacae</i>
	<i>Staphylococcus sciuri</i>
B	<i>Pantoea</i> spp.
	<i>Listeria welshimeri</i>
	<i>Enterobacter cloacae</i> <i>Staphylococcus warneri</i>
C	<i>Kocuria varians</i>
	<i>Enterobacter cloacae</i>
D	<i>Staphylococcus sciuri</i>
	<i>Enterobacter sakazakii</i>
E	<i>Kluyvera</i> spp.
	<i>Escherichia coli</i>
	<i>Enterobacter cloacae</i>
	<i>Staphylococcus warneri</i>

, *E. coli* O157:H7 API Listeria kit , *L.*  
 MacConKey sorbitol agar *welshimeri* .  
 API 20E kit .  
*E. sakazakii* *E. cloacae* ,  
*cloacae* *Pantoea* spp. , , ,  
*Kluyvera* spp. . *Staph.* (Lin et al.  
*aureus* MSEY 2006), *E. sakazakii*  
 API Staph kit ,  
*Staph. sciuri*, *Staph.*  
*warneri*, *Kocuria varians* , ,  
*Micrococcus* spp. . *L.* 가  
*monocytogenes* Oxford ,  
 agar , ,



, *E. sakazakii*가 20-30% (Nazarowec-White and Farber, 1997). *Staph. sciuri*, (Schleifer, 1986). *Staph. wareneri* (Kamath, Singer and Isenberg, 1992). *L. welshimeri* (Schleifer, 1986). *Micrococcus* spp. (Lee

*et al.*, 1999) *Pantoea* spp. (Kratz, 2003). Oh Lee (2001) *E. coli* O157, *Pseudomonas aeruginosa*, *Klebsiella. ornithinolytica*, *Staph. aureus*, *E. coli*, *Serratia odorifera*가, *Aeromonas sobria*가, *E. cloacae* *Flavimonas orzihabitans*가 .

가 5 *Salmonella* spp., *Staph. aureus*, *E. coli* O157:H7, *L. monocytogenes*

$6.6 \times 10^3$ - $2.7 \times 10^5$  CFU/g,  $8.9 \times 10^1$ - $2.1 \times 10^5$  CFU/g *Salmonella* spp., *E. coli* O157:H7, *L. monocytogenes* *Staph. aureus*가 . 가

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