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식중독균에 대한 오메가-3 지방산 EPA의 항균 활성

대구대학교, *경북대학교 : 강선철, 김학렬*, 신승용

Antibacterial activity of omega-3 fatty acid EPA against foodborne pathogenic bacteria

Department of Biotechnology, Daegu University.
*Department of Animal Science, Kyungpook University.
Sun-Chul Kang, Hak-Ryul Kim, and Seung-Yong Shin

Objectives

Eicosapentaenoic acid (EPA), is a precursor of the ω-3 eicosanoids, which has been shown to have beneficial effects in prevention of coronary heart disease, arrhythmias and thrombosis. Clinical prevention of cardiovascular disease by EPA has been extensively reported, but there is no available evidence on antibacterial activity of ω-3 fatty acid, eicosapentaenoic acid (EPA). Hence, it is aimed to investigate the antibacterial activity of EPA against most commonly occurring food-borne pathogenic bacteria.

Materials and Methods

○ Materials

Chemical : Eicosapentaenoic acid (EPA) was purchased from Nu-Chek-Prep Inc. (Elysian, MN, USA). The purity of fatty acid was over 99%.

Microorganisms : *Bacillus subtilis* ATCC 6633, *Enterobacter aerogenes* KCTC 2190, *Escherichia coli* ATCC 8739, *E. coli* O157:H7 ATCC 43888, *E. coli* O157:H7 (human), *Listeria monocytogenes* ATCC 19166, *Pseudomonas aeruginosa* KCTC 2004, *Salmonella enteritidis* KCCM 12021, *S. typhimurium* KCTC 2515, *Staphylococcus aureus* ATCC 6538 and *S. aureus* KCTC 1916

○ Methods

The antibacterial activity of EPA against the food-borne pathogenic bacteria was determined qualitatively and quantitatively by agar diffusion method based on presence or absence of inhibition zones, MIC values, and bacterial growth kinetics .

Results and Discussion

We found that EPA had antibacterial activity against a range of food-borne pathogenic bacteria such as *Bacillus subtilis, Listeria monocytogenes, Staphylococcus aureus* (ATCC 6538), *S. aureus* (KCTC 1916) *and Pseudomonas aeruginosa* with minimum inhibitory concentration (MIC) ranging from 500 - 1,350 μg/ml. There was apparent difference in the growth kinetics of *S. aureus* (ATCC 6538) when grown in the presence of various concentrations of EPA as compared to the control. Our results suggest that the use of EPA can be considered as an antibacterial availability for trials in controlling food safety standards.

Corresponding author : 강선철 E-mail : sckang@daegu.ac.kr Tel : 053-850-6553

* 시험성적

Table 1. Antibacterial activity of eicosapentaenoic acid

Bacteria strain	Inhibition zones (mm)	MIC (μg/ml)
Bacillus subtilis ATCC 6633	11	500
Listeria monocytogenes ATCC 19166	12	750
Staphylococcus aureus ATCC 6538	11	750
Staphylococcus aureus KCTC 1916	11	1,350
Pseudomonas aeruginosa KCTC 2004	12	500
Escherichia coli ATCC 8739	ND[a]	ND[a]
Escherichia coli O157:H7 ATCC 43888	ND[a]	ND[a]
Escherichia coli O157:H7 (human)	ND[a]	ND[a]
Enterobacter aerogenes KCTC 2190	ND[a]	ND[a]
Salmonella enteritidis KCCM 12021	ND[a]	ND[a]
Salmonella typhimurium KCTC 2515	ND[a]	ND[a]

[a]ND : not detected antibacterial activity upto 5,000 μg/ml.

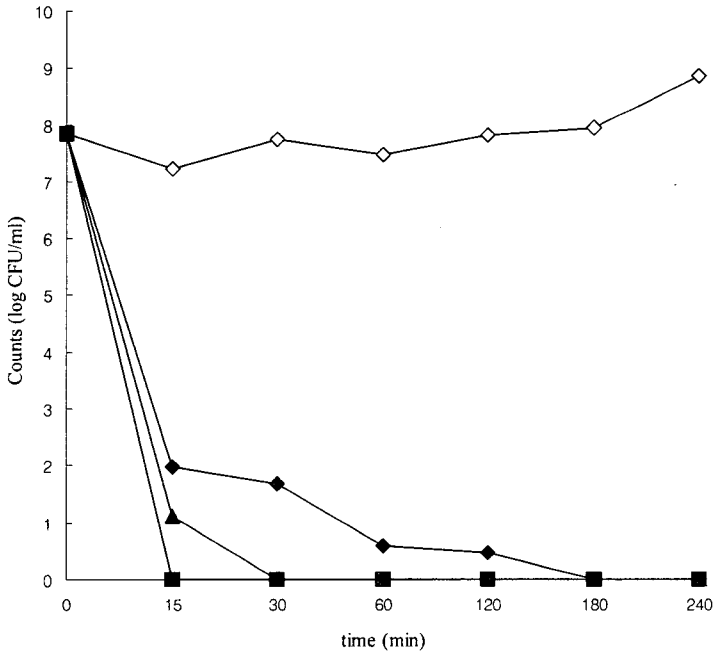

Fig. 1. Effects of EPA on viability of *Staphylococcus aureus* ATCC 6538 as affected by the addition of EPA at the lag phase. (◇) no EPA, (◆) 62.5 μg/ml, (▲) 125 μg/ml, and (■) 250 μg/ml