



Polylysine– A Natural Antimicrobial Agent

epsilon-Polylysine Natural Antimicrobial

ε-Polylysine is a natural substance from microbial metabolism. Polylysine has a function to prevent a microbe from proliferating by ionic adsorption in the microbe.

ε-polylysine has a wide antibacterial spectrum and has an obvious lethal effect on Gram-positive and Gram-negative bacteria, yeast, mould, viruses etc. It has a good antibacterial effect on the Gram-negative bacteria *E. coli* and salmonellae, which are difficult to control with other natural preservatives. It also has an inhibitory effect on heat-resistant Bacilli and some viruses, but higher concentrations are required to inhibit yeasts and moulds.

ε-Polylysine has already been used generally as a food additive in Japan, Korea and other parts of the world. In the US, FDA has recognized polylysine as a GRAS material.

Composition

ε-Polylysine is found in nature, a material produced by microbial fermentation like miso (soybean paste) and soy (soy sauce), yoghurt or the like, and combined to a straight chain of lysine which is one of an essential amino acid.

Physical properties

ε-Polylysine is slightly bitter, hygroscopic, light yellow powder. It is soluble in water, slightly soluble in ethanol. The molecular of polylysine is a straight chain polymer of L-Lysine. Its activity is not affected by pH, and stable when heated (120°C for 20 min). It inhibits thermophiles. Therefore, it is applied where high temperature processing took place. The activity of polylysine decreased at the presence of acidic polysaccharide, chloride, phosphate and Cu^{2+} , however, its activity increases with presence of hydrochloric acid, citric acid, malic acid, glycine and glyceride.

Effective pH Range

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The activity of polylysine is not affected by pH basically, which is a great advantage comparing to other natural preservatives.



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pH range

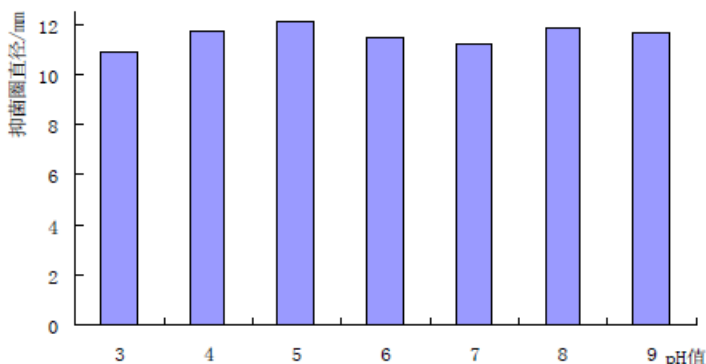


Figure 1, The inhibition diameter vs pH value

Minimum Inhibitory of Concentration of epsilon-Polylysine

Table 1 MIC of polylysine for common pathogen and spoilage microorganisms

Bacteria	(ppm)
Bacillus cereus	50
Bacillus stearothermophilus	5
Bacillus subtilis	3
Campylobacter jejuni	100
Clostridium sporogenes	32
Escherichia coli	50
Lactobacillus brevis	10
Micrococcus lueus	16
Pseudomonas aeruginosa	3
Salmonella typhimurium	16
Staphylococcus aureus	12
Streptococcus lactis	100
Molds and Yeast	(ppm)
Aspergillus niger	250
Candida utilis	<3
Pichia anomala	150
Pichia membranaefaciens	<3
Rhodotorula lactosa	25
Saccharomyces cerevisiae	50
Zygosaccharomyces rouxii	150

Profood Polylysine– A Natural Antimicrobial Agent

Applications of ϵ -Polylysine

Researches have found wide application of polylysine, as listed below.

Table 2 Common usage level of polylysine in typical foods

Category	Food Products	Dosage, ppm
Meat	Sausages	100-300
	Ham	100-300
	Red-cooked meat	100-200
Seafood		100-200
Rice		80-150
Beverage	Fruit juices and fruit flavored drinks	50-100
	Energy and sport drinks	
Prepared foods	Dips, sauces, salad dressings	50-100
	Pasta and noodles	50-200

Quality Standard

FAO/WHO, 1992

Package Size

1 Kg.