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Letter to the Editor

Efficacy of ε-Poly-L-lysine as an Antibacterial Additive for Platelets Stored at Room Temperature

Dear Editor,

The need for platelet concentrates (PCs) is currently growing while the use of packed red blood cells is on the decline. PCs that are stored at room temperature (20-24 °C) provide a bacterial growth condition and are regarded as the main cause of bacterially induced transfusion disorders.[1] Recently, the antibacterial effects of several agents have been evaluated in platelets.[1,2] Epsilon-Poly-L-lysine (ε-PLL) is a polypeptide composed of 27 to 33 identical L-lysine subunits, which was studied for the first time in Japan as an antimicrobial agent in PCs.[3]

In the present study, PCs units were collected from healthy blood donors who visited the Blood Bank of Tehran (Iran) to determine the efficacy of the bactericidal activity of ε-PLL. Informed consent was obtained from all donors and the project was approved by the Research Ethics Committees of the Iranian blood transfusion organization.

The results indicated that the growth of *S. epidermis, Pseudomonas aerugenosa*, *E. coli,* and *S. aureus* in PCs was completely inhibited after 8 days of incubation with 100 µg/mL ε-PLL. There were no significant differences between the untreated controls and the PCs treated with ε-PLL in terms of the PCs quality variables (table 1). These findings are consistent with a previous report in Japan. In a study by Tanaka et al.,[3] ε-PLL was found to inhibit the growth of the bacterial contaminants *S. aureus, B. cereus,* and *K. oxytoca* in the concentrations of 200 and 50 µg/mL in the plasma and PAS-IIIM PCs, respectively, after 8 days of incubation. Moreover, they demonstrated that ε-PLL did not significantly affect the quality of the PCs except for increased CD62P expression. The results of a study by Liu et al.[4] also showed the combination of ε-polylysine and nisin has synergistic antimicrobial activity against E. coli, B. subtilis, and S. aureus. Samadi et al.[5] investigated the antimicrobial activities of magnesium oxide nanoparticles and ε-PLL against two major foodborne bacteria, *Escherichia coli* O157:H7 and Listeria monocytogenes. They demonstrated the inhibitory effects of both substances. In a study by Zhao et al.,[6] the amphiphilic e-poly-L-lysine (EPL)/poly (e-caprolactone) (PCL) copolymer showed a broad-spectrum antibacterial activity against *Escherichia coli*, *Staphylococcus aureus*, and *Bacillus subtilis*.

The main limitation of the present study was that the samples of each PCs were obtained on days 1, 3, 5, and 8 to determine the colony count of PCs inoculated with each bacterium. Thus, the trend of quality parameter changes was not studied. Consequently, more research on this topic is required prior to its application in clinical trials.

In conclusion, the presented data further support the proposal that ε-PLL inhibits the growth of the bacterial contaminants in room temperature stored platelets.

Conflict of Interest: None declared.

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Table 1: Na, K, mean PLT volume (MPV), PLT count, and PH changes in PCs inoculated with *S. epidermis, Staphylococcus aureus, Pseudomonas aerugenosa,* and *Escherchia coli* after the 8-day storage (PCs units with ε-PLL is compared with control PCs without ε-PLL)

Variable	Control PCs without ε-PLL	PCs with 50 µg/mL ε-PLL	P value	PCs with 100 µg/mL ε-PLL	P value	PCs with 200 µg/mL ε-PLL	P value
S. epidermis							
Na	174±1	171±3	0.560	172±1	0.698	171±2	0.127
K	3.1±0.10	3.2±0.09	0.555	3.5±0.12	0.117	3.3±0.10	0.542
MPV	10.4±0.5	10.1±0.6	0.860	10.2±0.4	0. 310	10.2±0.7	0.604
PLT count/µL	1,100,100±278,000	1,052,500±295,000	0.548	1,000,100±277,100	0.221	990,550±292,000*	0.000
PH	7.2±0.10	7.15±0.9	0.300	7.0±0.11	0.530	6.99±0.15	0.137
Staphylococcus aureus							
Na	170±2	170±1	0.937	171±2	0.824	173±1	0.571
K	3.0±0.12	3.1±0.17	0.598	3.3±0.13	0.555	3.3±0.09	0.435
MPV	9.2±0.8	9.3±0.6	0.369	10.0±0.8	0.231	9.7±0.08	0.381
PLT count/µL	1,116,000±284,000	1,112,000±304,000	0.137	1,120,000±311,000	0.119	1,013,000±321,000	0.150
PH	6.95±0.10	7.9±0.9	0.060	7.12±0.14	0.204	7.07±0.10	0.017
Pseudomonas aerugenosa							
Na	169±3	171±2	0.520	172±2	0.561	172±1	0.582
K	3.3±0.12	3.6±0.17	0.390	3.4±0.13	0.550	3.6±0.12	0.650
MPV	10.2±0.8	10.3±0.6	0.440	12.5±9*	0.000	8.5±0.7*	0.000
PLT count/µL	587,000±271,000	559,000±270,000	0.29	564,000±285,000	0.360	528,000±293,000*	0.001
PH	7.1±0.9	7.0±0.11	0.452	6.95±0.14	0.461	7.12±0.9	0.344
Escherchia coli							
Na	170±2	171±1	0.561	172±1	0.560	172±3	0.698
K	3.2±0.11	3.2±0.14	0.550	3.3±0.11	0.545	3.8±0.09	0.571
MPV	10.0±0.7	10.1±0.9	0.300	10.2±0.9	0.360	10.4±0.8	0. 310
PLT count/µL	1,156,000±280,000	1,153,000±280,000	0.361	1,132,000±321,000	0.538	1,128,000±313,000	0.212
PH	7.2±0.11	7.12±0.14	0.460	7.15±0.11	0.310	7.0±0.13	0.503

*P<0.05 were considered statistically significant. Analysis of paired t test was used to compare values

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