Development of surface charge modified-poly (lactic-*co*-glycolic acid)/polyethylenimine nanoparticles loaded antibiotic clindamycin

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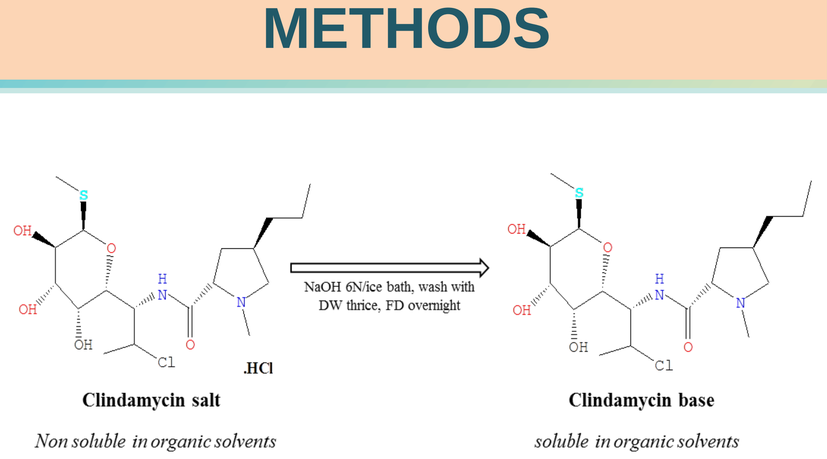
PURPOSE

The delivery of antibiotic through NPs drug carries showed potential efficacy in treating bacterial infection. In particular, positive charge nanoparticle was found to enhance antibacterial activity as it provides electrostatic bonding to negatively charge of bacterial cell wall. Therefore the purpose of this study was to develop clindamycin releasing polymeric nanoparticles with modification of surface charge by using polyethylenimine.

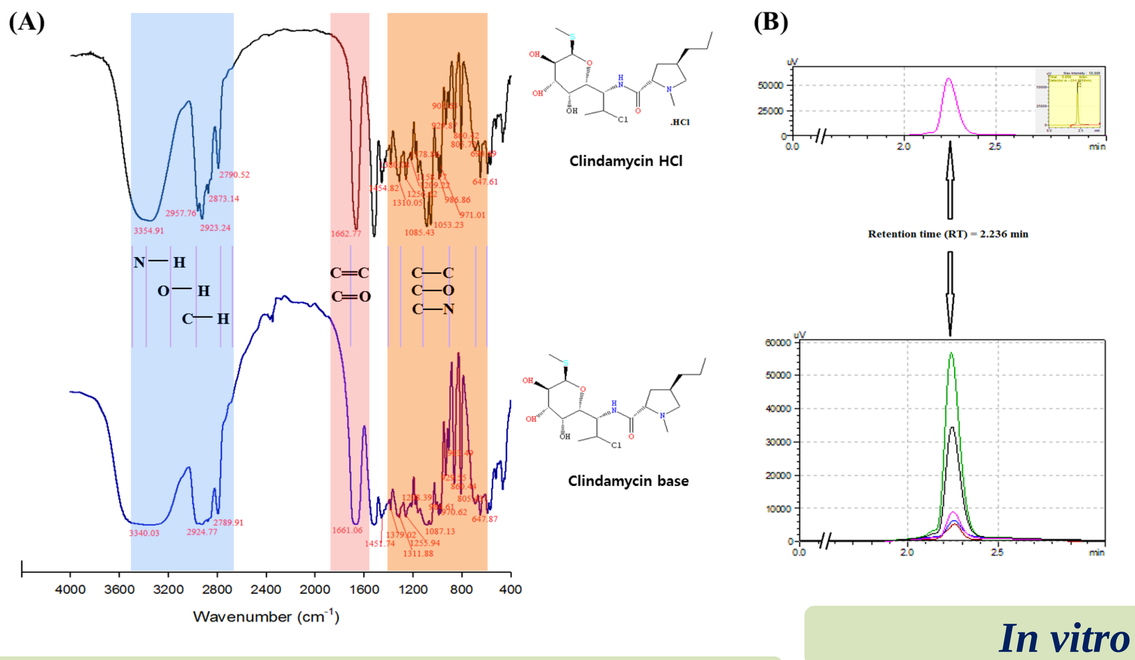
METHODS



- The clindamycin-releasing poly (lactic-*co*-glycolic acid)-polyethyleimine (PLGA-PEI) nanoparticles ((+) Cly/PPNPs) and clindamycin releasing PLGA nanoparticles ((-) Cly/PNPs) were characterized by particle size, polydispersity index (PDI), surface charge and drug loading.
- In vitro drug release was evaluated in PBS pH 7.4 at 37°C.
- The in vitro cytotoxicity study of nanoparticles was tested against L929 mouse fibroblast cell.

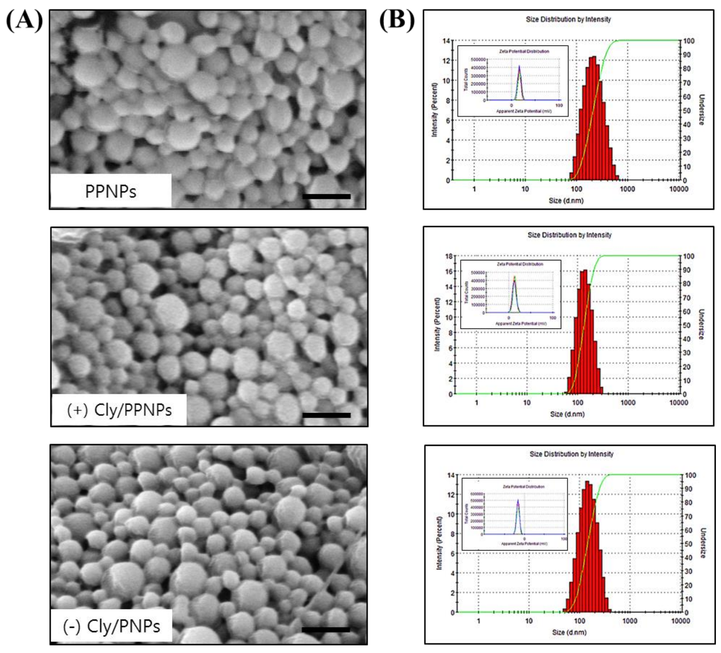
RESULTS

Characterization of clindamycin base



(A) FTIR spectra and (B) Peak and RT of clindamycin HCl (salt form) and clindamycin (base form).

Characterization of nanoparticles

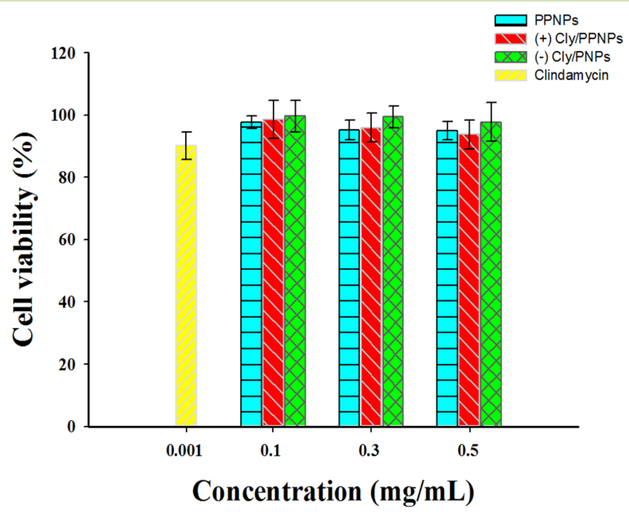


(A) SEM images of PPNPs, (+) Cly/PPNPs, and (-) Cly/PNPs, bars represent 300 nm. (B) Size distribution of PPNPs, (+) Cly/PPNPs, and (-) Cly/PNPs by zetasizer nano series ZS90, Insets represent zeta potential measurement.

Size and zeta potential of nanoparticles

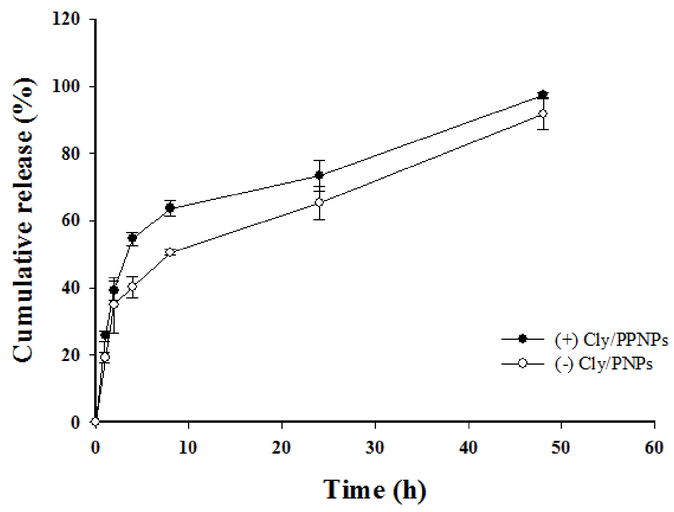
NPs	Drug Loading (% w/w)	Size (nm) DLS	Size (nm) SEM	Pdi	Zeta potential (mV)
PPNPs	N.D	193 ± 38	184 ± 36	0.147	+17 ± 0.5
(+) Cly/ PPNPs	1.31 ± 0.26	126 ± 33	147 ± 37	0.108	+ 13 ± 0.6
(-) Cly/ PNPs	1.43 ± 0.45	132 ± 41	141 ± 43	0.143	-16 ± 0.2

Toxicity against L929 fibroblast cell



Viability (%) of L929 mouse fibroblast cell showing 24-hour exposure to nanoparticles at different concentration (n=8)

In vitro release profile



In vitro release profile of (+) Cly/PPNPs and (-) Cly/PNPs. All samples were placed in PBS pH 7.4 at 37ºC, data presented are mean ± standard deviation; n=3.

CONCLUSION

✓In this study, clindamycin-releasing polymeric NPs with surface charge modified were successfully performed.

✓The resulting Nps could be a suitable approach for better antibacterial activity.

ACKNOWLEDGMENTS

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