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Clindamycin-loaded cinnamaldehyde-based nanostructured-lipid carriers: A potential platform to treat MRSA skin infection

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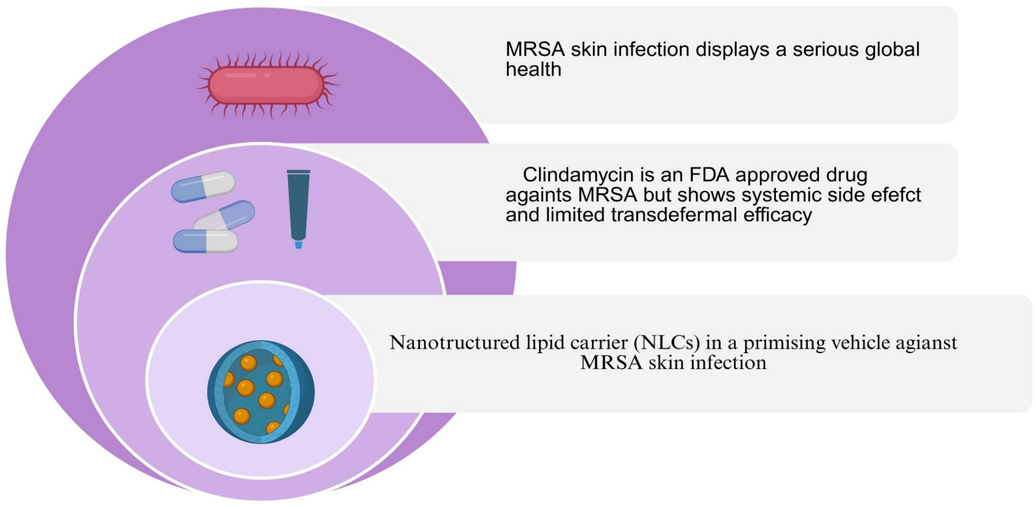
INTRODUCTION & AIM



This work aims to design a novel clindamycin-loaded cinnamaldehyde-based NLC to improve transdermal MRSA infection treatment due to the synergistic effect between anti-bacterial oil cinnamaldehyde and clindamycin.

METHOD

Preparation of NLC	Cold microemulsiontechnique was used
Characterization of NLC	Size Polydispersity index Transmission electron microscope Ex-vivo permeation
In-vitro anti-microbial study	MIC MBC Biofilm inhibition Regrowth assay
In-vivo anti-microbial study	MRSA wound infection animal model

RESULTS & DISCUSSION

✓ Clindamycin-loaded cinnamaldehyde-based NLC displayed a nanometric size of 100.3±3.8 nm, PDI of 0.19 ± 0.0002. and improved skin permeation through excised rat skin around 380±95 µg/cm² compared to the marketed product (287.9±74 µg/cm²).

✓ It showed spherical morphological structure (Fig. 1).

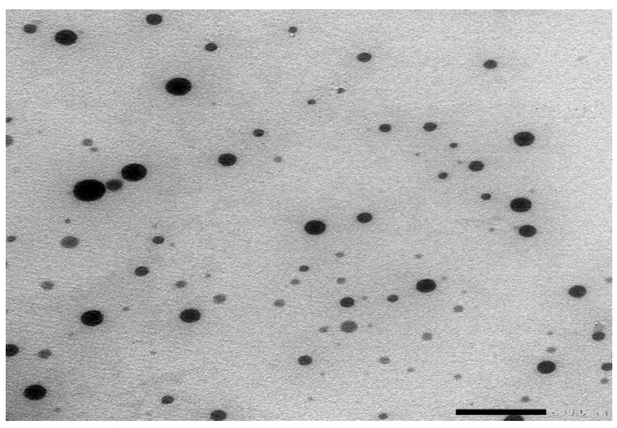


Fig. 1. TEM image of clindamycin-loaded cinnamaldehyde-based NLC (scale 500 nm).

✓ The unloaded and loaded NLC showed a safe profile compared to clindamycin solution, with cell viability above 80%, as demonstrated by MTT assay (Fig. 2)

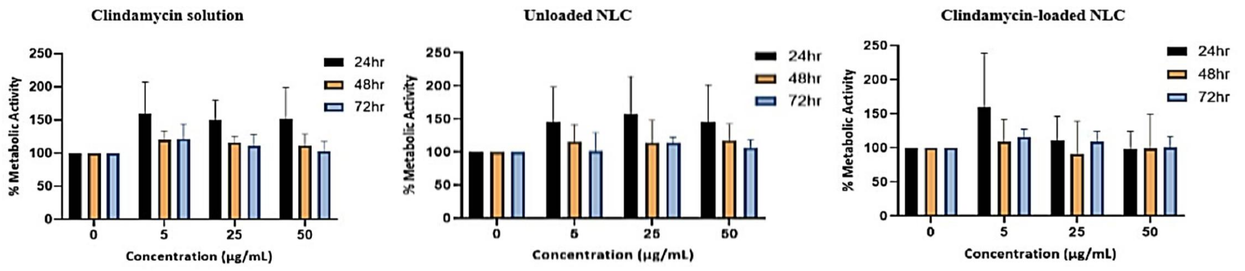


Fig. 2. MTT assay of the control solution, loaded and unloaded NLC

✓ Improved in-vitro anti-microbial activity (table 1) and biofilm inhibition.

Table 1. MIC and MBC values of free clindamycin, unloaded and loaded-cinnamaldehyde-based nanostructured lipid carrier against *MRSA*.

Microorganism	MIC of clindamycin solution (µg/mL)	MIC of unloaded NLC (µg/mL)	MIC of loaded NLC (µg/mL)	MBC of clindamycin solution (µg/mL)	MBC of unloaded NLC (µg/mL)	MBC of loaded NLC (µg/mL)
MRSA	2	8	1	8	64	2

✓ The loaded NLC displayed improved MRSA skin infection recovery after 5 days of treatment compared to the marketed product (Fig. 3).

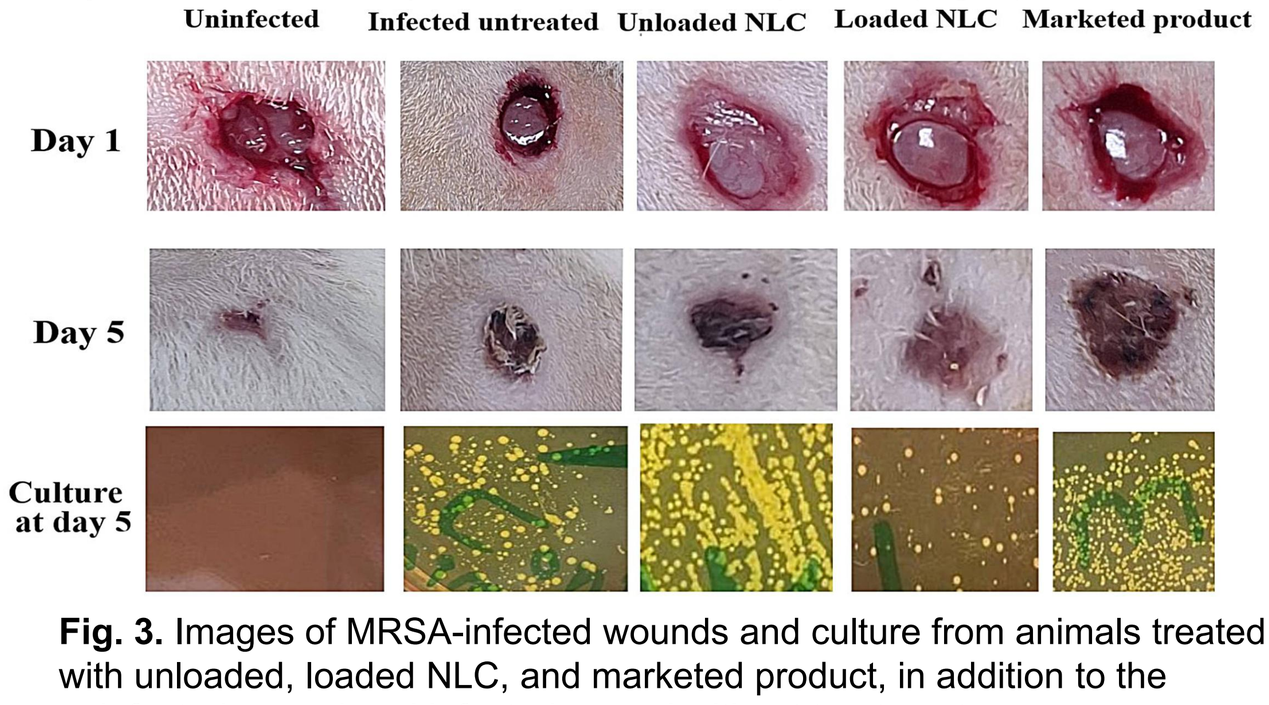


Fig. 3. Images of MRSA-infected wounds and culture from animals treated with unloaded, loaded NLC, and marketed product, in addition to the uninfected wound and infected wound without treatment.

CONCLUSION

In the present work, a transdermal delivery system for clindamycin delivery was successfully prepared using NLC. It displayed a safe profile and remarkable antibacterial activity against the MRSA strain in vitro and in vivo. Thus, this platform is a promising alternative to standard antibiotic dosage forms against antibiotic-resistant bacteria

FUTURE WORK / REFERENCES

Future research will involve clinical trials of the formulated product on human patients.

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