IOCT 2025 Conference

The 3rd International Online Conference on Toxins

10–12 September 2025 | Online

MDPI

Crotalus molossus Venom-Loaded PLGA Nanoparticles as Potential Drug Delivery Systems for Breast Carcinoma Cells

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INTRODUCTION & AIM

Cancer is one of the leading causes of death in developed and in under-development countries. Specifically **in Mexico**, **breast cancer** is amongst the **most common types** in both **incidence** and **mortality.**

Encapsulating bioactive agents such as **peptides** and **proteins** in biocompatible **nanoparticles**, such as PLGA, may enhance their therapeutic properties.

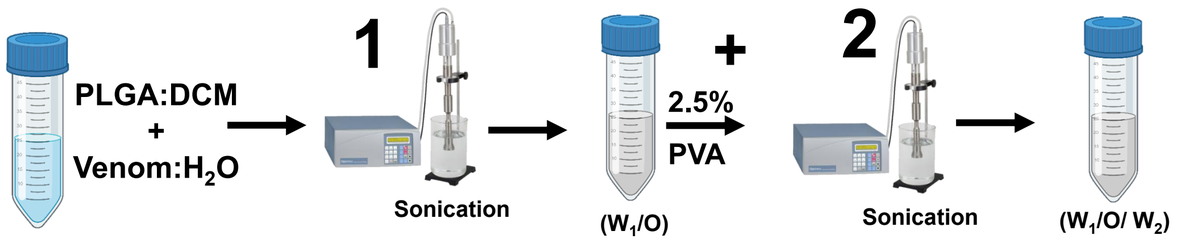
Snake venoms contain a **high diversity** of **bioactive** agents, some of which have been reported with:

Antibacterial activity
Antiparasistic activity
Antitumoral activity

Our aim was to **entrapp** the **venom** of the northern black-tailed **rattlesnake** (*Crotalus molossus*) into **PLGA NPs**, and evaluate their drug delivery system potential **against** a **breast carcinoma** cell line (**T-47D**).

METHOD

Nanoparticles (**NPs**) were obtained by a **double emulsion-solvent evaporation** process:



CONCLUSION

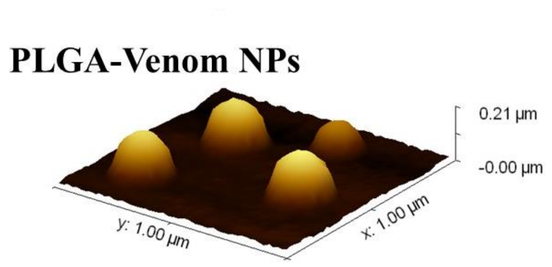
- The **encapsulation** of **bioactive components** from *C. molossus* venom **was effective** through a double emulsion-solvent evaporation method.
- **Venom** from the **PLGA NPs** was **released** in a **sustained** manner following a first-order model kinetic, driven mainly by diffusion and matrix relaxation process.
- The **PLGA-Venom NPs delivered** the **bioactive** components **into** the **breast carcinoma** cells, supporting their role as potential drug delivery systems.

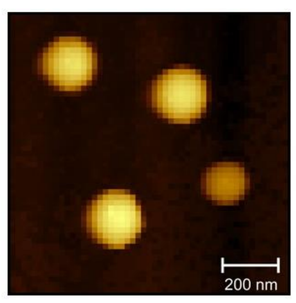
FUTURE WORK / REFERENCES

RESULTS & DISCUSSION

PLGA-Venom NPs have suitable sizes and high EE%

Nanoparticles	D_H (nm)	PDI	Z-Potential (mV)	EE%	LC%
PLGA NPs	286.9 ± 3.49	0.11 ± 0.02	-32.5 ± 0.65	N/A	N/A
PLGA-Venom NPs	310.2 ± 5.36	0.15 ± 0.02	-32.8 ± 0.46	74.54 ± 4.22	9.19 ± 0.92

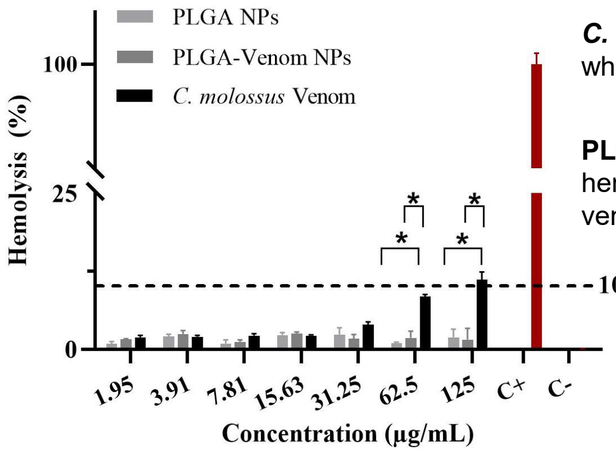




PLGA-Venom NPs have a smooth surface and are spherically shaped.

AFM images confirm **DLS** size data.

Snake Venom Encapsulation Inhibits Hemolytic Activity

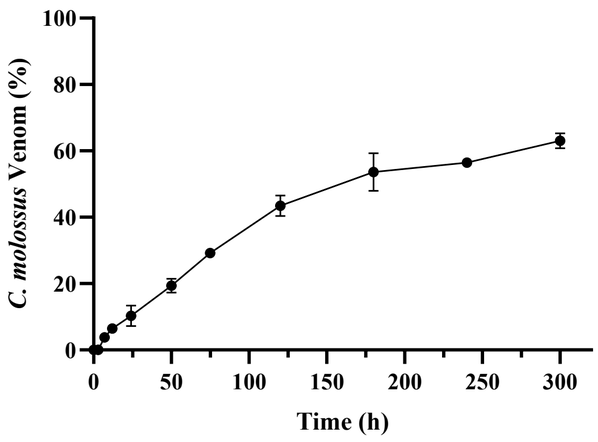


C. molossus venom can be considered as hemolytic when evaluating concentrations >60 µg/mL.

PLGA-Venom NPs did not exhibit a significant hemolytic activity when evaluated at the same venom concentrations.

Data suggests that by using concentrations <60 µg/mL of *C. molossus* venom **may** be **safe** against red blood cells.

PLGA-Venom NPs Have a Sustained Protein Release

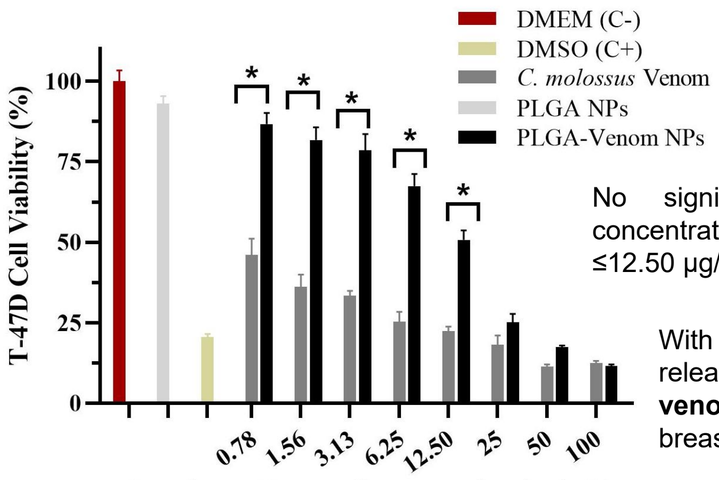


C. molossus venom from the **PLGA NPs** was released in a sustained manner, similarly to what's been reported in other works.

Approximately **12.5% of** *C. molossus* **venom** was **released** during the first **24 h** and, around **60%** cumulatively released **at 300 h**.

First-order model **best fits** our data (R^2: 0.997), while **zero-order** and **Higuchi** models had **decent**, **but inferior** values (R^2: 0.931 and 0.981, respectively).

PLGA-Venom NPs are Cytotoxic Against Breast Carcinoma Cells



IC_{50} of ***C. molossus*** **venom** was determined at **1.55 µg/mL** at 24 h.

No significant differences were found at concentrations ≥25 µg/mL, in contrast to those ≤12.50 µg/mL (*p* ≤0.001).

With 12.50 µg/mL of loaded venom, the released amount at 24 h is around **1.56 µg of venom**, reaching approximately **50%** of the breast carcinoma **cells viability**.