

Novel Metal-Hydroxide Nanoparticles as Antiviral Agent Against H1N1

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INTRODUCTION:

The current research is based on tested the metal compound $\text{CaZn}_2(\text{OH})_6\cdot 2\text{H}_2\text{O}$ as an antiviral agent against the influenza virus H1N1pdm09 in addition measuring the cytotoxicity of the chemical compound by MDCK cell lines, in order to be a new novel research line of the current development outstanding metal hydroxide chemical compounds.

GOALS:

1. Evaluate the antiviral activity of $\text{CaZn}_2(\text{OH})_6\cdot 2\text{H}_2\text{O}$ (CZ) obtained by several methods of synthesis: Hydrothermal (HT), Sol-Gel (SG), Mechano-synthesis (MS) Microwave (MW), against H1N1 virus.
2. Establish the possible mechanism of action of (CZ) on the replication cycle of influenza virus H1N1.

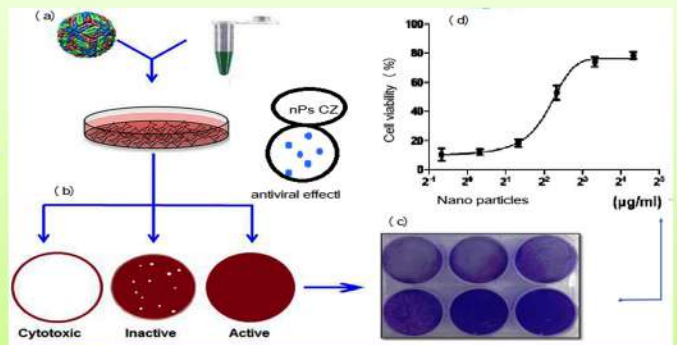
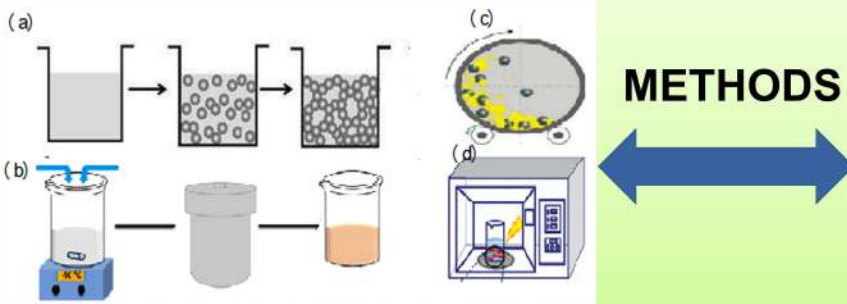


Figure 1. Synthesis techniques used for (CZ), (a) SG (Sol-gel CZ), (b) HT (Hydrothermal CZ), (c) MS (Mechanosynthesis), (d) MW (Microwave CZ).

Figure 2. Experimental scheme for cytotoxicity and antiviral effect. (a) Culture mixture with nanoparticles (NPs), (b) performance of cytotoxicity test, (c) reading of antiviral activity (d) record of mean concentration CC50

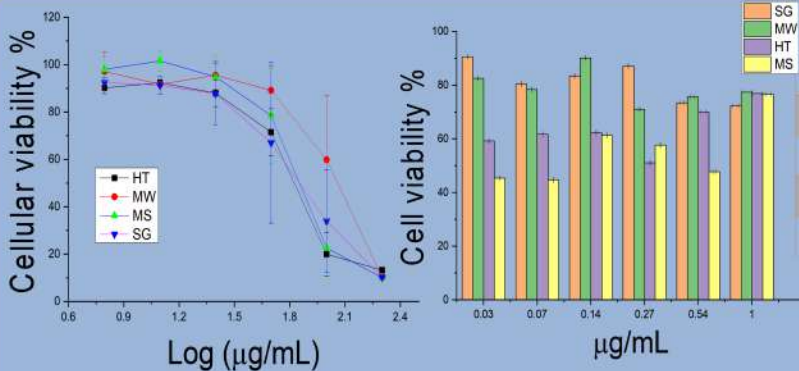


Figure 3. (CZ) cytotoxicity test carried by various methods of synthesis

Figure 4. Antiviral effect test of CZ nanoparticles. SG: 6.47 nM/mL, MW: 9.71 nM/mL, HT: 12.95 nM/mL, MS: 10.5 nM/mL

Compound	CC ₅₀ (µg/mL) ± DS
HT	67,97 ± 4.95
MW	116,50 ± 28.00
MS	71,47 ± 18.71
SG	78,75 ± 26.96

Table 1. CZ CC₅₀ carried by diverse synthesis methods

CONCLUSIONS

- $\text{Ca}(\text{Zn}_2(\text{OH})_6\cdot 2\text{H}_2\text{O})$ was synthesized, evaluated and characterized by 4 synthetic routes.
- CZ was evaluated for its cytotoxicity and antiviral activity. The cytotoxic and cytopathogenic concentration CC50 were in the range of 116-68 µg/mL and $1 < \mu\text{g/mL}$, respectively
- These results make CZ an outstanding compound, therefore, can be applied on textiles as a protection compound against SARS-CoV-2 for workers in the Mexican health system

References

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RESULTS: The particle size was calculated by TEM obtaining sizes of CZ particle in a range of 70-80 nm for the different methods of synthesis Sol-gel, Hydrothermal, Mechano-synthesis. The obtained data for the cytotoxic assay CC₅₀ was in the range of 116-68 µg/mL, and the virus inhibition concentration for CC₅₀ was $< 1 \mu\text{g/mL}$.