

Highly Functionalized pH-Triggered Supramolecular Nanovalve for Targeted Cancer Chemotherapy

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LIVER AND LUNG CANCER

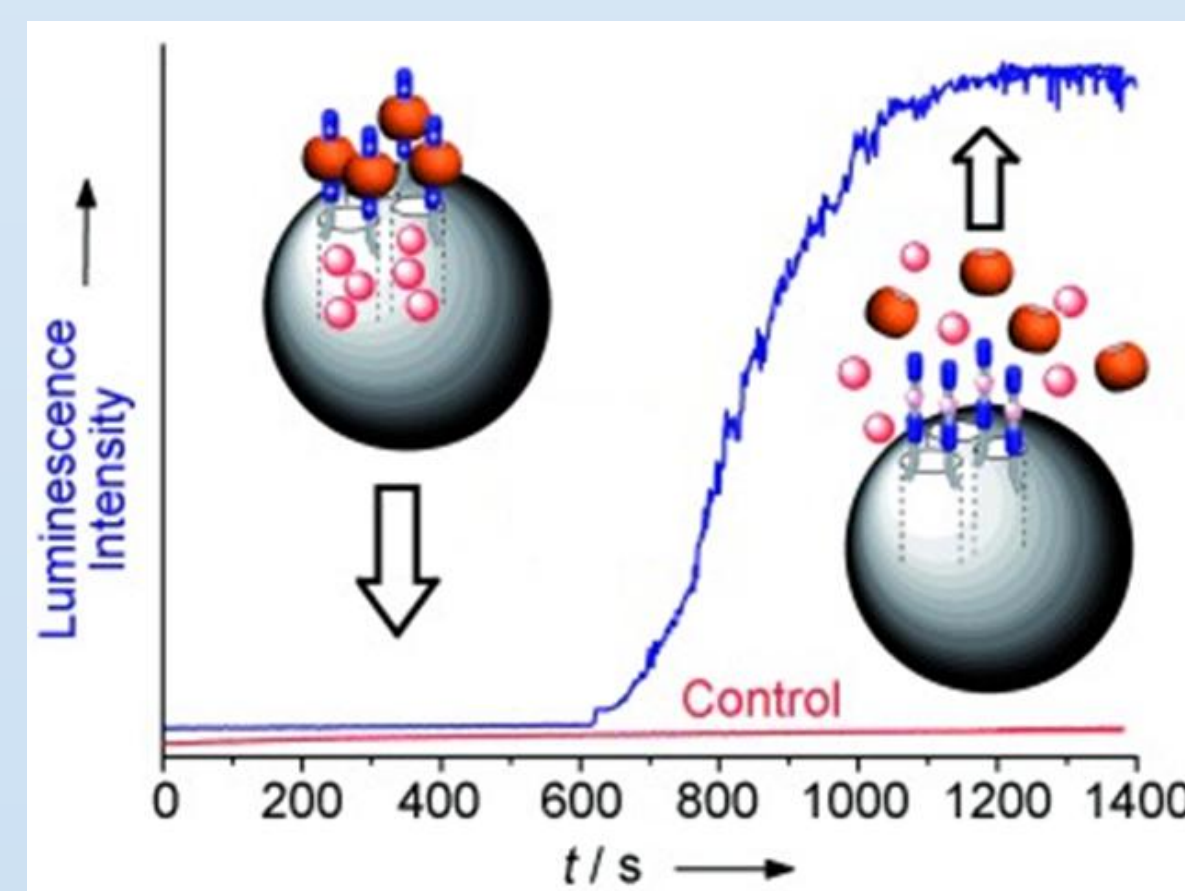
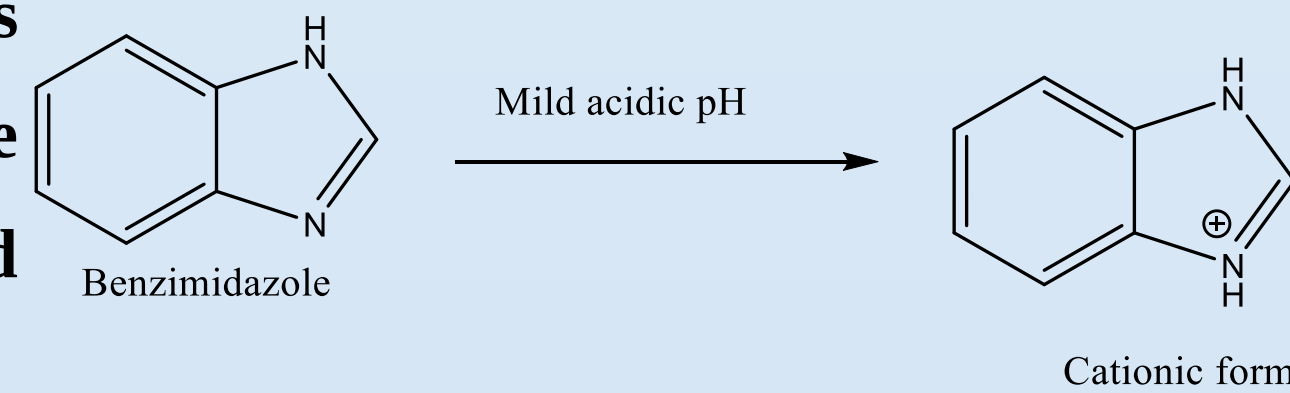
Lung and Liver cancers are considered as 4th and 6th most prevailing forms of cancers around the globe, and both has significant mortality rates.

Treatments available these cancers include surgery, chemotherapy, radiotherapy and immunotherapy etc.

Chemotherapy, used to treat cancer are all associated with severe side effects, poor bioavailability and lacks cancer cells targeting specificity. To counter the use of natural products and on demand drug delivery systems attracts scientific attention.

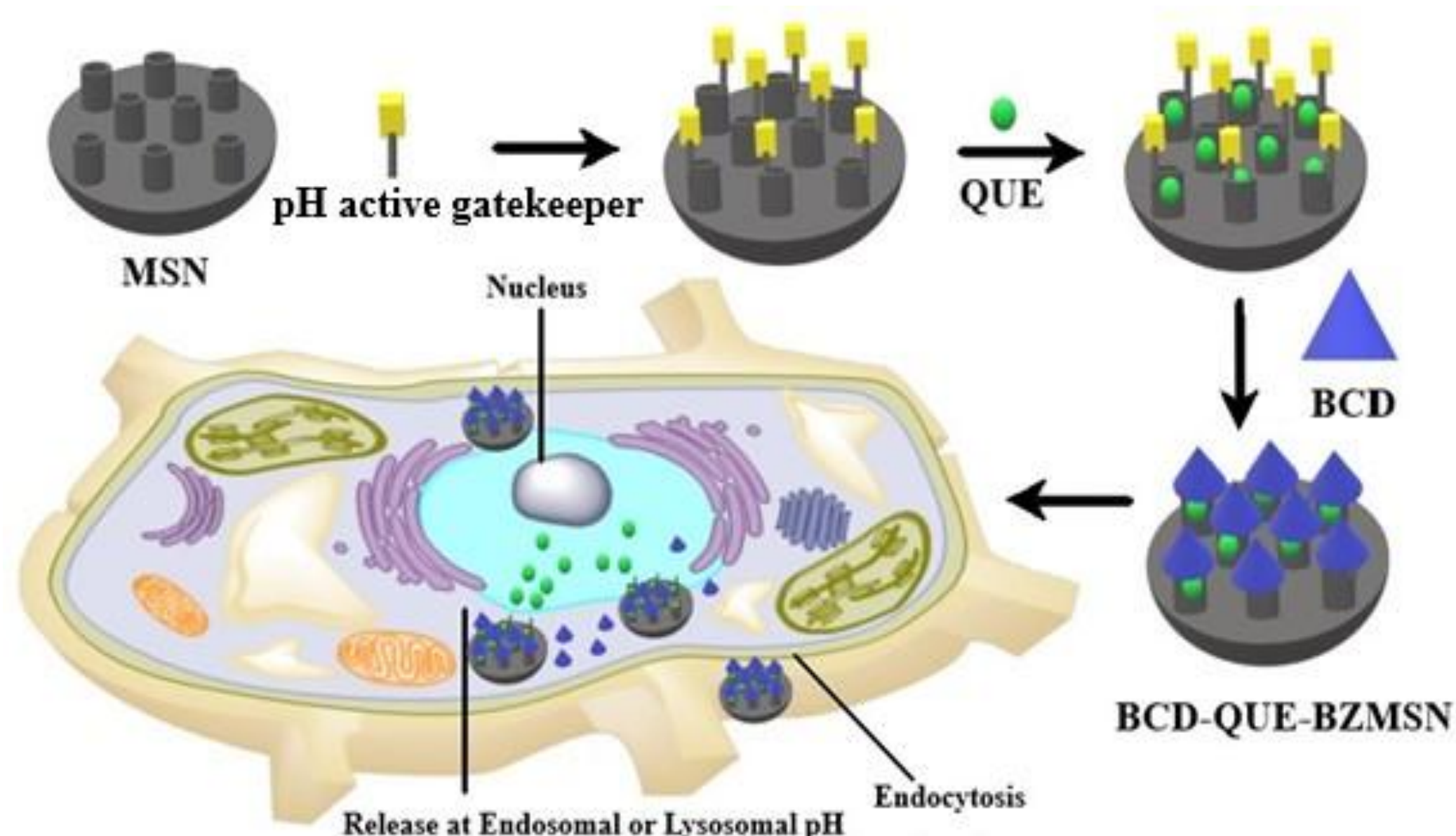
pH RESPONSIVE DRUG DELIVERY SYSTEMS

- pH responsive drug delivery systems are one of the most fascinating systems chemotherapy because it functions at the lower pH of endosomes (pH 5.5) and Lysosome (pH 4.5).

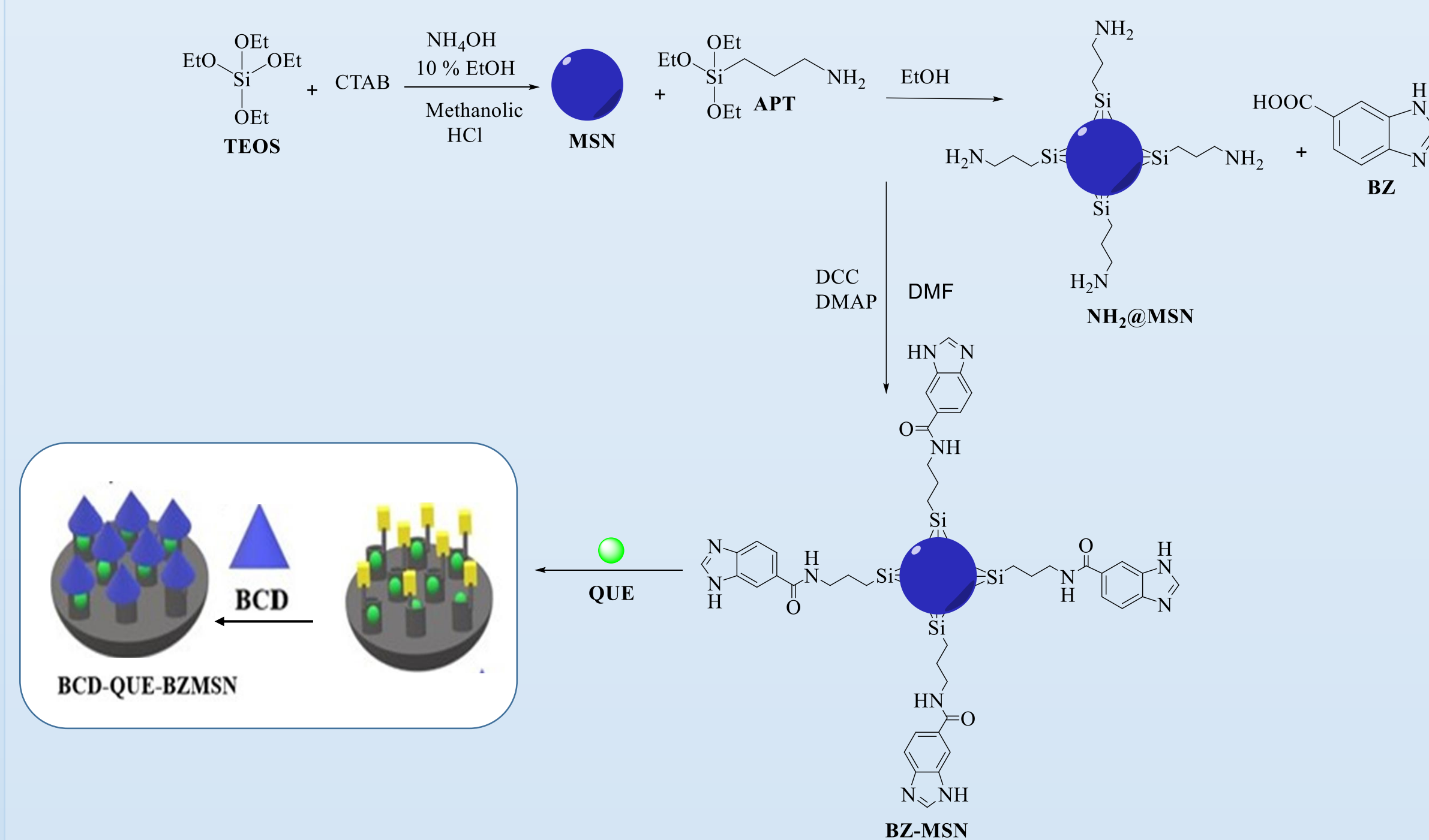


- Ionizable molecules like Benzimidazole is the preferred moiety for pH gated system because when the pH was less than 5.5 it exist in cationic and owing to their higher biocompatibility and cost effectiveness they can be utilized for drug delivery.
- In this study we developed Benzimidazole coated mesoporous silica nanoparticles capped with beta cyclodextrin (BCD) and we use Quercetin as a model drug.

GRAPHICAL REPRESENTATION OF THE STUDY PLAN



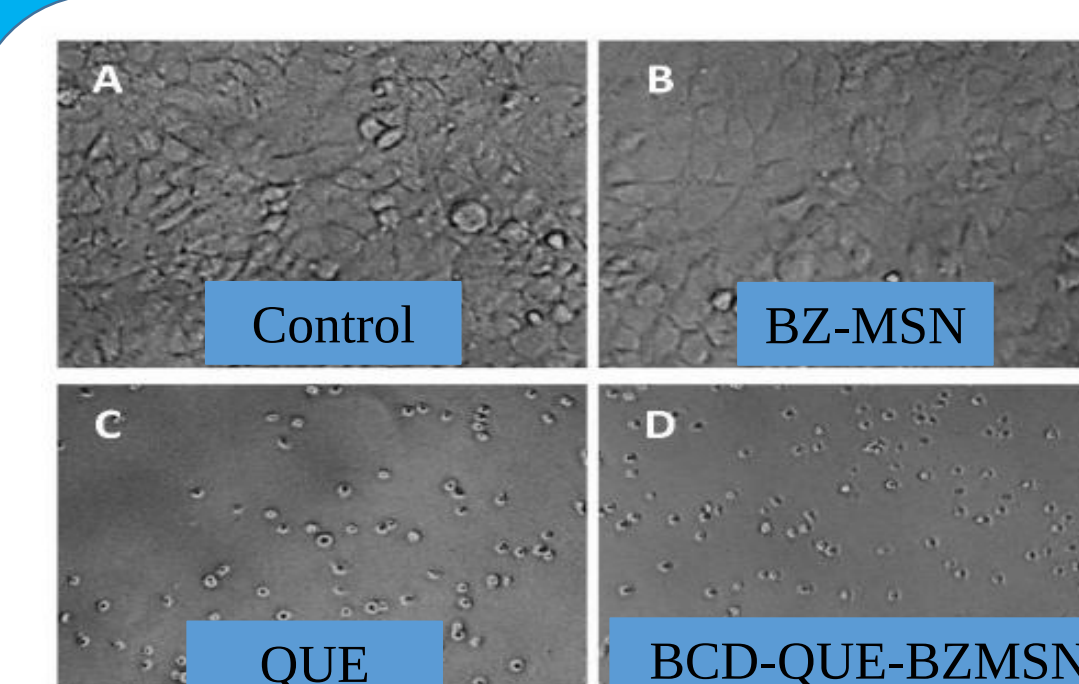
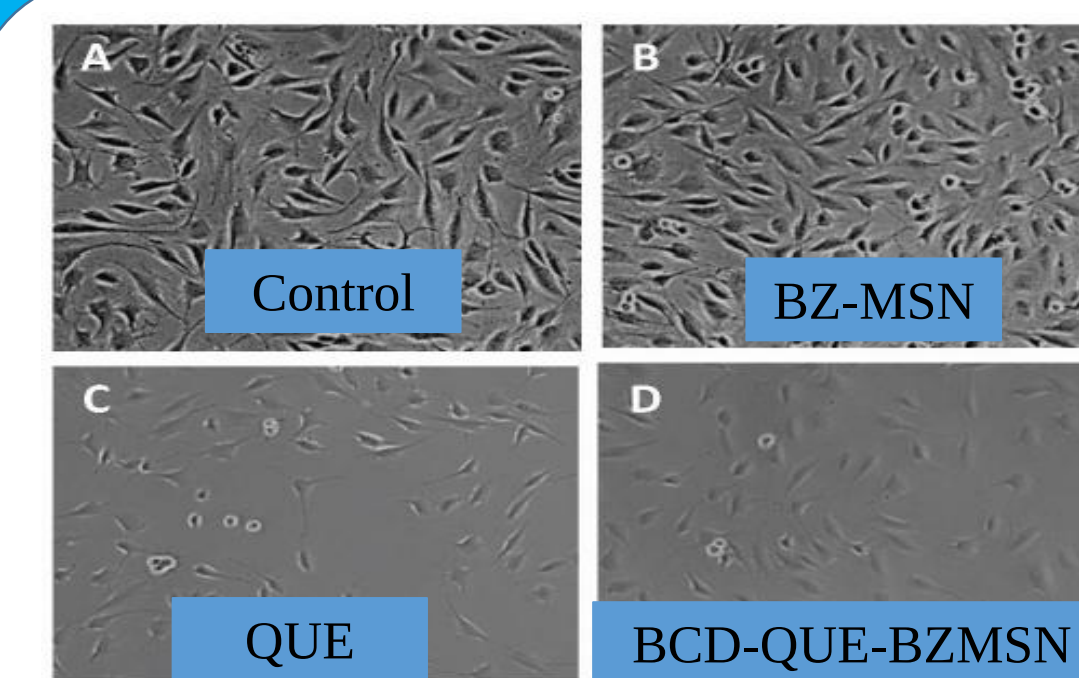
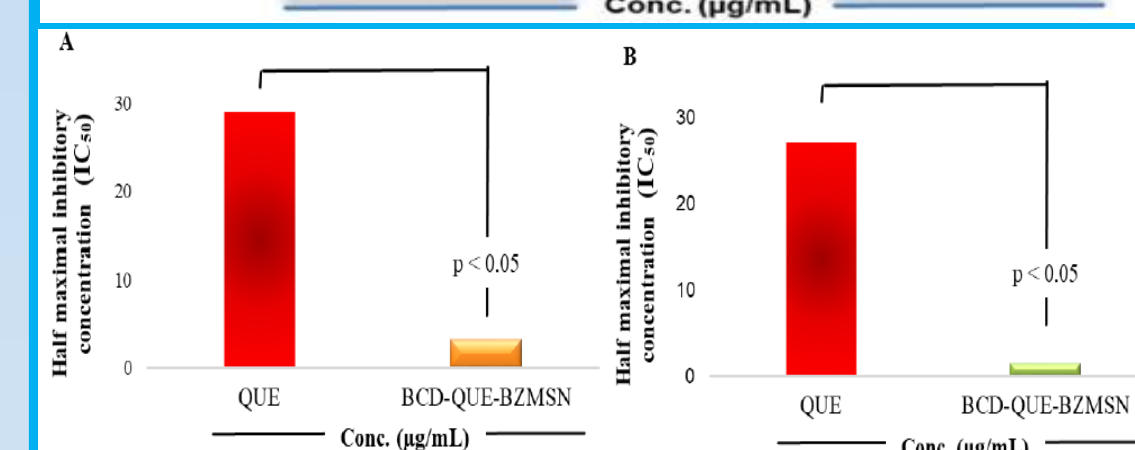
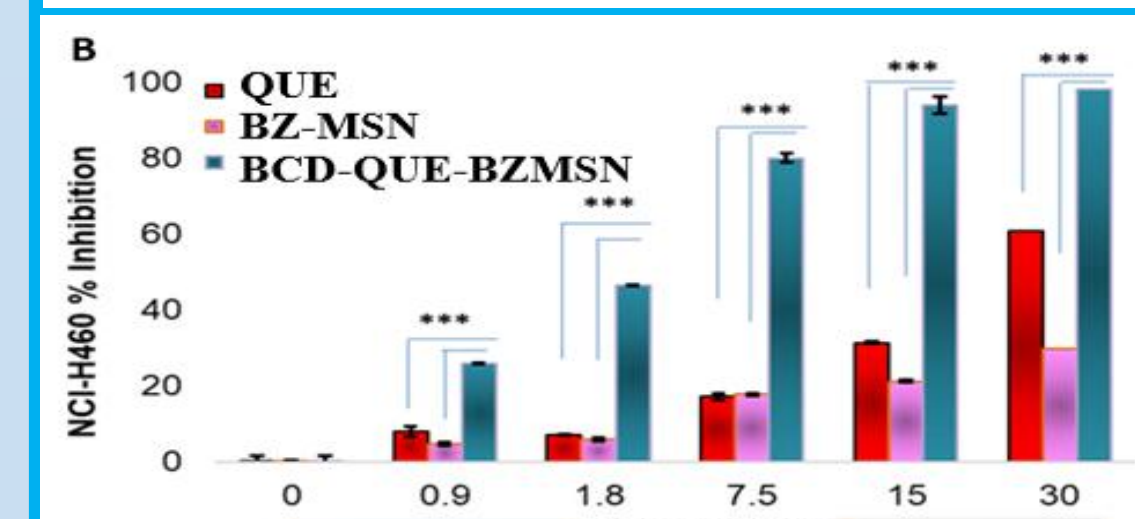
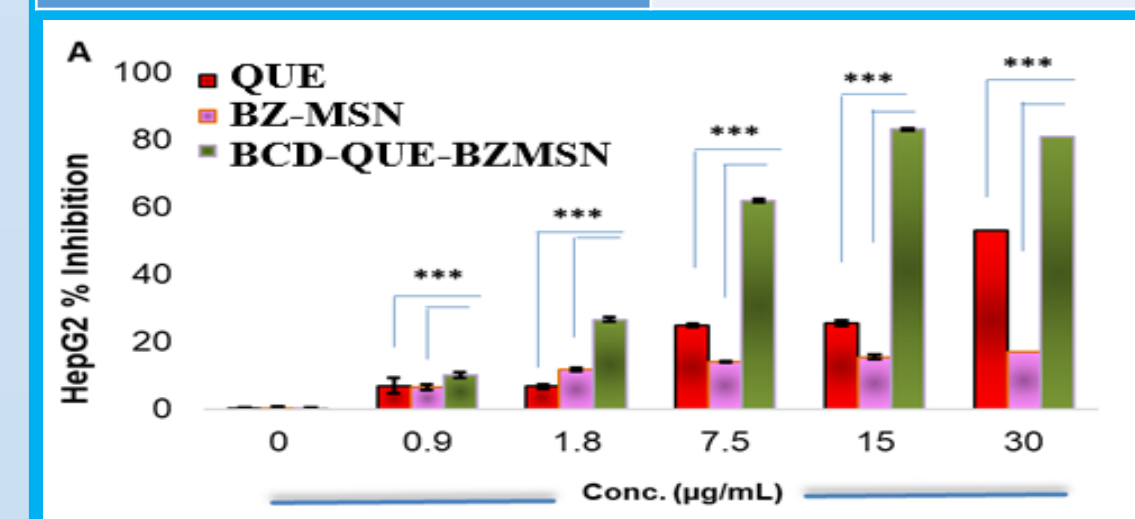
METHODOLOGY



RESULTS AND DISCUSSION

In-vitro Screening on Liver and Lung Cancer Cells

Cell lines	QUE (IC ₅₀ µg/mL)	BCD-QUE-BZMSN (IC ₅₀ µg/mL)
Hep-G2	29 ± 0.24	3.2 ± 0.13
NCI-H460	27.07 ± 0.69	1.45 ± 0.06



- Our Developed formulation BCD-QUE-BZMSN showed significant inhibition against liver and lung cancer cells as compare to drug.

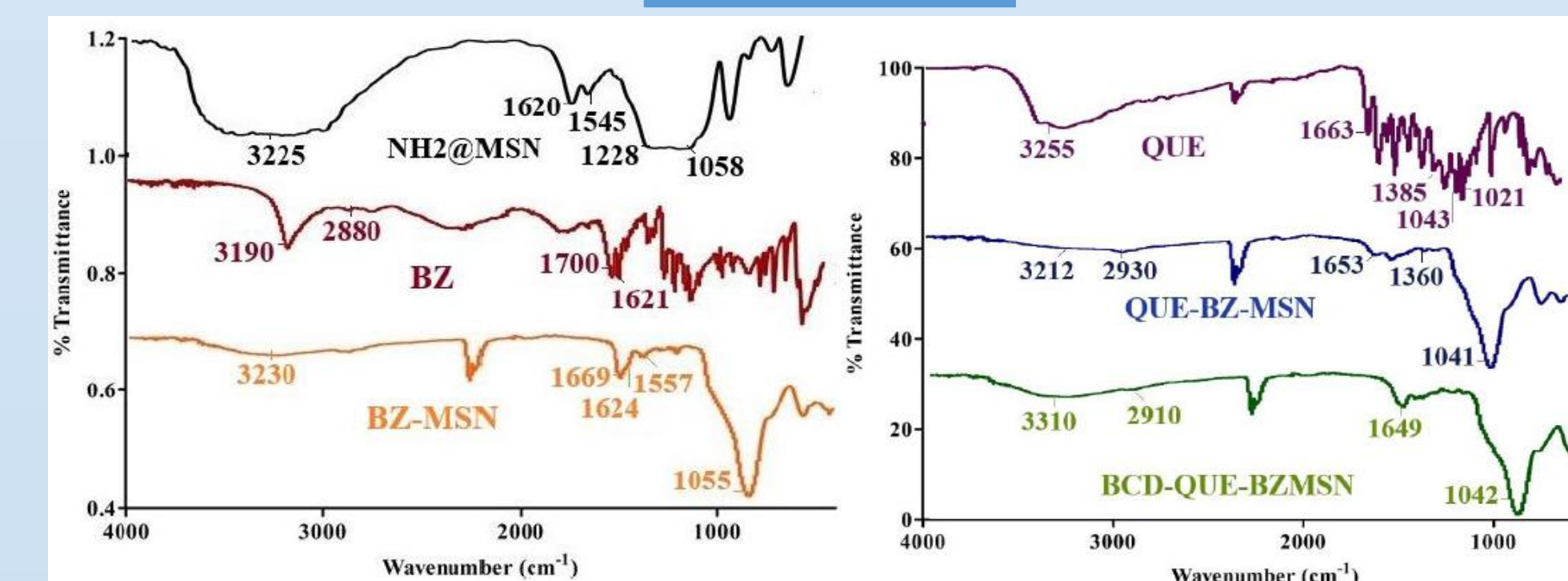
SIGNIFICANCE OF STUDY

- A convenient, cost effective and high performance pH responsive nanocarrier that releases the drug at mild acidic pH.
- The developed nanoformulation showed potent inhibition against liver and lung cancer cells.
- The synthesized BCD-QUE-BZMSN nanoformulation found to be non-cytotoxic on normal 3T3 cell lines.
- The IC₅₀ of our develop formulation is comparable to some marketed drug Sorafenib IC₅₀ (2.32 µg/mL).

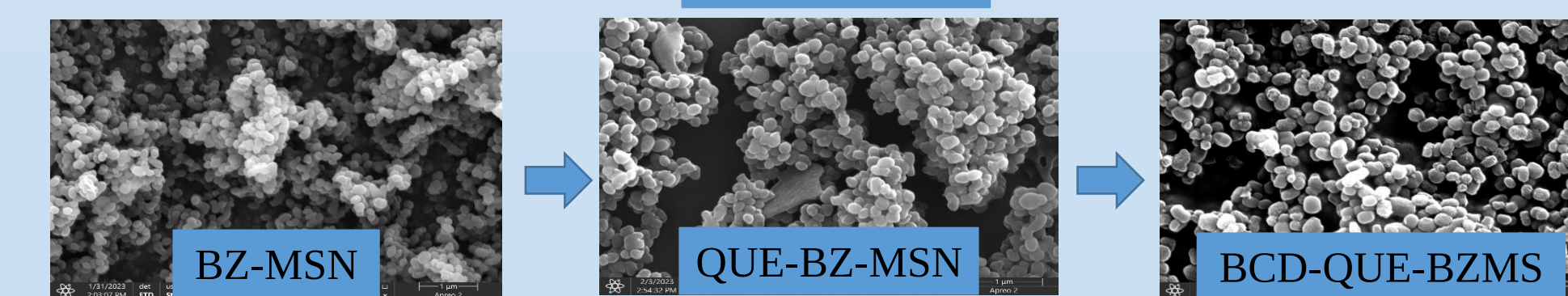
CHARACTERIZATION DATA

Samples	Size (nm)	Zeta Potential (mV)	PDI	Entrapment Efficiency (%EE)
BZ-MSN	212.1 ± 20.2	-23.1 ± 1.75	0.294 ± 0.07	--
QUE-BZ-MSN	186.3 ± 1.20	-12.04 ± 2.45	0.285 ± 0.02	--
BCD-QUE-BZMSN	115.2 ± 19.02	-7.05 ± 2.37	0.188 ± 0.06	76.5 ± 1.2

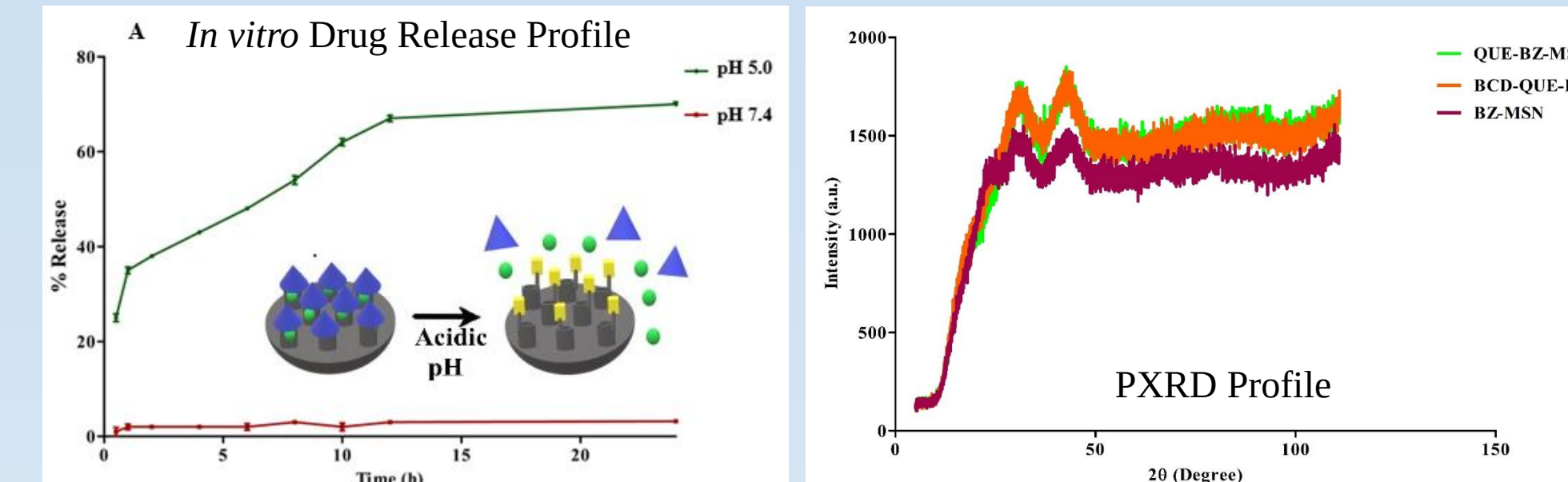
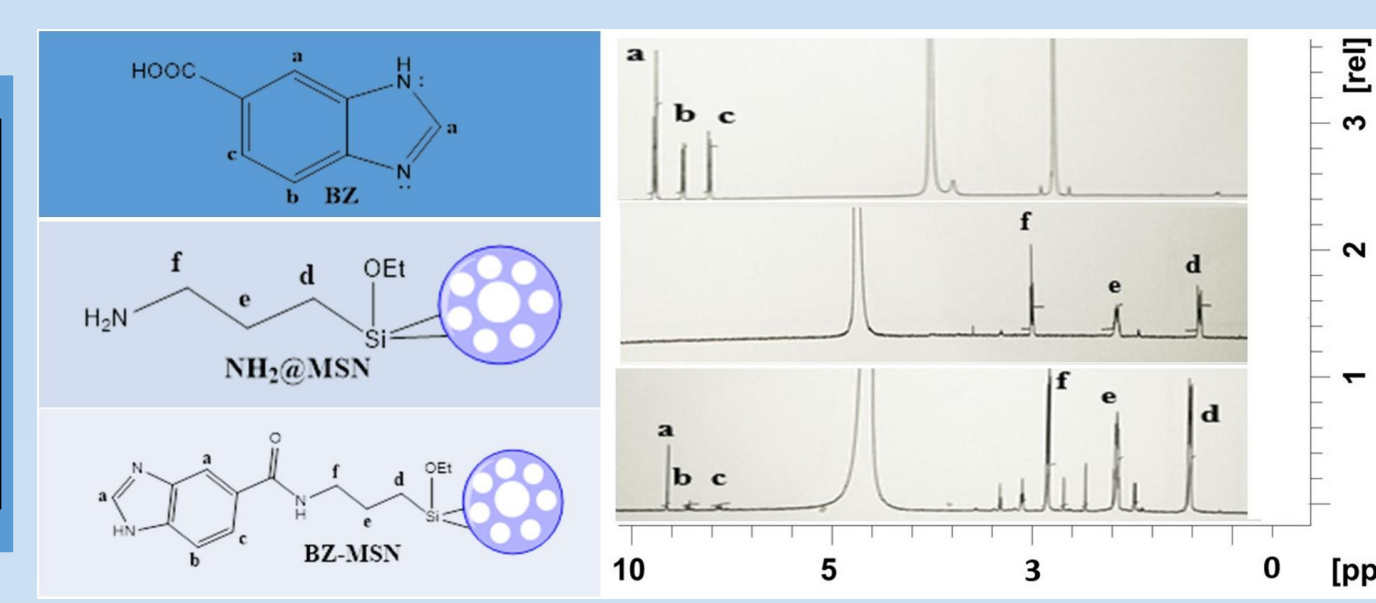
FTIR SPECTRA



SEM IMAGES



NMR SPECTRA



CONCLUSION

- A high performance, cheap pH responsive nanocarrier loaded with quercetin was designed.
- The nanoformulation showed high drug entrapment, stability and release the drug in mild acidic environment.
- In vitro analysis on Liver and Lung cancer cells revealed that our developed formulation showed significant inhibition of cells at lower concentration.
- The outcomes revealed the potential of our nanoformulation for safer and effective chemotherapy.



FUTURE GOALS

IN-VIVO STUDIES

CHRONIC TOXICITY

BIO-AVAILABILITY STUDIES

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