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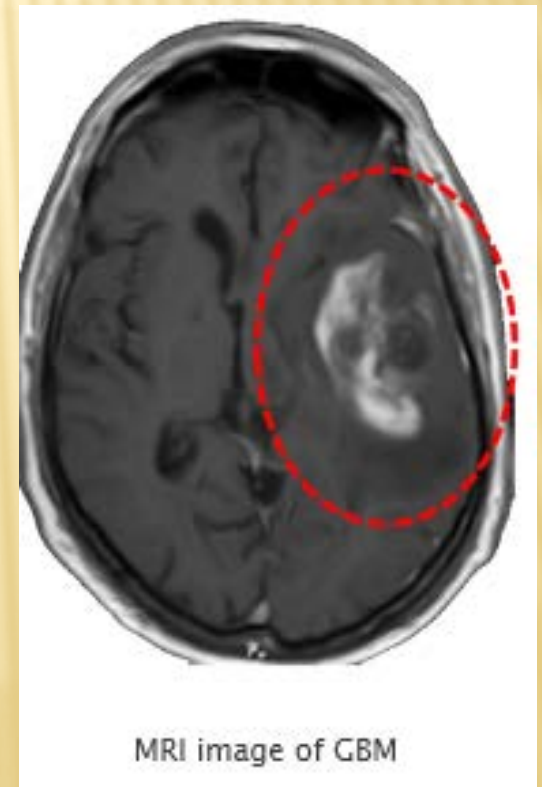
# APPLICATION OF NANOTECHNOLOGY IN BRAIN TUMOR SPECIALLY GLIOBLASTOMA MULTIFORM

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# GLIOBLASTOMA MULTIFORM...

- ❑ Among all types of cancers, Glioblastoma Multiform (GBM) have one of the lowest survival rate. despite of treatment methods such as surgery, chemotherapy and radiotherapy,
- ❑ survival rate is between 12-15 month  
5-y survival is 9.8%
- ❑ GBM: uncontrolled cell proliferation, high aggressive ability, high angiogenesis , cellular genetic instability



MRI image of GBM

# GBM...

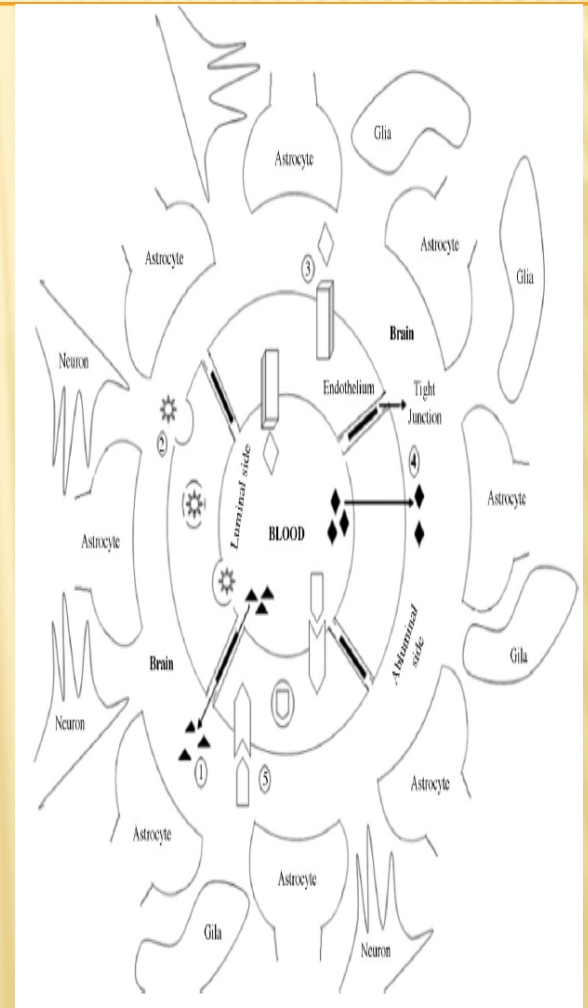
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□ major obstacles to treating GBM :

1. Feature of GBM
2. side effects and inefficacy of chemotherapeutic agents
3. blood-brain barrier (BBB)
4. blood-cerebrospinal fluid barrier (BCB)
5. drug resistance(...)
6. low bioavailability of drug
7. brain cancer stem cells (BCSCs)
8. Drug penetration into tissue is limited to ~1 mm

# BLOOD-BRAIN BARRIER...

- ❑ The blood-brain barrier (BBB) is a major obstacle to treating GBM
- ❑ The BBB is highly permeable to water, CO<sub>2</sub>, oxygen and lipid-soluble substances like alcohol. impermeable to plasma proteins
- ❑ selective permeability of the BBB arises from the tight junction, efflux pumps, multidrug resistance proteins and degrading enzymes
- ❑ The vast majority of GBMs recur within 2 cm of the original tumor focus



# STRATEGIES OF OVERCOMING THE BBB

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## ❑ Four major approaches:

1-Invasive approaches rely on the direct administration of drugs into the brain; catheter, drug implants, osmotic disruption of the BBB

2- Pharmacological approach relies on modification of drugs to enable penetration through the BBB

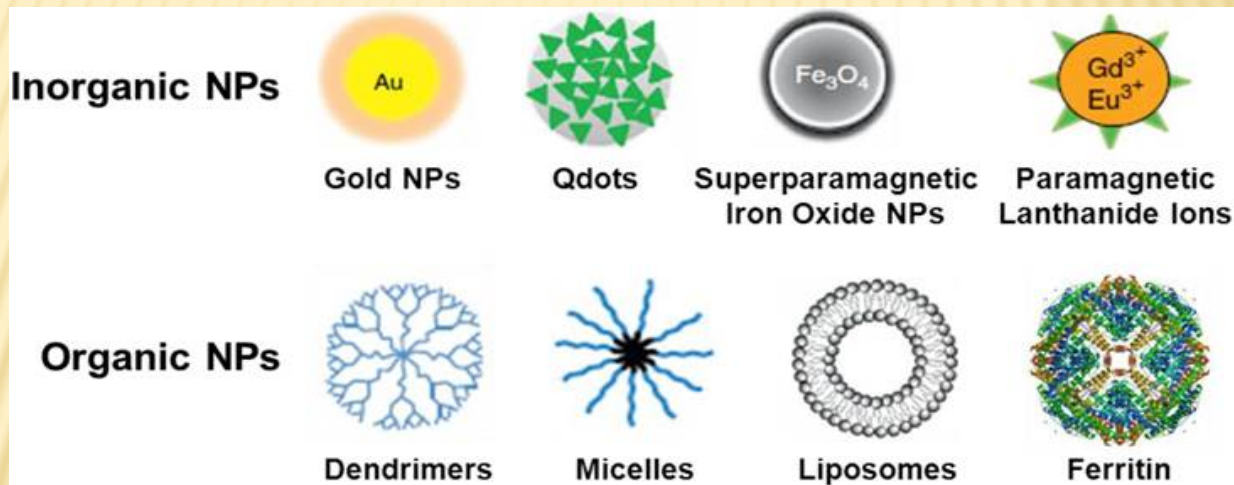
3- Physiological approaches; specific receptors or transport mechanisms in order to penetrate the BBB such as glucose, insulin, growth hormones and low-density lipoproteins, VEGF, low-density lipoprotein receptor proteins (LRPs)

❑ Disadvantages: long recovery times, decreased drug uptake and low receptor mediated transport

# NANOTECHNOLOGY AND NANOMEDICINE...

4- The final approach to bypass the BBB is through the use of NPs

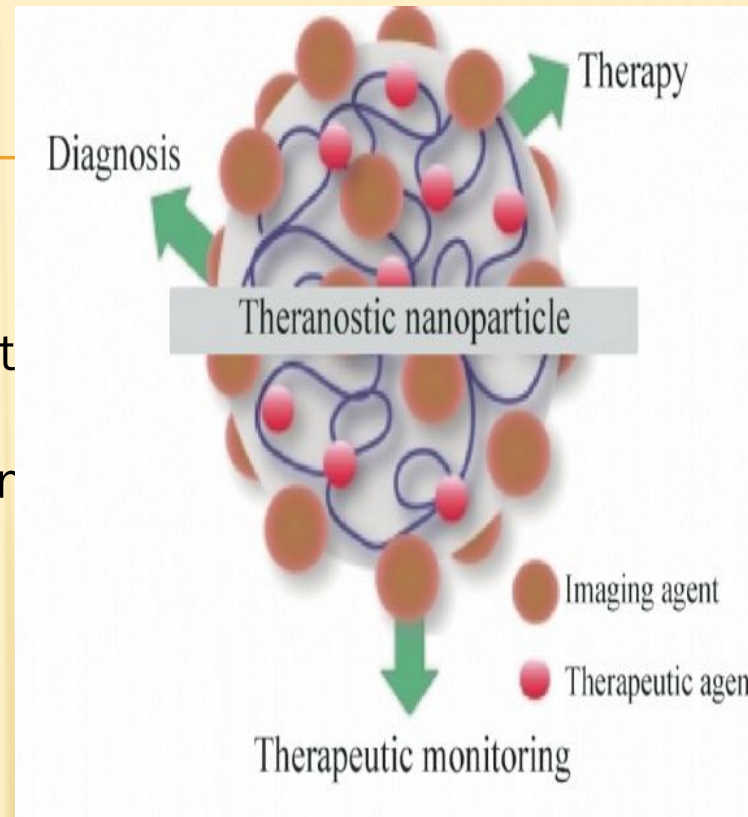
□ Drug delivery: 76% share of scientific papers



□ In brain cancer research: with the aim of imaging and drug delivery solid-inorganic (magnetic Fe<sub>3</sub>O<sub>4</sub> NPs, gadolinium NPs, gold NPs [AuNPs] and semiconductor quantum dots [QDs] and organic-based (dendrimer, hydrogel and polymer NPs

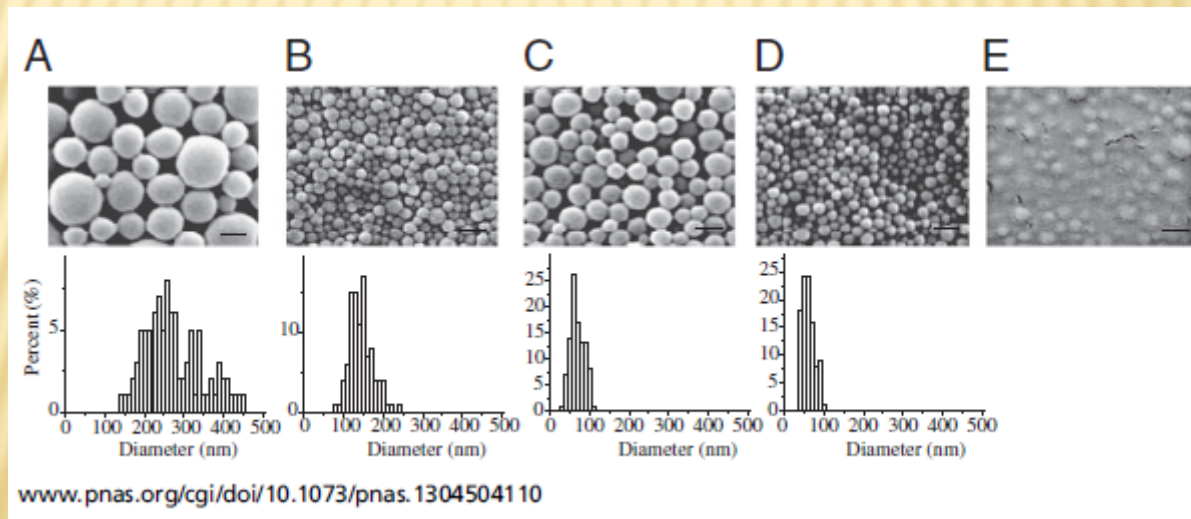
# NPS AS 'THERANOSTICS'...

- ❑ It should be apparent that one of the most promising aspects of nanomedicine is the multi modality of a NP in any given application
- ❑ Incorporation of both diagnostic and therapeutic modalities
- ❑ Utilized polymer-coated magnetic NPs to both deliver the anticancer drug eprubicin and provide an MRI contrast agent in brain tissue



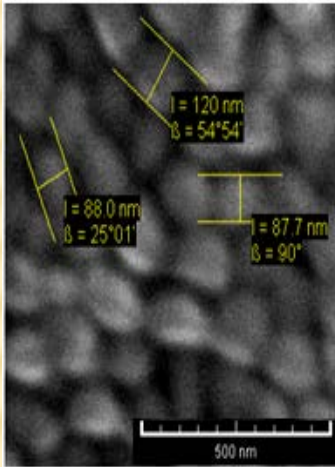
# EFFECTS OF NP PROPERTIES FOR PENETRATION ....

- 1- size
- 2- shape
- 3- surface charge
- 4- surface coating
- 5- ...





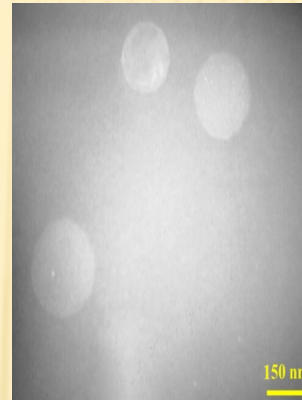
# IN OUR STUDIES ...



SEM; MTX-PLGA



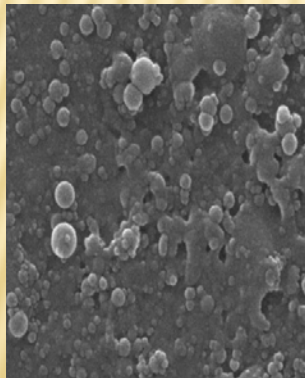
Powder; Curcumin-PLGA



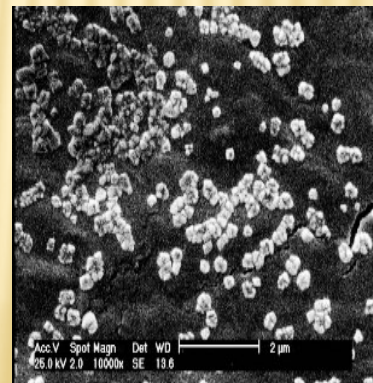
TEM; SLN- Indirubin



Albumin- MTX



SEM; Albumin -Imatinib



SEM; Albumin -Indirubin

