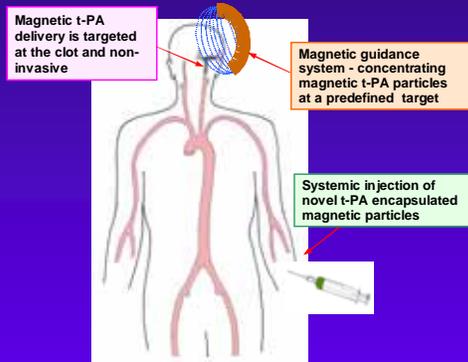


# Feasibility of Magnetically Guided Targeted Stroke Lysis Can Plasminogen Activator Loaded Magnetic Carriers Do the Job?

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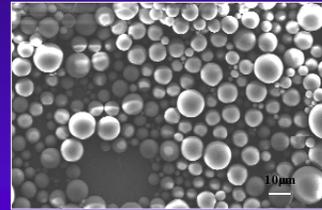
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## Background

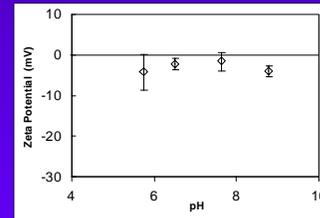


- Non-invasive, targeted tissue plasminogen activator (tPA) delivery
- Improved clot lysis efficiency
- Reduced side effects
- Extended therapeutic time window

## Model Protein Encapsulation



- Bovine serum albumin (BSA) loaded carriers
- Encapsulation efficiency 6–60% (70%, A. Lamprecht, 1999); batch differences noticed
- BSA loading 0.7–6.5%



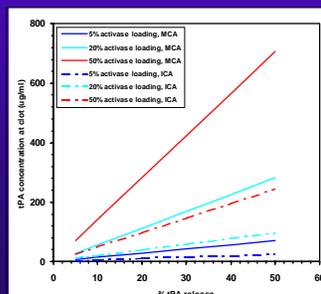
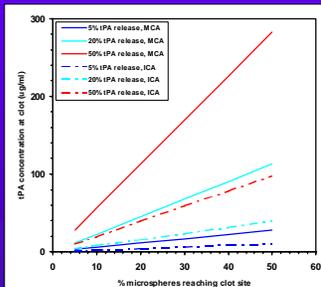
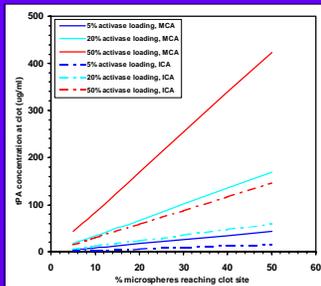
- Neutral surface charge (expressed as zeta potential)
- Suitable for prolonged intravascular survival

## Modeling

### Assumptions

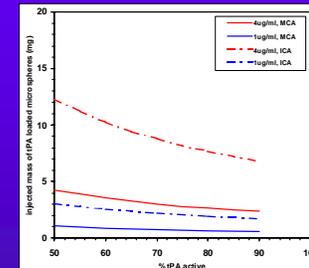
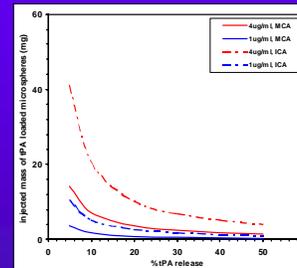
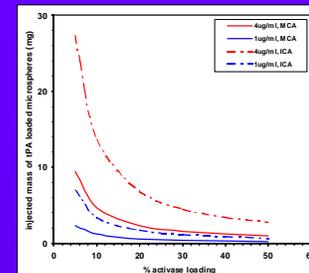
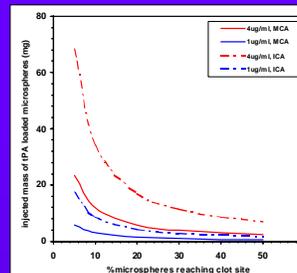
- Activase contains 2.22% tPA
- Targeted vessel dimension is 2.5 cm in length; 3 mm (middle cerebral artery, MCA) or 5.1 mm (internal carotid artery, ICA) in diameter
- Density of the tPA-loaded magnetic microspheres is 1.3 g/mL
- Packing of the microspheres is 0.7 ccp

• Assuming a single injection of 100 mg tPA-loaded microspheres, what is the tPA concentration at the clot site?



- 100 mg dosage is enough for effective clot lysis (1–4 µg/mL tPA concentration at clot site)

• Assuming that a targeted local tPA concentration at the MCA or ICA ranges from 1 to 4 µg/mL, what is the dosage of tPA-loaded microspheres needed?



- The dosage needed can be controlled to less than 100 mg—much lower than the toxic dose threshold of iron (750 mg) for humans.

## Summary

- tPA-loaded magnetic carriers feasible for magnetically guided targeted stroke lysis.
- Need to encapsulate magnetic substances into BSA/tPA microspheres and investigate how this affects BSA/tPA encapsulation efficiency, release, and activity.
- Batch to batch differences need to be reduced.

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