CEST MRI to contrast chondrosarcoma tumors: two contrasts in one acquisition

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Declaration of Financial Interests or Relationships

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I have no financial interests or relationships to disclose with regard to the subject matter of this presentation.

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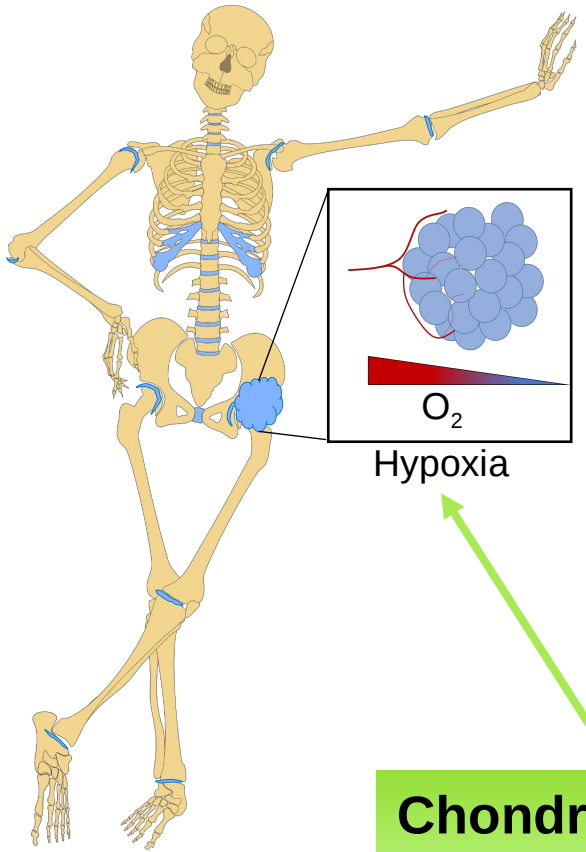
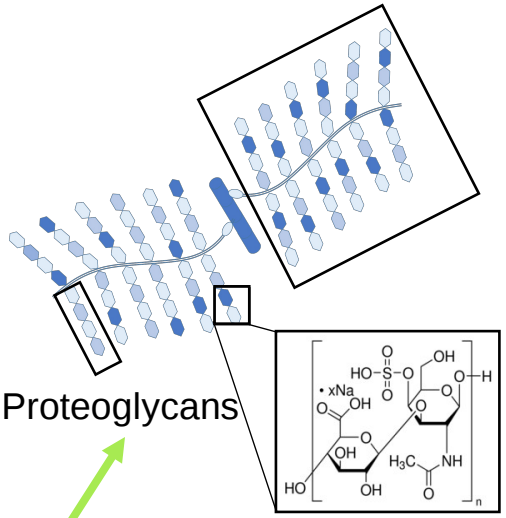
Pathological Context



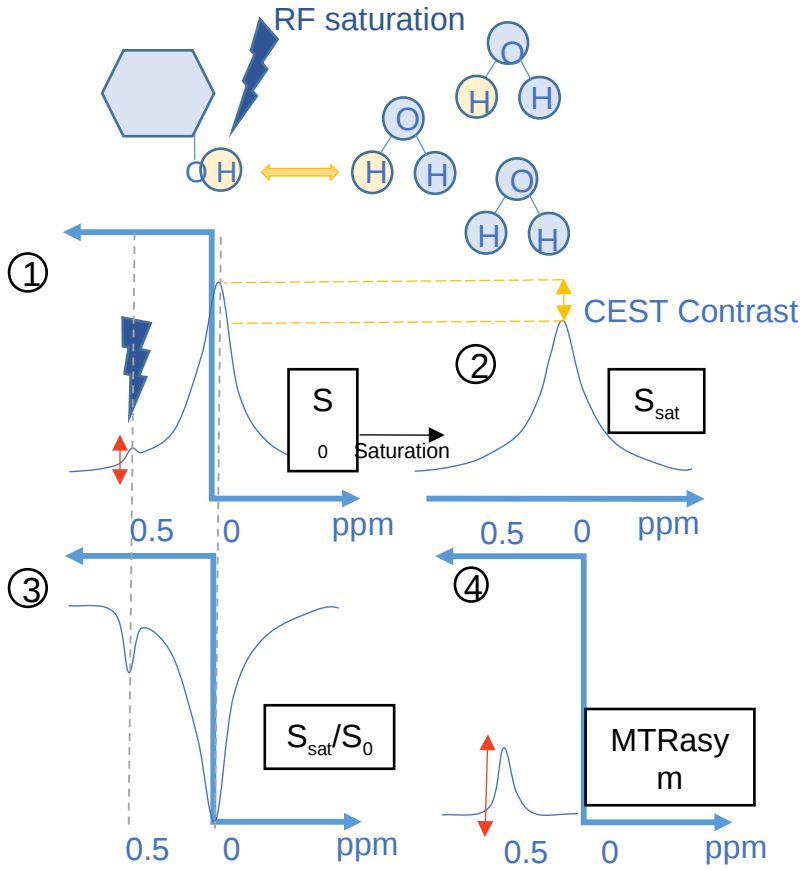


Chondrosarcoma

- **Malignant cartilage tumor**
- **2nd bone cancer**
- **Diagnostic by imaging**
  - ☜
    - no specific method
- 2 mains characteristics :
  - Hypoxia

Could be used to develop a new imaging strategy?

CEST MRI principle

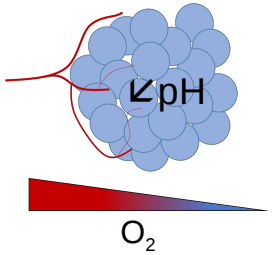


Functions	Frequency
Hydroxyl (OH)	250 - 750 Hz
Amines (NH_2)	800 – 1400 Hz
Amides (NH)	1500 – 2100 Hz

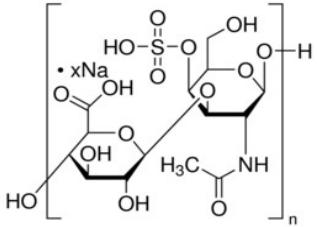
APT CEST

GAG CEST

Hypoxia



Proteoglycan



CEST-MRI should be able to simultaneously image both properties

In vivo study – Experimental design

H-EMC-SS Model

3M cells H-EMC-SS
Implanted orthotopically (tibia)

Human Chondrosarcoma

> 4 weeks

Swarm Model

Swarm tumor implanted sub-cutaneously

Rat Chondrosarcoma

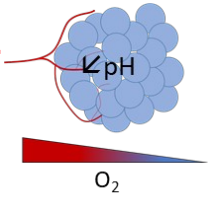
2 weeks

CEST MRI

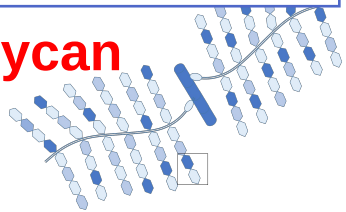
Reference imaging

PET	SPECT	MRI
^{18}F-MISO	^{99m}Tc-NTP 15-5	^{23}Na

Hypoxia

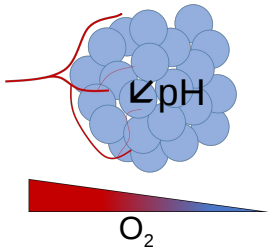


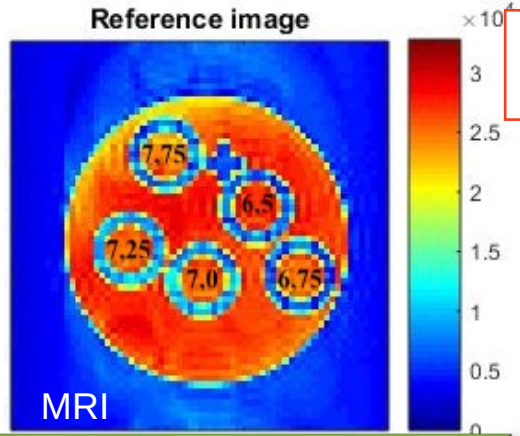
Proteoglycans



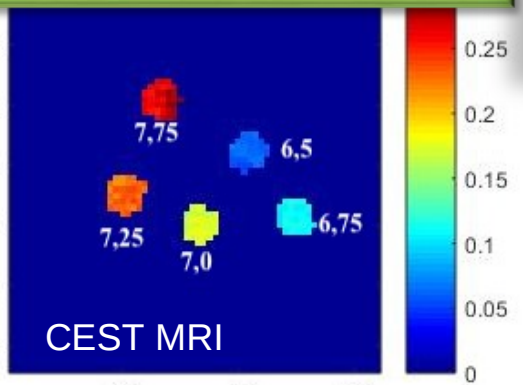
CEST MRI *in vitro*

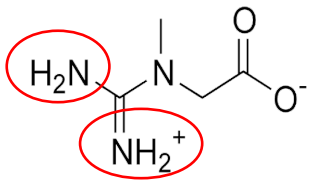
Hypoxia





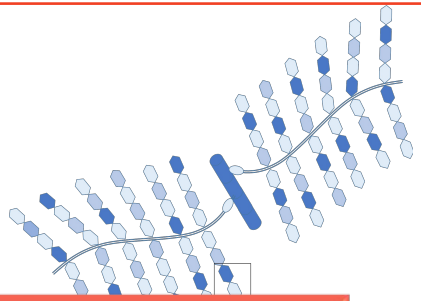
↗ pH = ↗ CEST effect

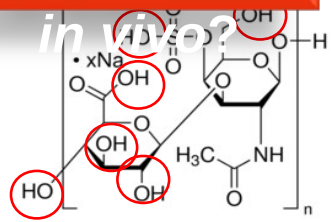




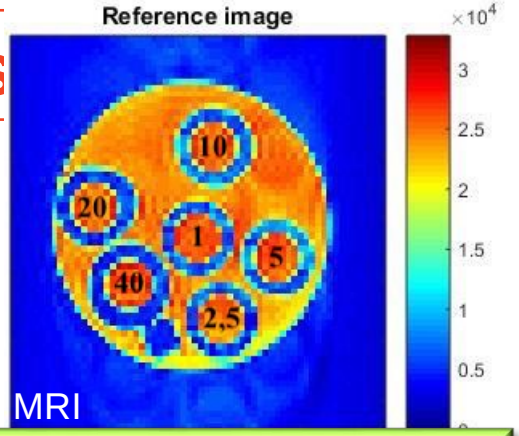
Creatin
e

Proteoglycans

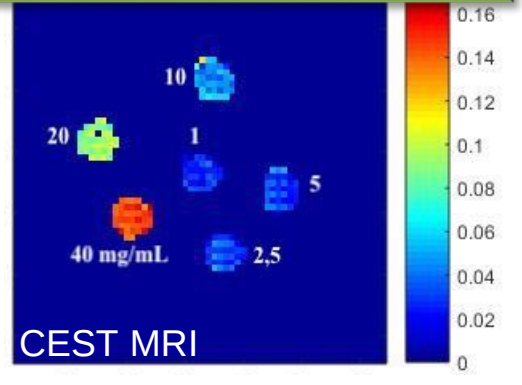




Chondroitin 4 sulfate



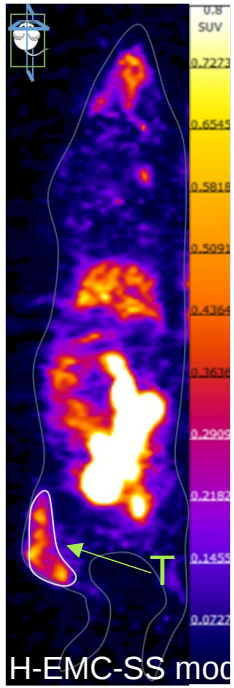
↗ PG = ↗ CEST effect



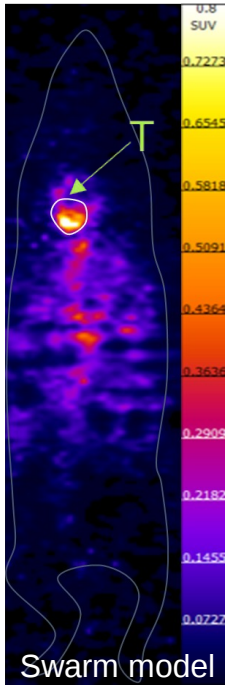
What happens *in vivo*?

PET *vs* CEST MRI

^{18}F-FMISO



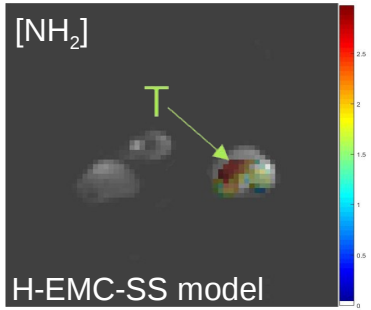
T/M ratio = 1,79

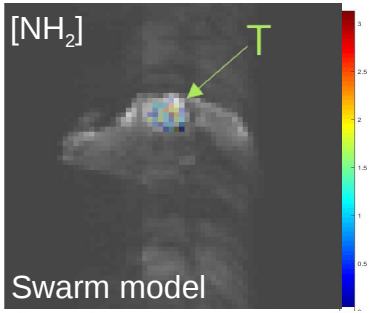


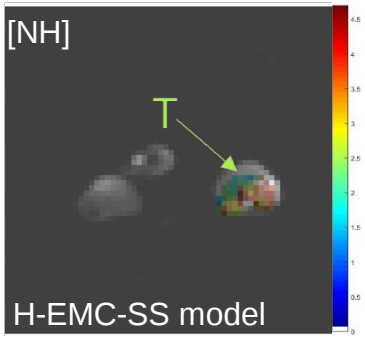
T/M ratio = 2,04

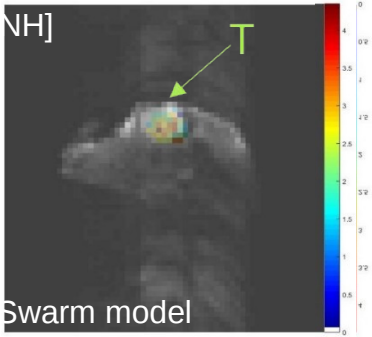
The two models are hypoxic

CEST Maps





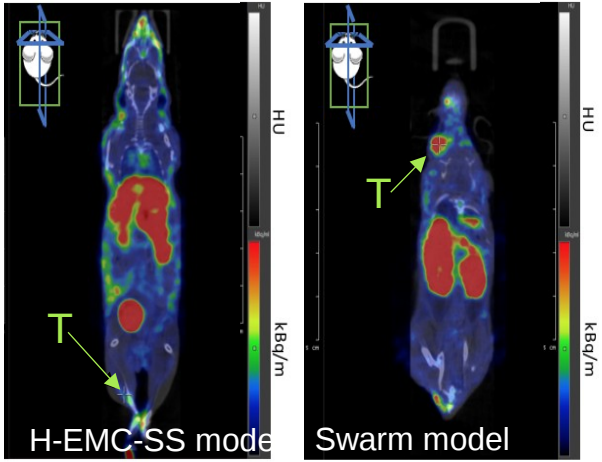




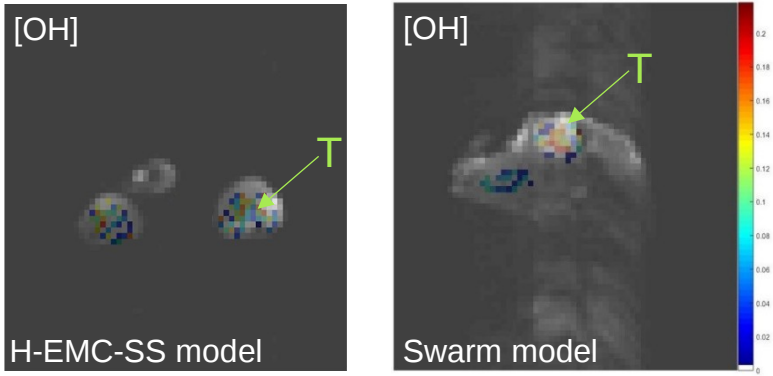
Difference in CEST effect observed in the two different models => difference in pH

SPECT *vs* CEST MRI

^{99m}Tc-NTP 15-5

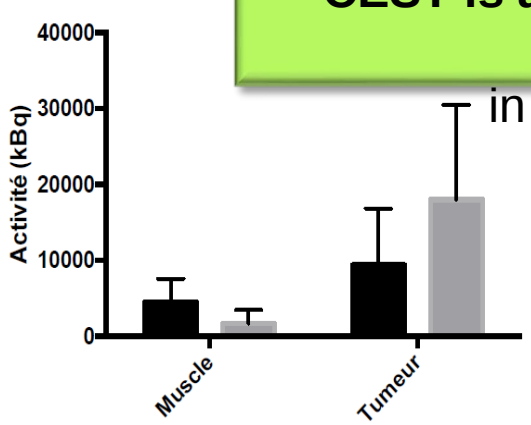


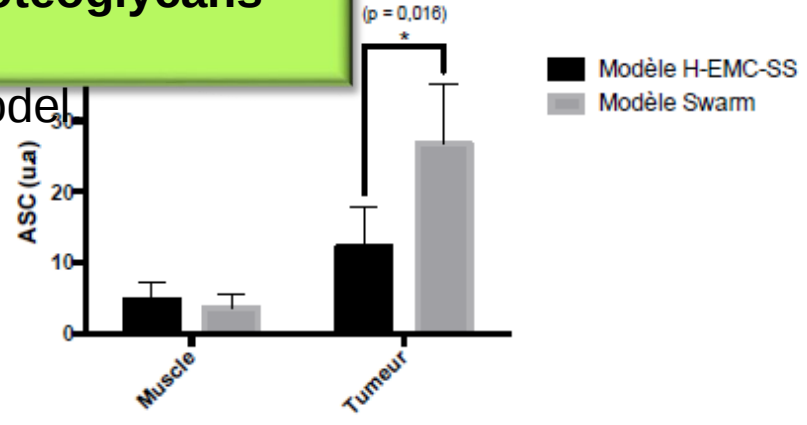
CEST Maps



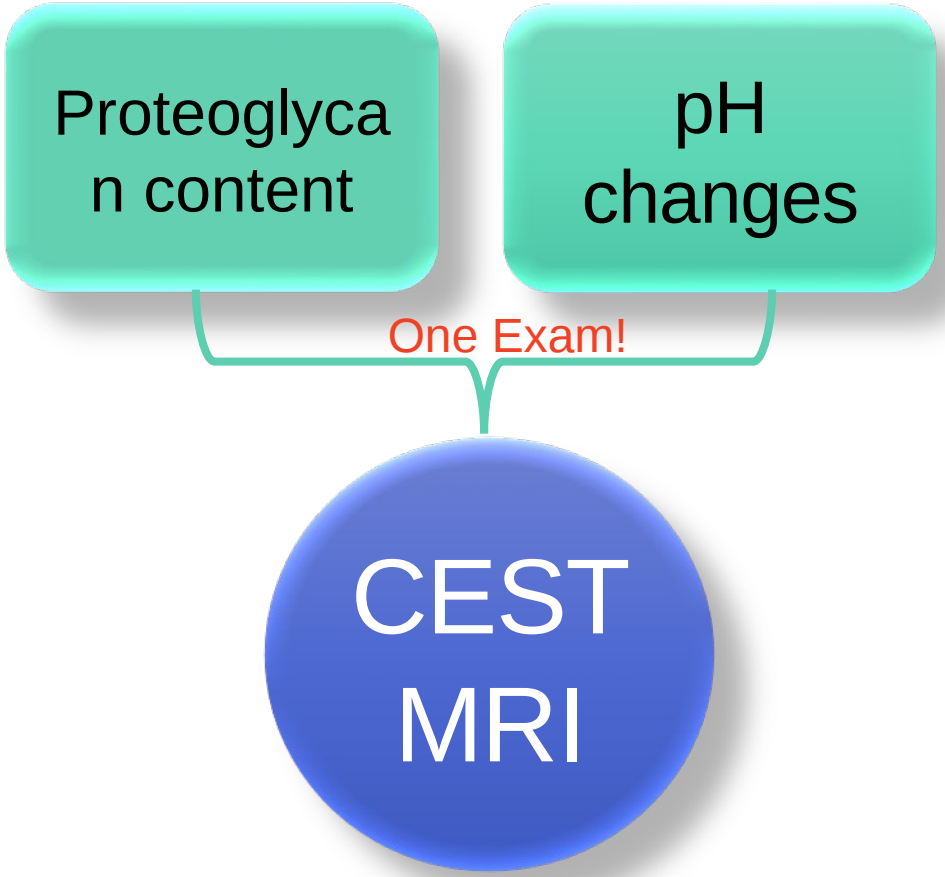
CEST is able to assess proteoglycans content

in different tumor model





Conclusion - Perspectives



New diagnostic tool for chondrosarcoma

Therapeutic efficiency
=> pronostic tool?