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

Leslie Mazuel, A. Voissiere, Valérie Weber, Yvain Gerard, Sophie Besse, J.-M. Bonny, Elisabeth Miot-Noirault, C. Peyrode, Guilhem Pages

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Paris Expo Porte de Versailles  
Paris, France

# Declaration of Financial Interests or Relationships

Speaker Name: Leslie MAZUEL

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

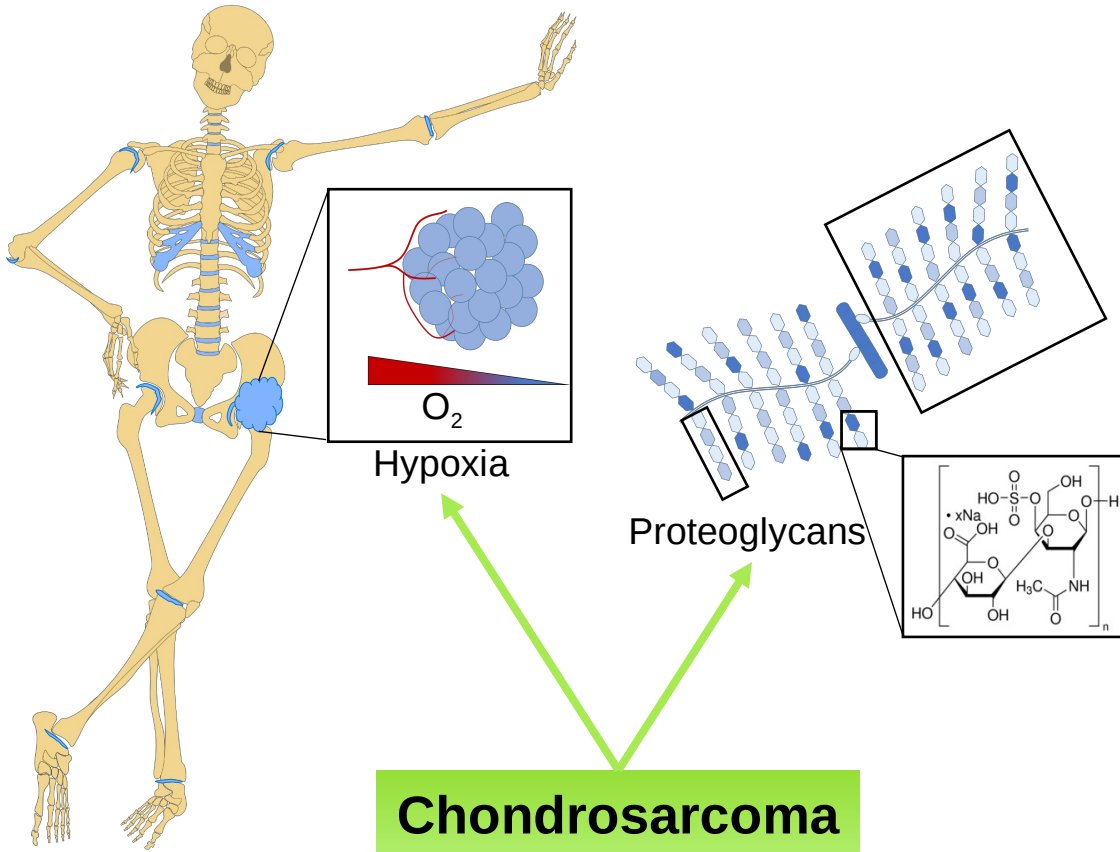
# CEST MRI to contrast chondrosarcoma tumors: two contrasts in one acquisition

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# Pathological Context



**Chondrosarcoma**

- **Malignant cartilage tumor**
- **2<sup>nd</sup> bone cancer**
- **Diagnostic by imaging**

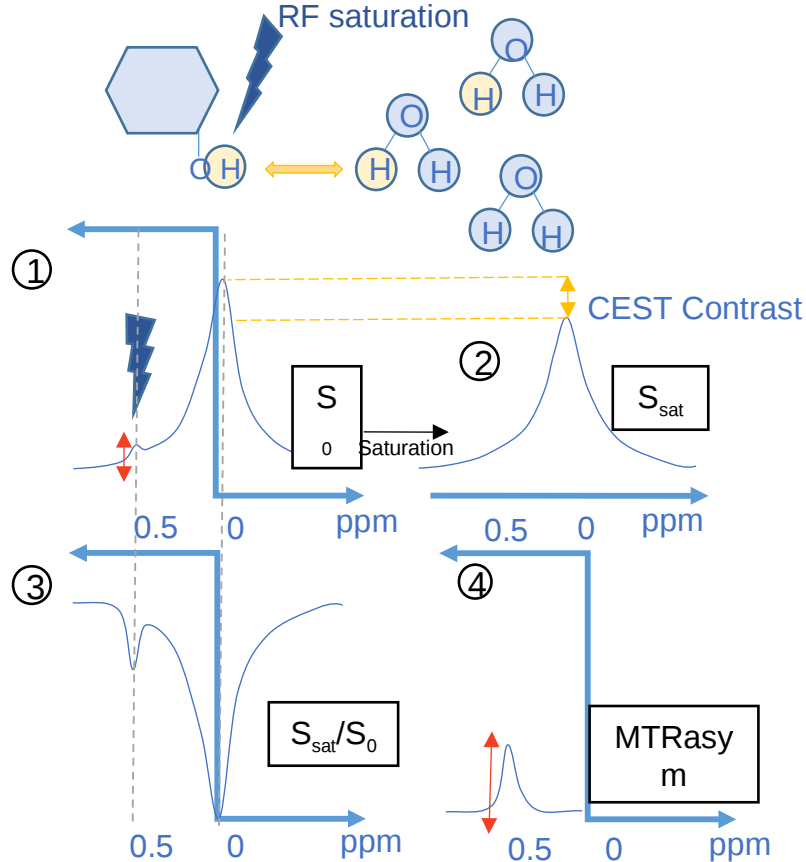


- no specific method

- 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<sub>2</sub>)

800 - 1400 Hz

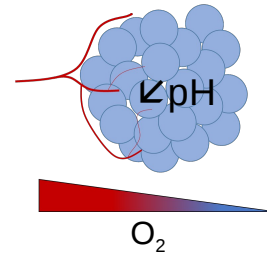
Amides (NH)

1500 - 2100 Hz

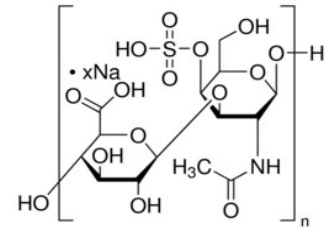
APT CEST

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

7 weeks



## Swarm Model

Rat Chondrosarcoma

Swarm tumor implanted sub-cutaneously

2 weeks

**CEST MRI**

PET

$^{18}\text{F}$ -MISO

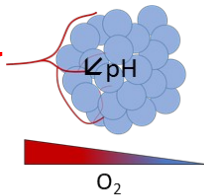
SPECT

$^{99\text{m}}\text{Tc}$ -NTP 15-5

MRI

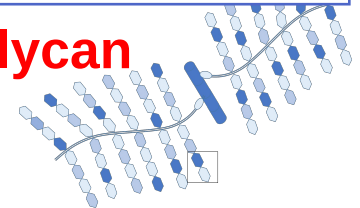
$^{23}\text{Na}$

**Hypoxia**



**Proteoglycans**

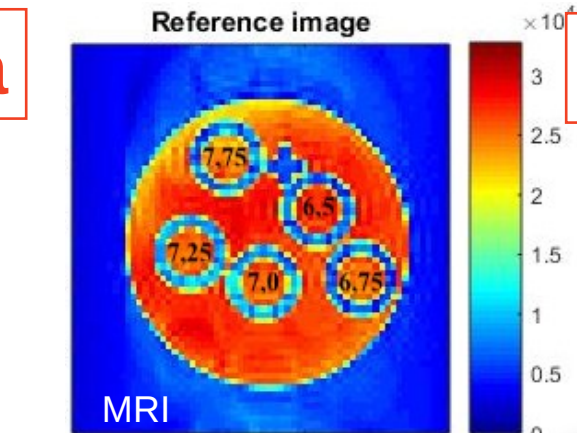
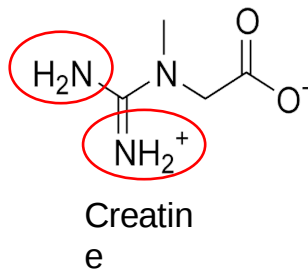
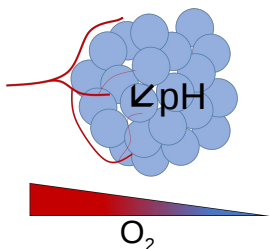
**S**



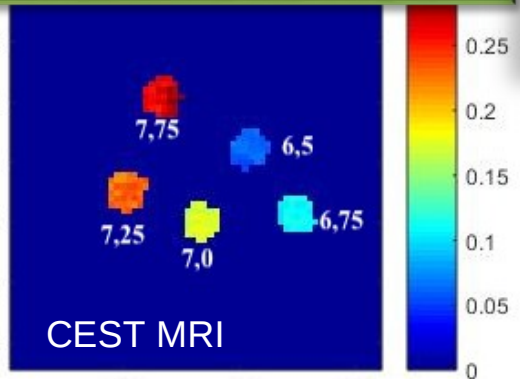
Reference imaging

# CEST MRI *in vitro*

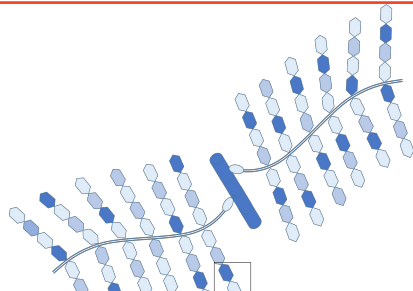
## Hypoxia



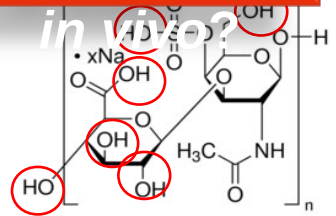
$\nearrow$  pH =  $\nearrow$  CEST effect



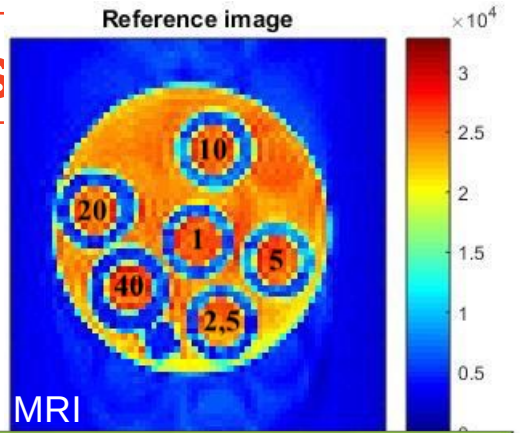
## Proteoglycans



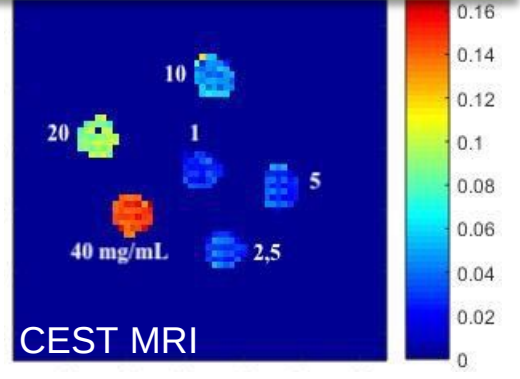
What happens *in vitro*?



Chondroitin 4 sulfate



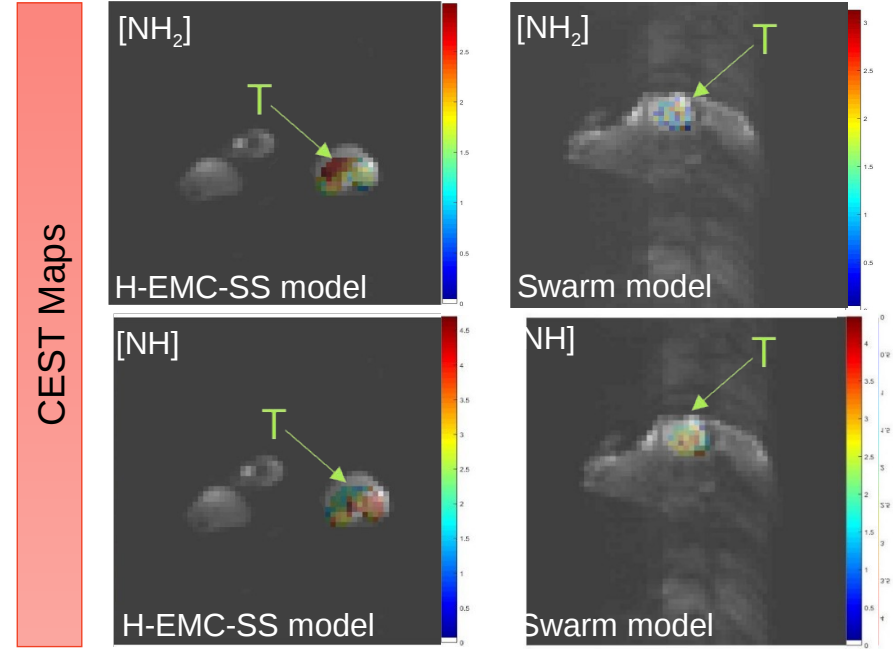
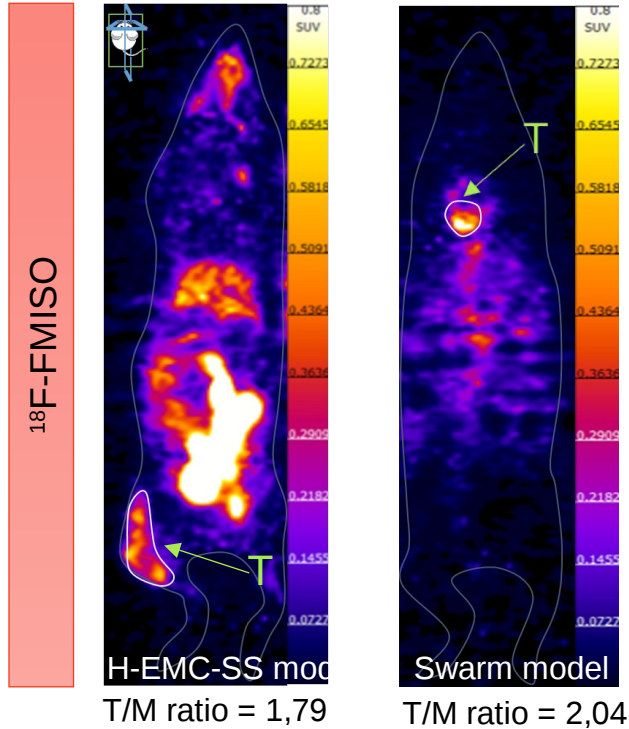
$\nearrow$  PG =  $\nearrow$  CEST effect



# PET

VS

# CEST MRI



The two models are hypoxic

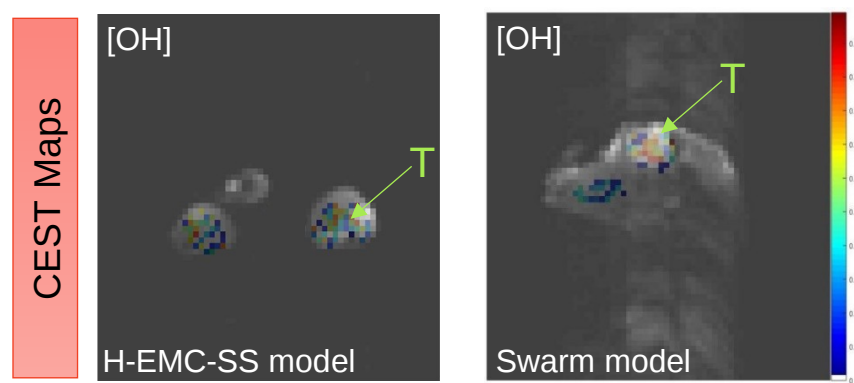
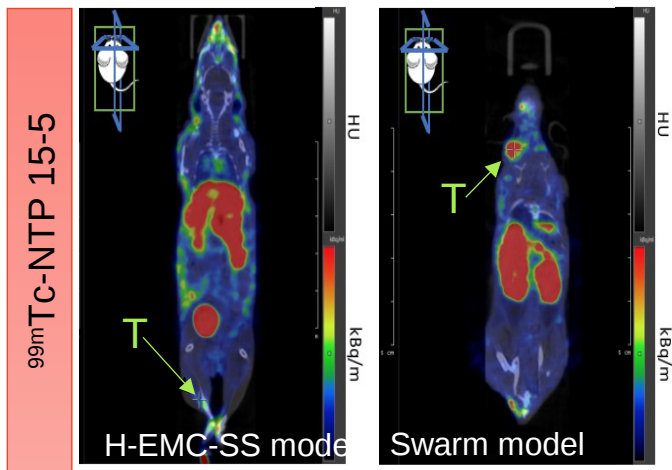
Difference in CEST effect observed  
in the two different models =>  
difference in pH



# SPECT

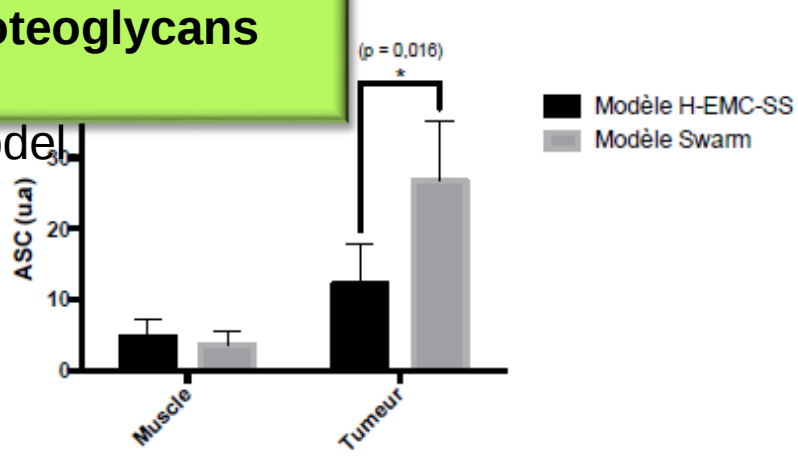
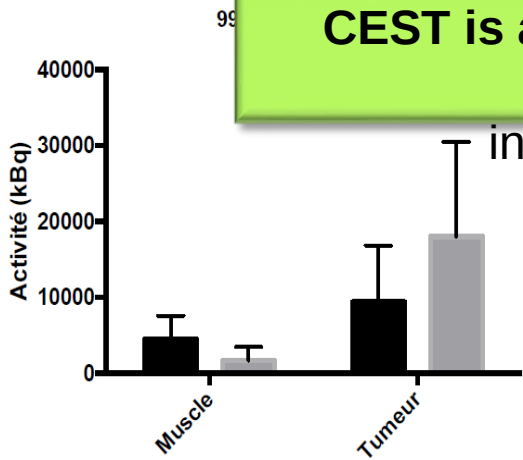
VS

# CEST MRI

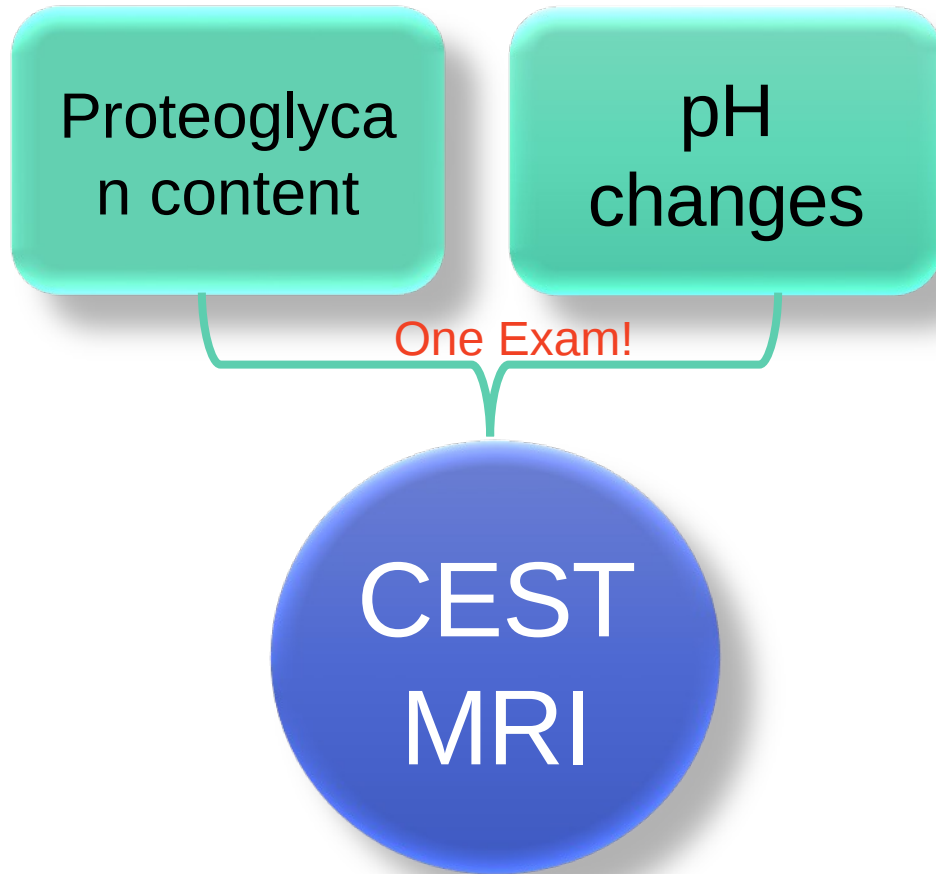


**CEST is able to assess proteoglycans content**

in different tumor model



# Conclusion - Perspectives



New diagnostic tool  
for  
chondrosarcoma

Therapeutic efficiency  
=> prognostic tool?

A red-bordered box is tilted to the right and contains the text 'New diagnostic tool for chondrosarcoma'. A blue arrow points from the bottom of this box to the text 'Therapeutic efficiency => prognostic tool?' located below it.