



**HAL**  
open science

## Tumor microenvironment imaging: Benefits of multimodality to study chondrosarcoma

Roxane Autissier, ; Leslie Mazuel, Elise Maubert, Jean-Marie Bonny, Philippe Auzeloux, Sébastien Schmitt, Amidou Traoré, Caroline Peyrode, Elisabeth Miot-Noirault, Guilhem Pagés

### ► To cite this version:

Roxane Autissier, ; Leslie Mazuel, Elise Maubert, Jean-Marie Bonny, Philippe Auzeloux, et al.. Tumor microenvironment imaging: Benefits of multimodality to study chondrosarcoma. Journées du Grand Sud, Jul 2021, CLERMONT-FERRAND, France. 10.18145/ivia) . hal-03334046

**HAL Id: hal-03334046**

**<https://hal.inrae.fr/hal-03334046v1>**

Submitted on 3 Sep 2021

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Tumor microenvironment imaging: Benefits of multimodality to study chondrosarcoma

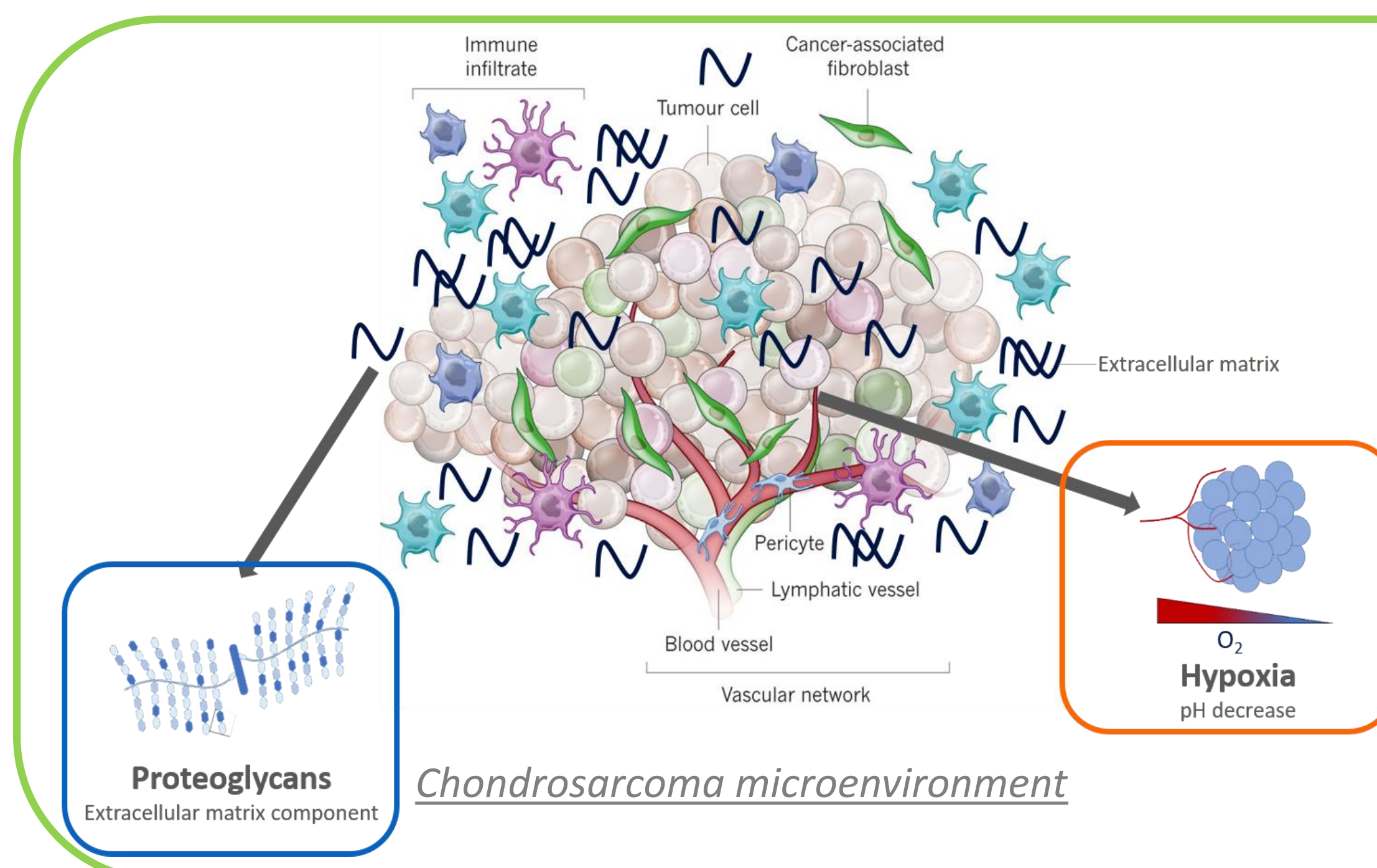
Roxane Autissier<sup>1,2,3</sup> ; Leslie Mazuel<sup>1,2,3</sup> ; Elise Maubert<sup>2</sup> ; Jean-Marie Bonny<sup>1,3</sup> ; Philippe Auzeloux<sup>2</sup> ; Sébastien Schmitt<sup>2</sup> ; Amidou Traoré<sup>1,3</sup> ; Caroline Peyrode<sup>2</sup> ; Elisabeth Miot-Noirault<sup>2</sup> ; Guilhem Pagés<sup>1,3</sup>

<sup>1</sup>INRAE, UR QuaPA, F-63122 Saint-Genès-Champanelle, France

<sup>2</sup>Université Clermont Auvergne, INSERM, U1240 Imagerie Moléculaire et Stratégies Théranostiques, F-63000 Clermont-Ferrand, France

<sup>3</sup>INRAE, ISC AgroResonance, F-63122 Saint-Genès-Champanelle, France

Contact: Roxane.Autissier@uca.fr



## CONTEXT

Chondrosarcoma (CHS) is a malignant cartilaginous tumor representing the most common primary bone cancer in adults (<https://www.cancer.org/cancer/bone-cancer/about/key-statistics.html>, American Cancer Society Web site, 2021). Due to its dense chondrogenic extracellular matrix and hypoxic environment, CHS is highly resistant to conventional chemotherapy and radiation (Nazeri E *et al.*, *Crit Rev Oncol Hemat*, 2018). Development of multimodal imaging to characterize and map *in vivo* CHS microenvironment is fundamental for specific diagnosis and personalized therapy.

**In this context, we proposed to combine the resolution of chemical exchange saturation transfer (CEST) MRI with nuclear imaging sensitivity to improve CHS microenvironment understanding (Autissier R *et al.*, *Magn Reson Med*, 2021).**

## METHODS

Swarm rat CHSs were implanted subcutaneously in NMRI nude mice (n=10).

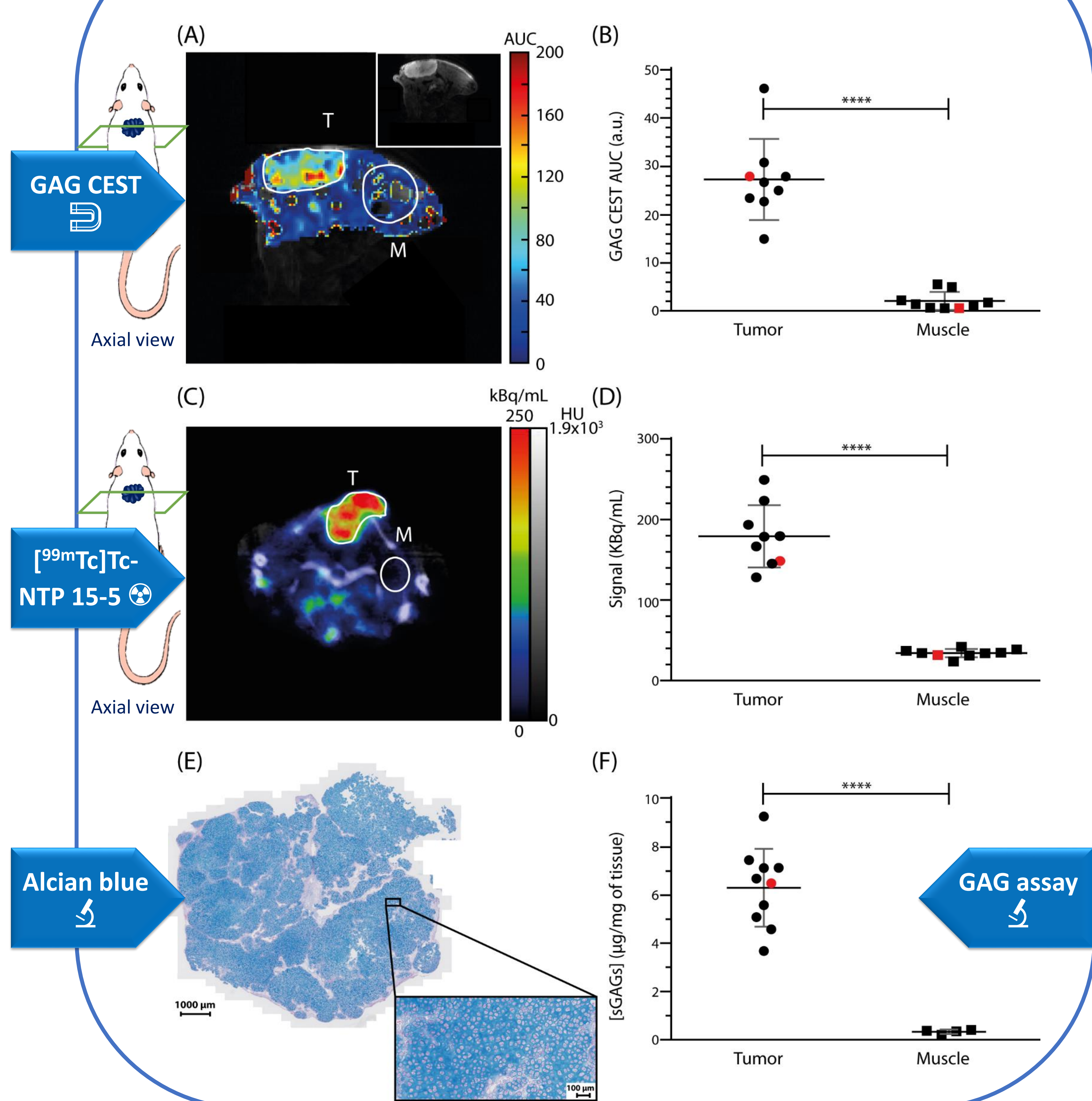
When tumors were measurable (12-16 days post-transplant), mice were imaged by CEST MRI (Dou W *et al.*, *Quant Imaging Med Surg*, 2019). Proteoglycans, the main component of chondrogenic extracellular matrix, were quantified by GAG CEST contrast. Guanidyl- and APT CEST contrasts were combined to characterize acidic pH, as hypoxia reflect.

These two features, proteoglycans and hypoxia, were assessed in parallel by nuclear imaging with [<sup>99m</sup>Tc]Tc-NTP 15-5 SPECT imaging (Peyrode C *et al.*, *Sarcoma*, 2011) and [<sup>18</sup>F]-FMISO PET imaging (Rajendran JG *et al.*, *Clin Cancer Res*, 2004), respectively.

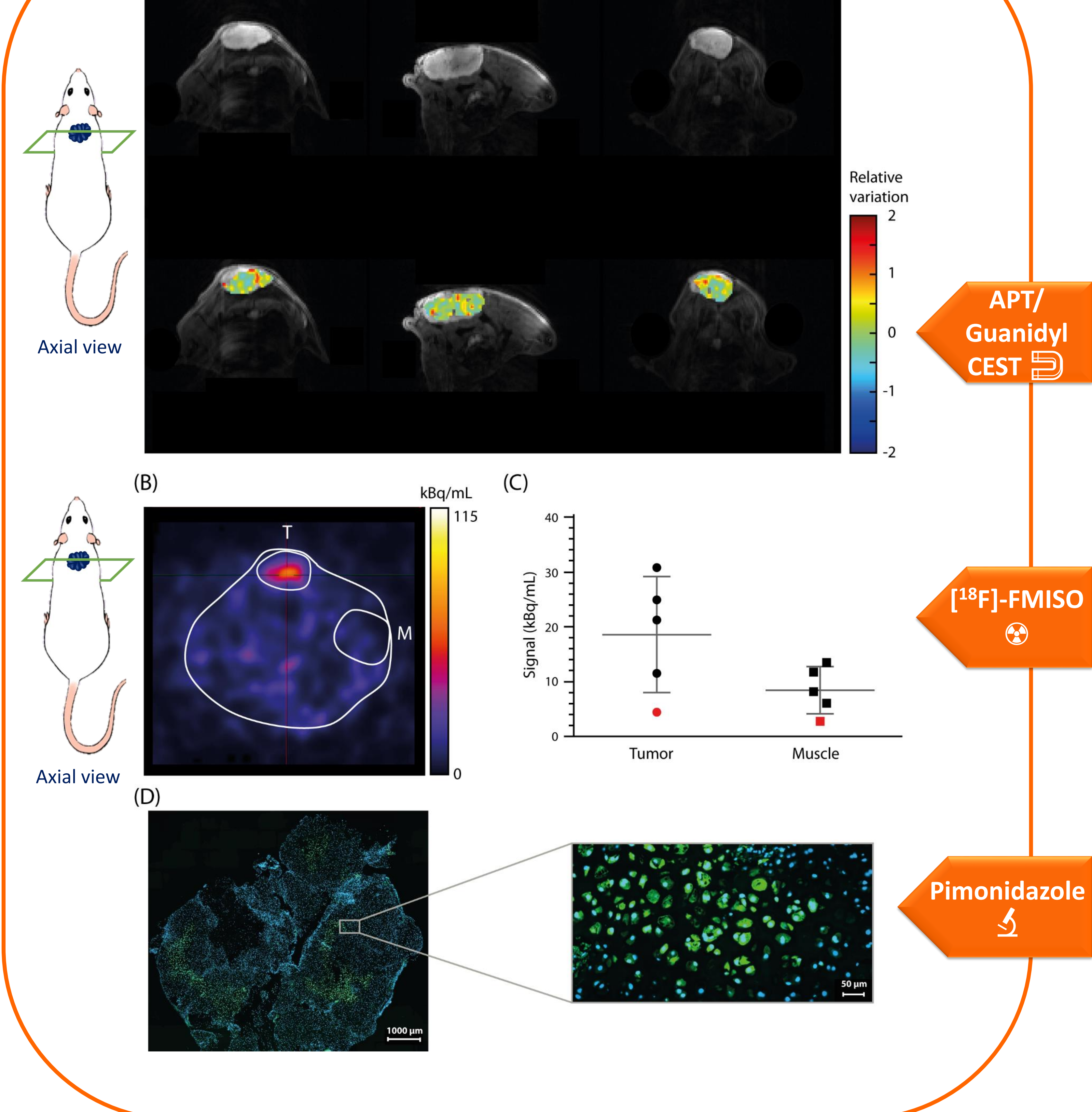
Data were also completed by *ex vivo* analyses of tumor and muscle proteoglycans (Alcian blue stain and biochemical assay with dimethylmethylene blue) and hypoxia (pimonidazole immunofluorescence).

## RESULTS

### PROTEOGLYCAN MAPPING



### HYPOXIA MAPPING



**CONCLUSION:** The results from CEST MRI, nuclear imaging and *ex vivo* analyses were in agreement and highlighted a rich proteoglycan extracellular matrix and a heterogeneous hypoxic tumoral microenvironment for Swarm rat CHS xenograft in mice.

This study emphasizes the role of multimodal imaging to characterize tumor phenotypes resistant to treatments and allows a better understanding of the relationship between tumor cells and their environment.

Grants: "La Ligue contre le Cancer Auvergne-Rhône-Alpes". All imaging experiments were performed at In Vivo Imaging Auvergne (IVIA) facility (Clermont-Ferrand, France; <https://doi.org/10.18145/ivia>).