



Chrysoula Vraka

# The next frontier in cell analysis: radioFA<sup>☉</sup>S and radioMA<sup>☉</sup>S

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Unpublished data

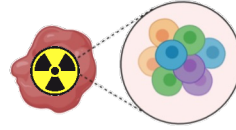
# radioFACS ?



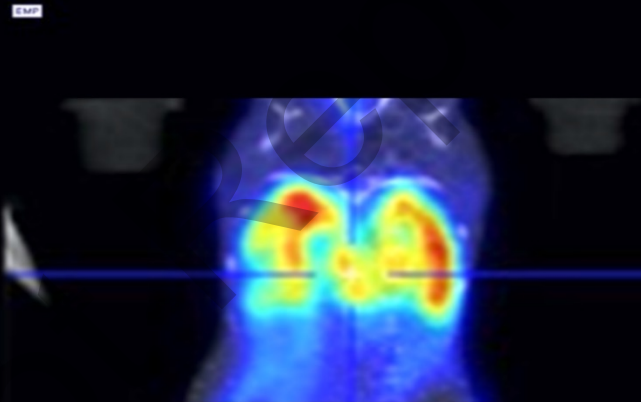
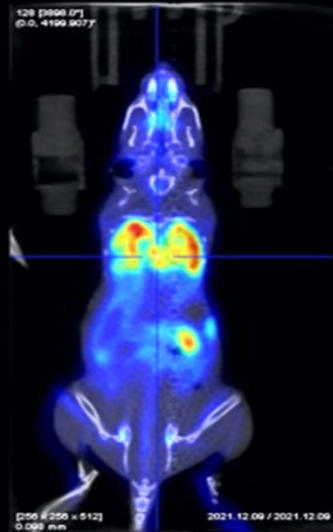
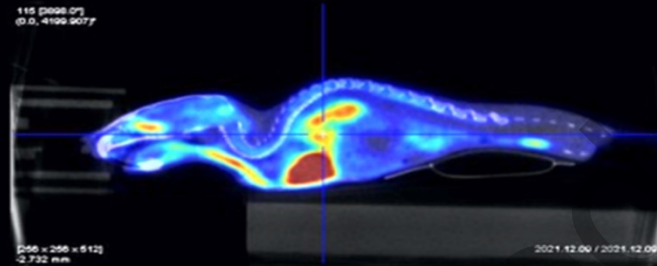
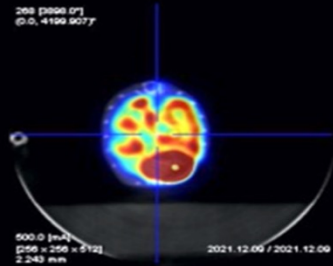
Fax



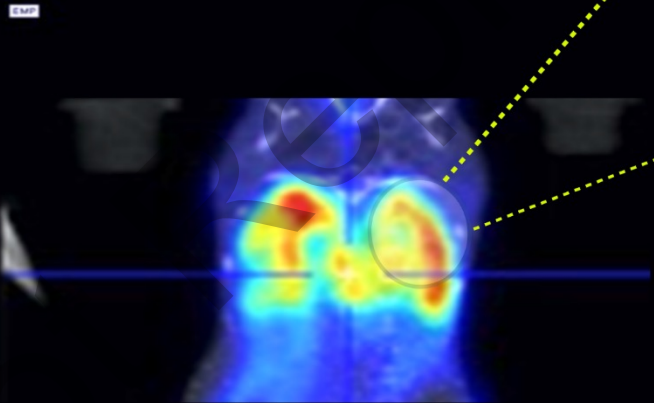
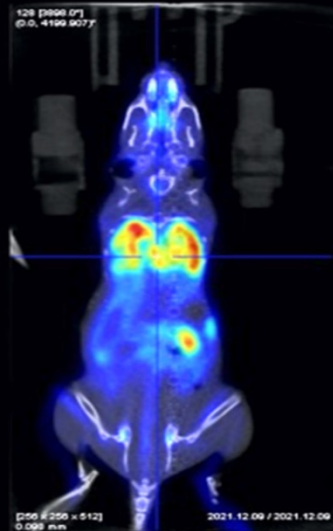
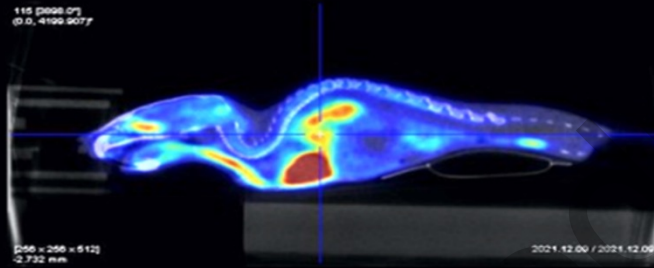
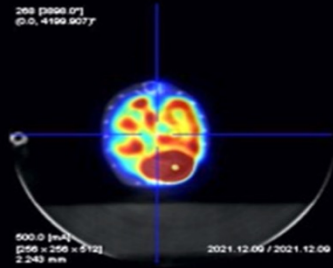
FACS (Fluorescence Activated Cell Sorting)



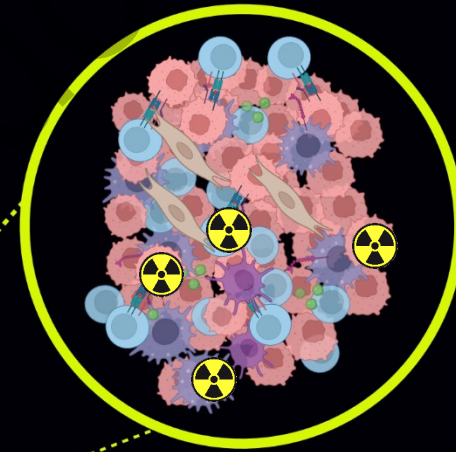
Do Not Reproduce



*[<sup>18</sup>F]FDG μPET/CT image of KPA mouse visualizing the lung tumors eleven weeks after virus inhalation*

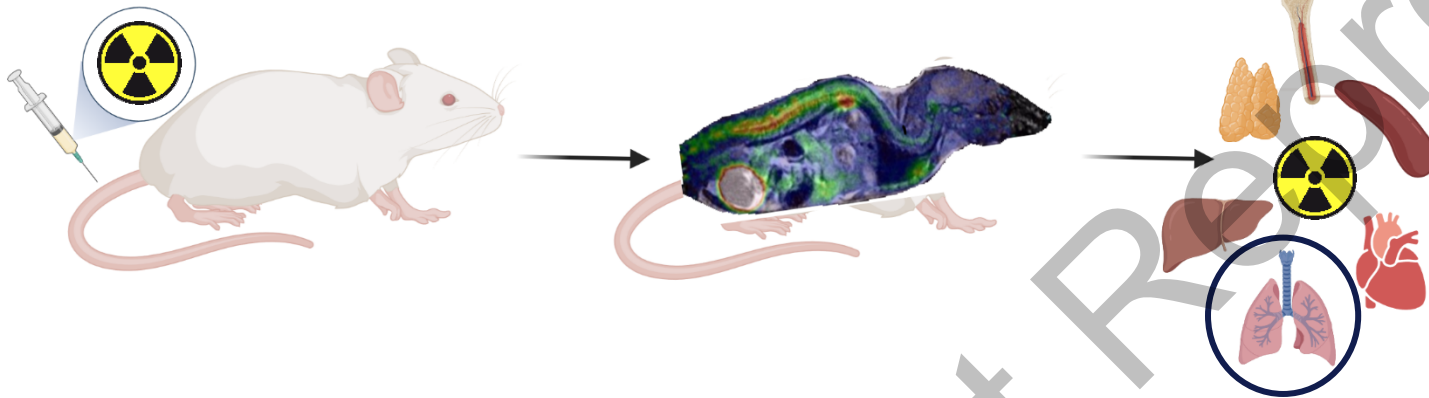


?

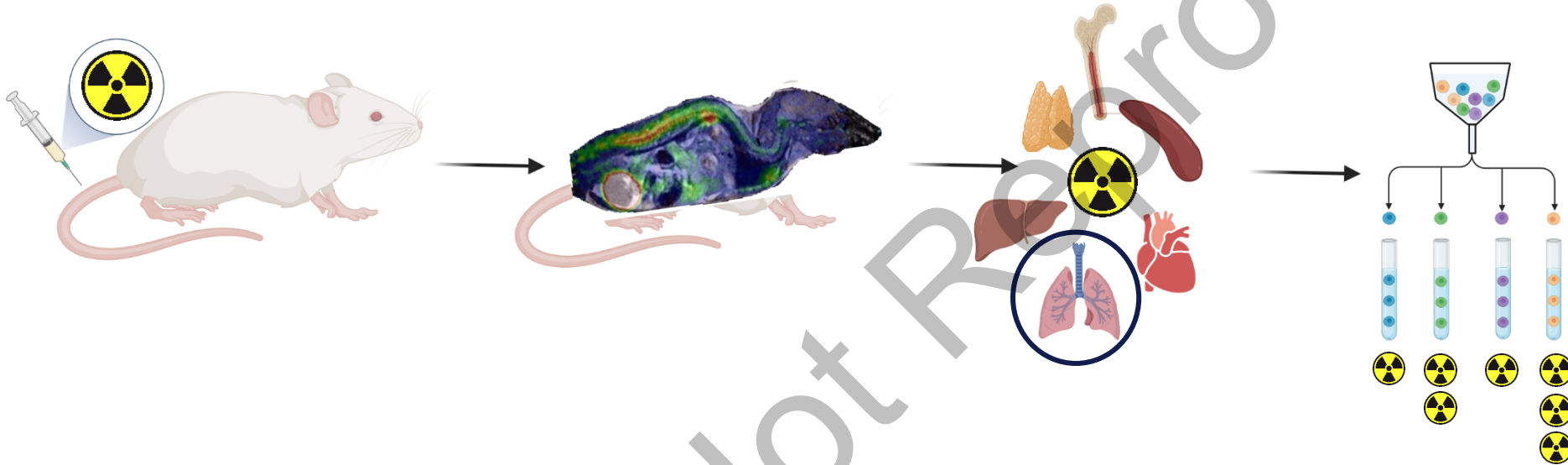


*[<sup>18</sup>F]FDG μPET/CT image of KPA mouse visualizing the lung tumors eleven weeks after virus inhalation*

# Workflow

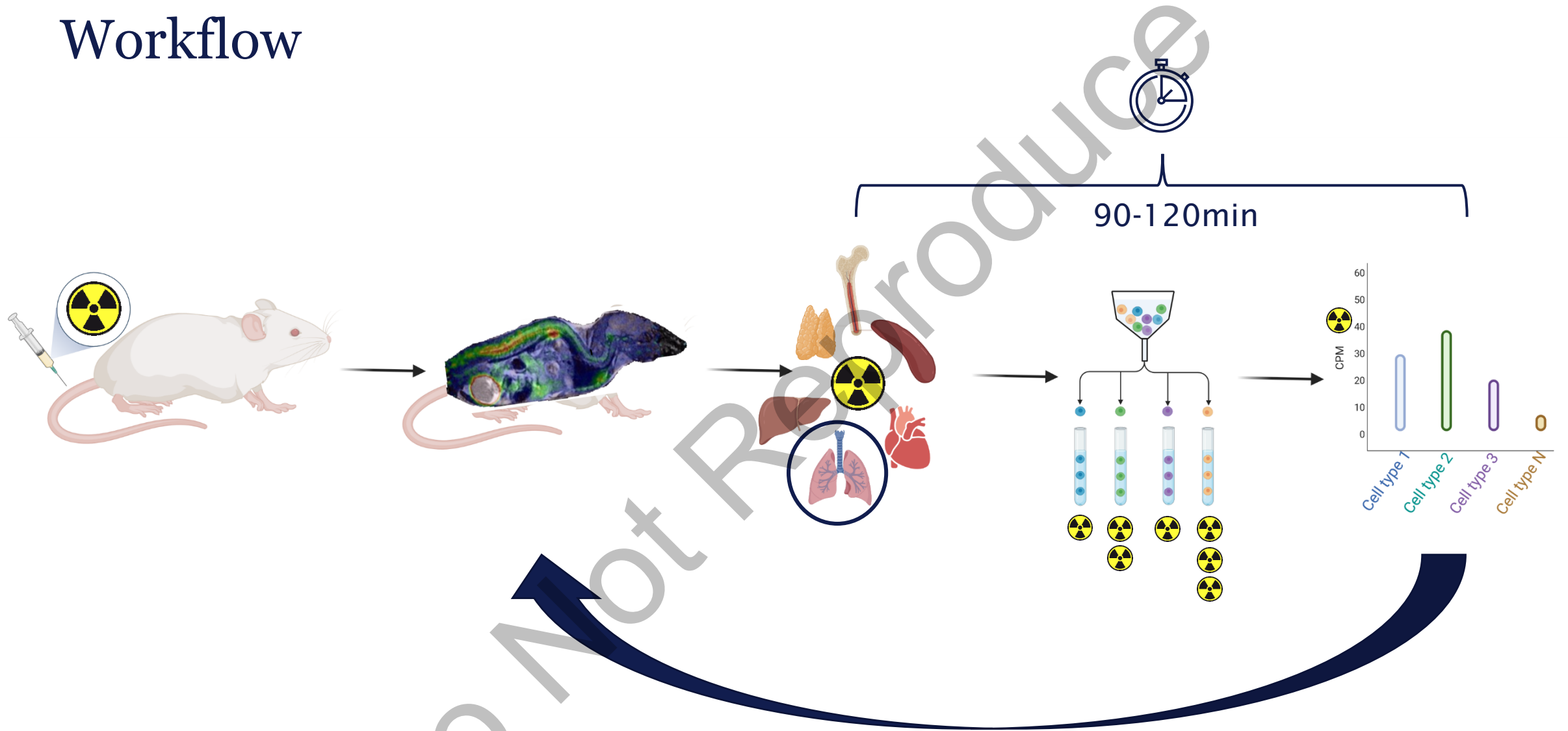


# Workflow



Similar methods by  
Reinfeld B. et al. *Nature* 593:282-8 (2021). DOI:10.1038/s41586-021-03442-1  
Bartos LM. et al. *J Nucl Med* 63:1459-62 (2022), DOI:jnumed.122.264171

# Workflow



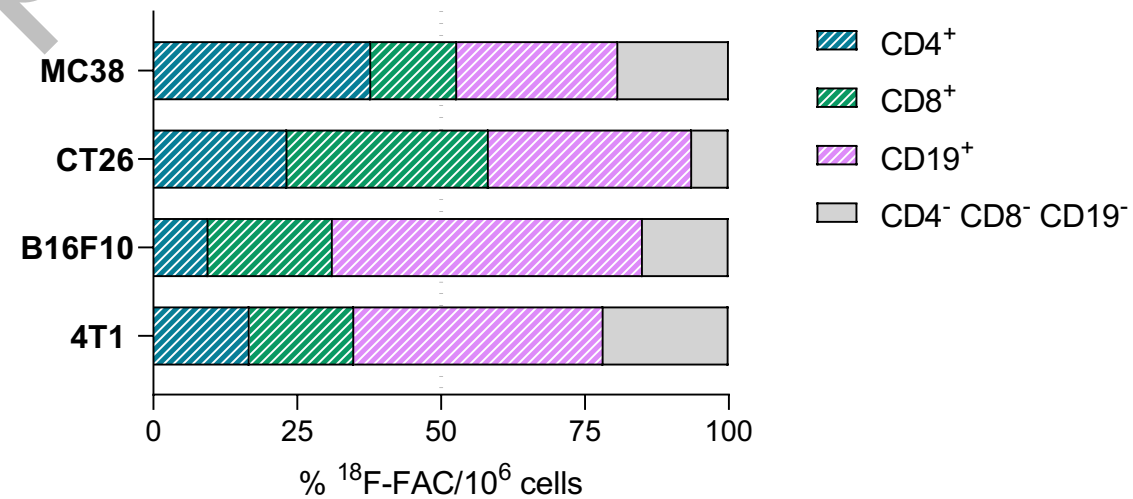
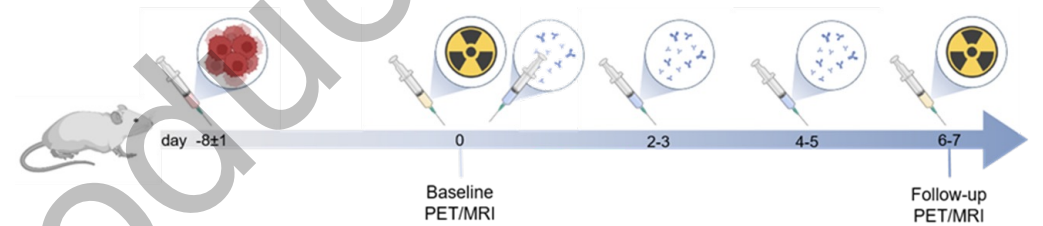
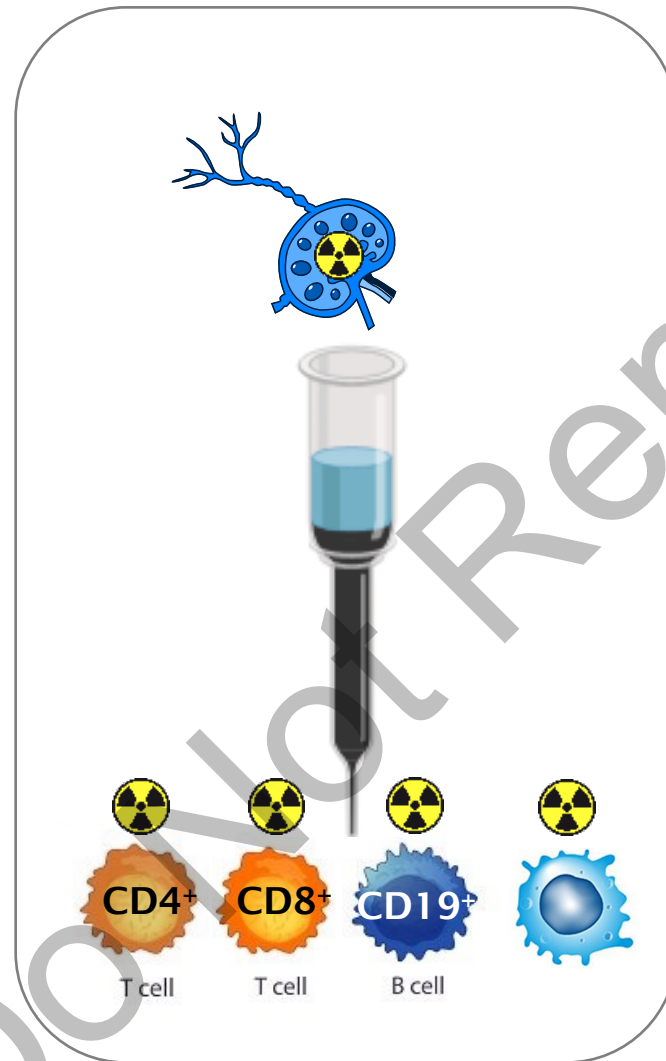
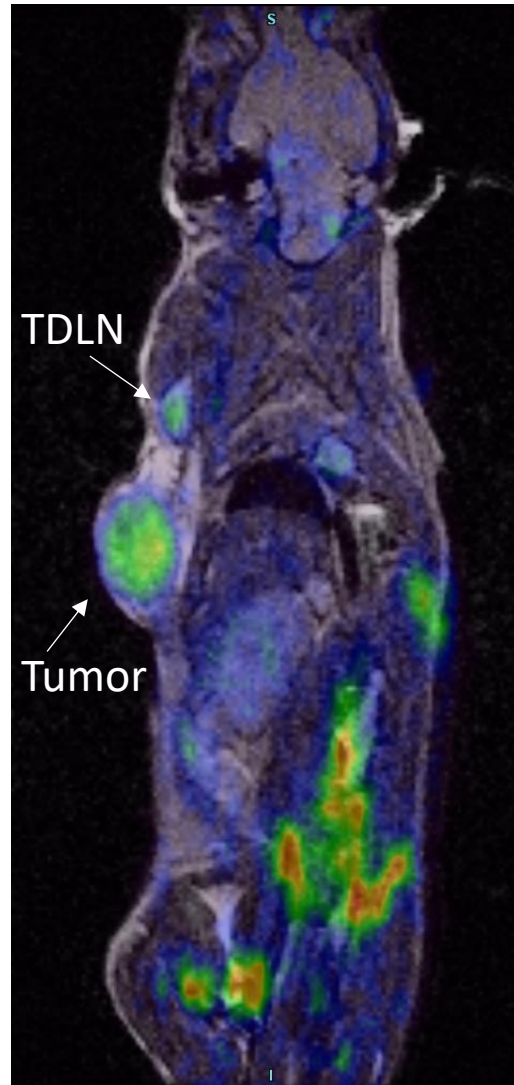
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# radioMACS

Do Not Reproduce

# radioMACS: *in vivo* [<sup>18</sup>F]FAC uptake



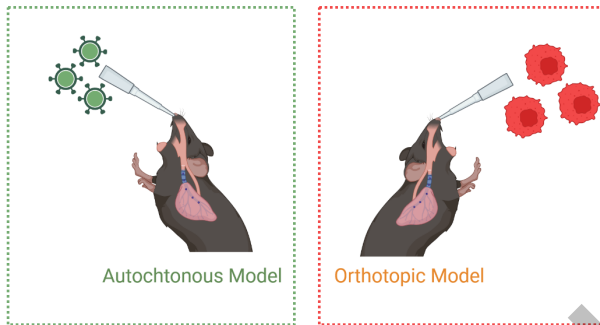
# radioFACS

Do Not Reproduce

# Animal model

- KRAS driven lung cancer mice

1. **KP:** K-ras<sup>G12D</sup>:p53<sup>ΔLep/ΔLep</sup>
2. **KPA:** K-ras<sup>G12D</sup>:p53<sup>ΔLep/ΔLep</sup>:A20<sup>ΔLep/ΔLep</sup>



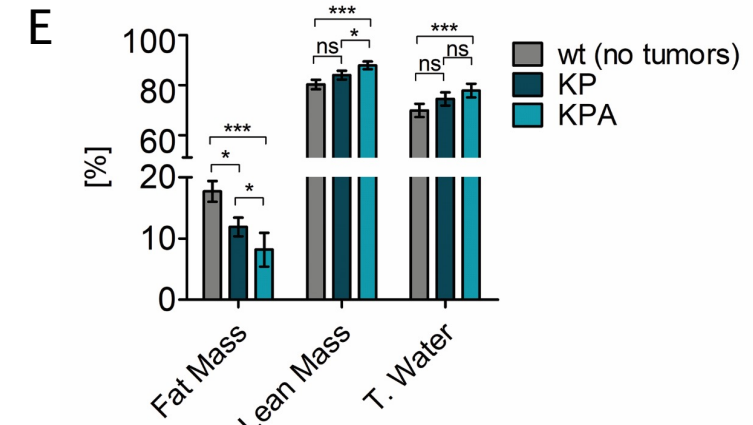
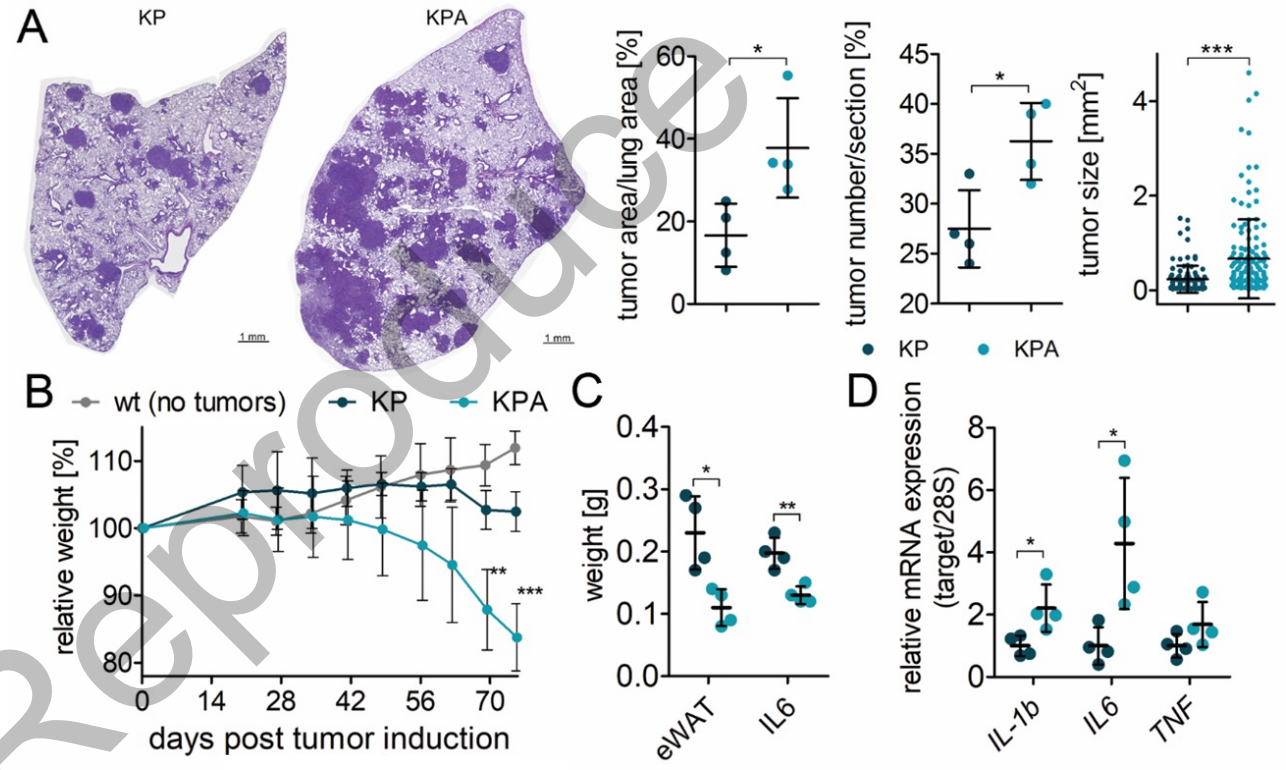
Emilio Casanova



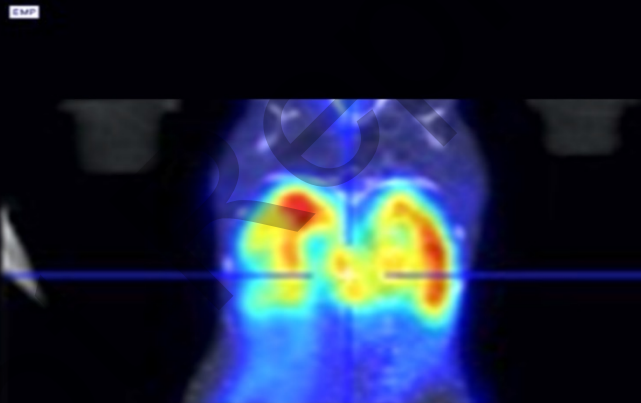
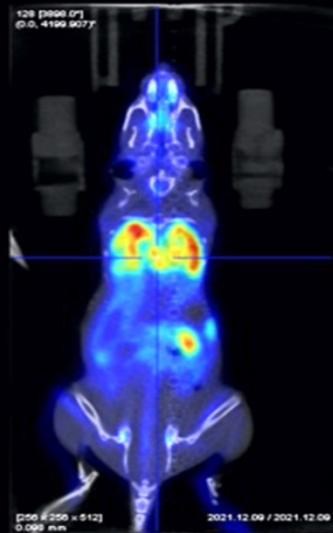
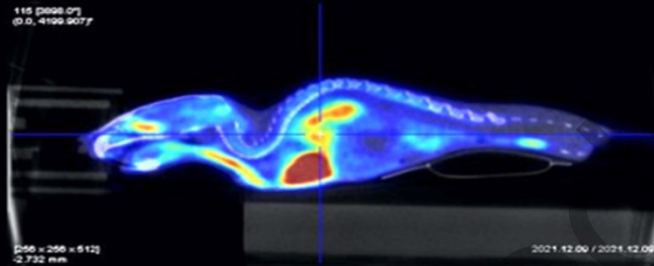
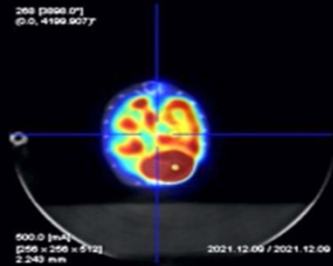
Herwig Moll



Monika Homolya



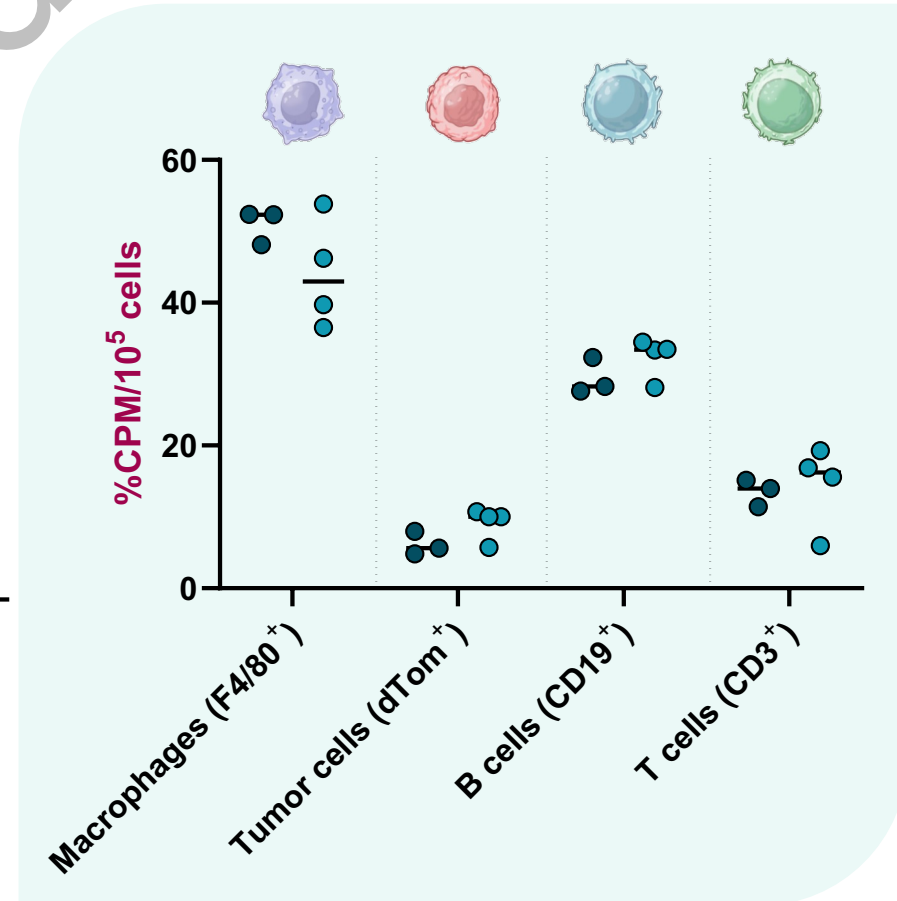
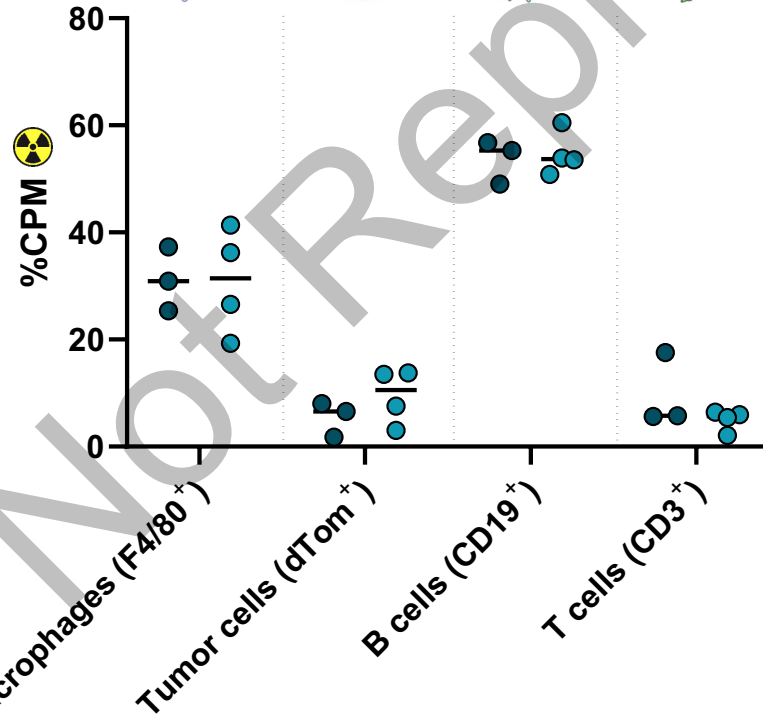
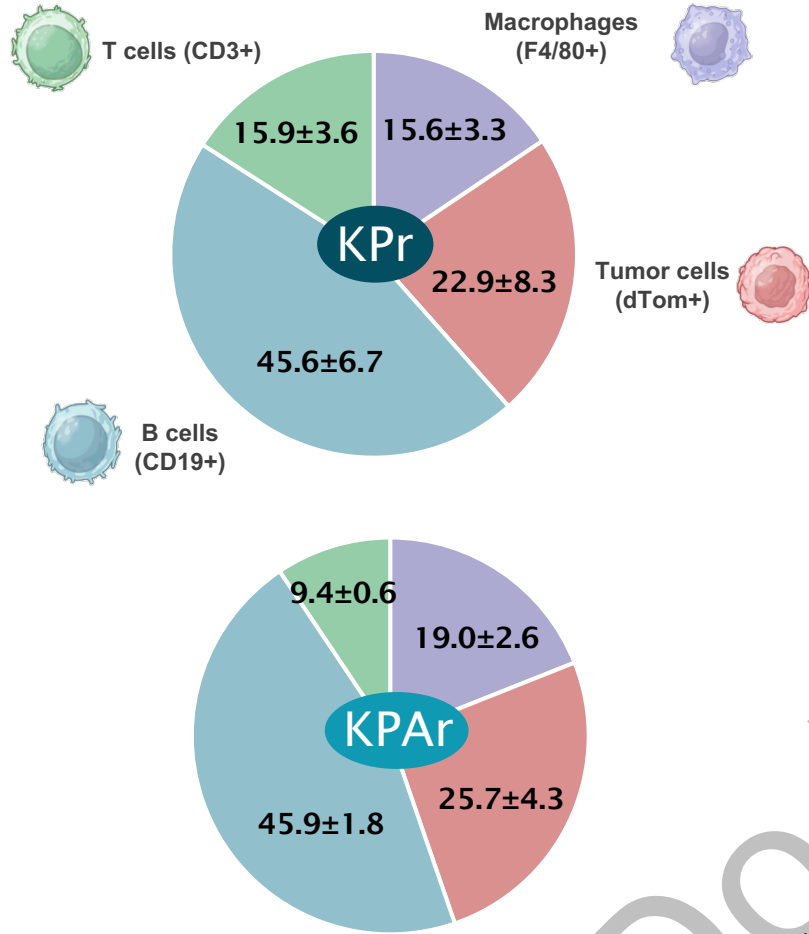
Moll & Casanova, unpublished data



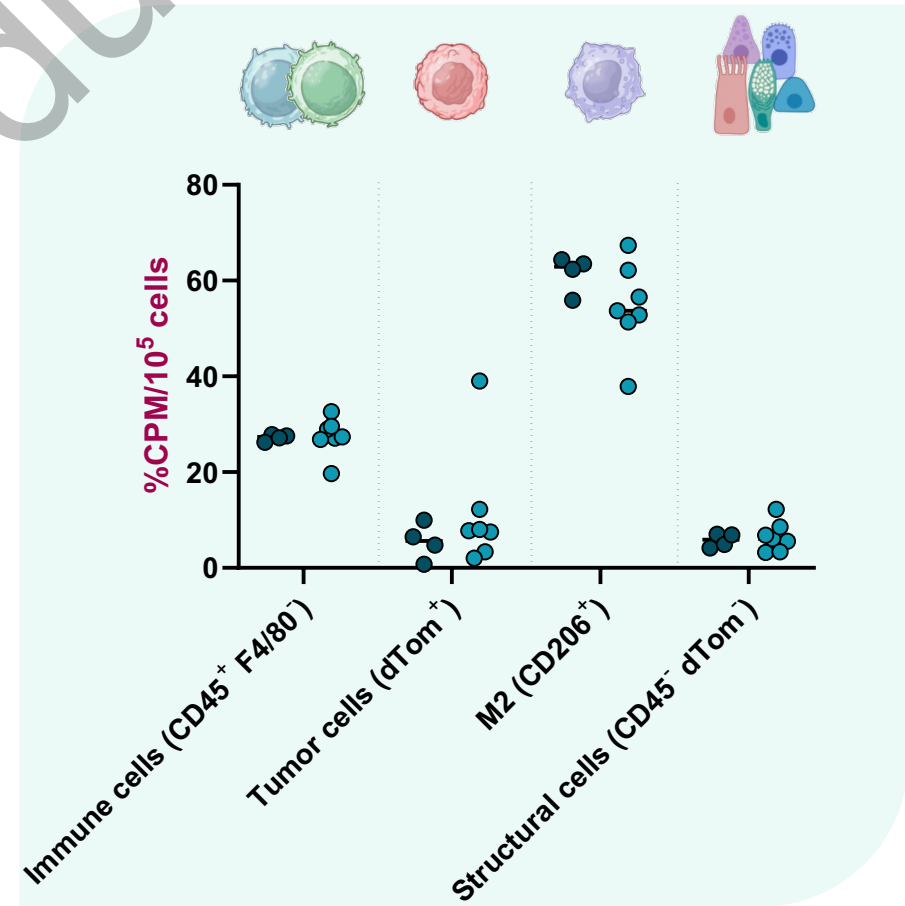
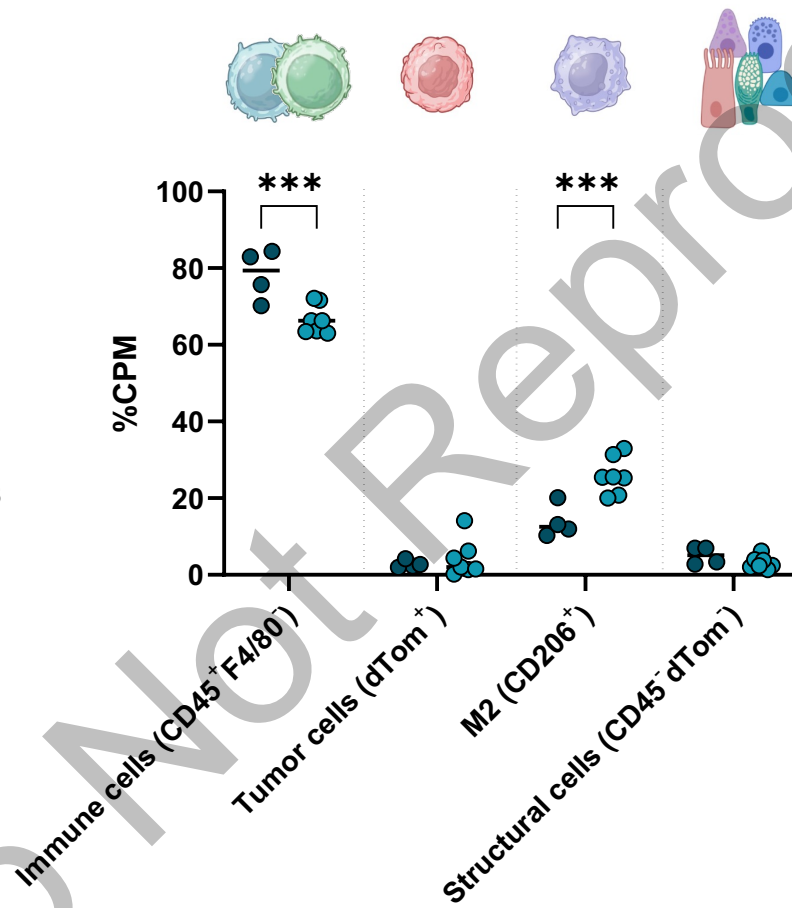
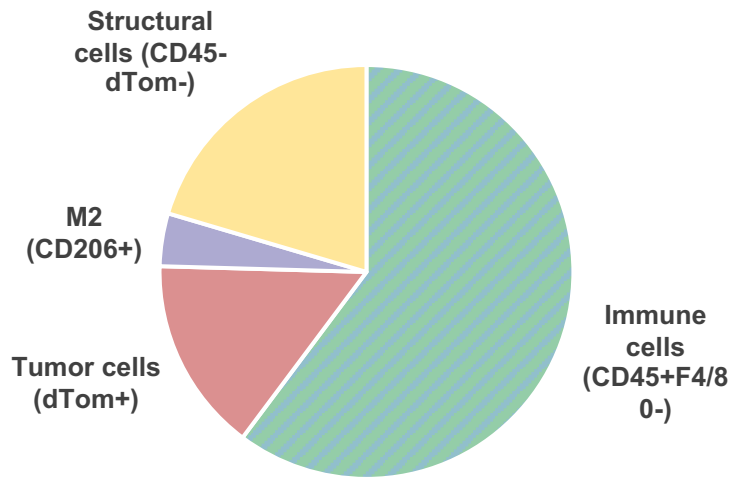
*[<sup>18</sup>F]FDG μPET/CT image of KPA mouse visualizing the lung tumors eleven weeks after virus inhalation*

# radioFACS: *in vivo* [<sup>18</sup>F]FDG uptake

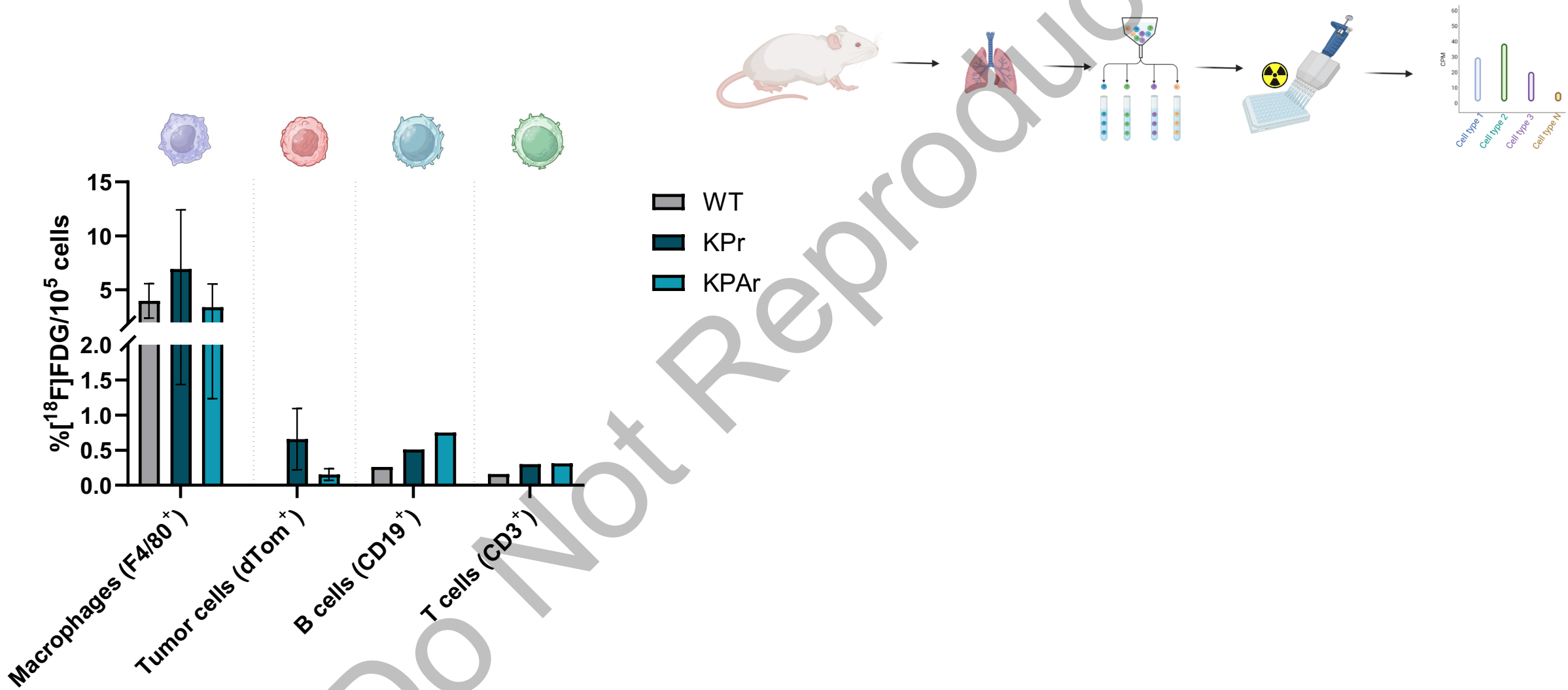
Cell subtypes [%]



# radioFACS: *in vivo* [<sup>18</sup>F]FDG uptake

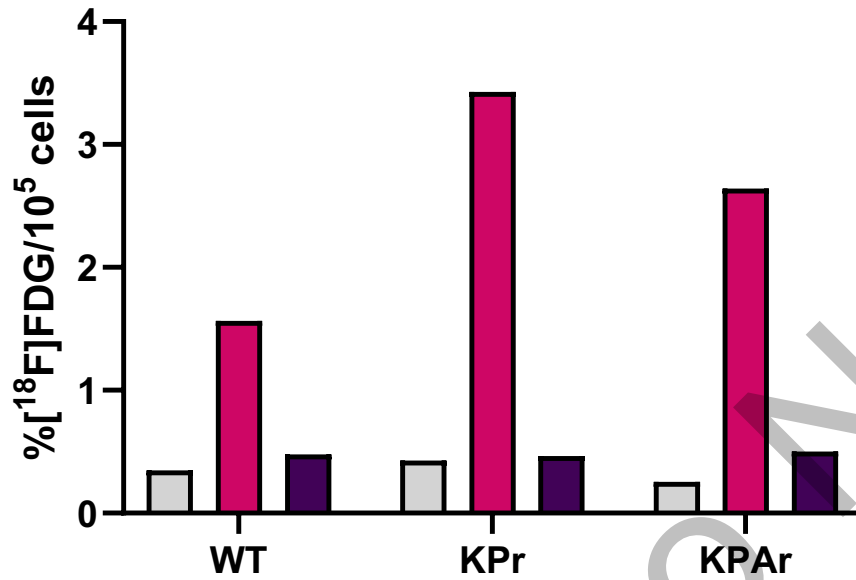
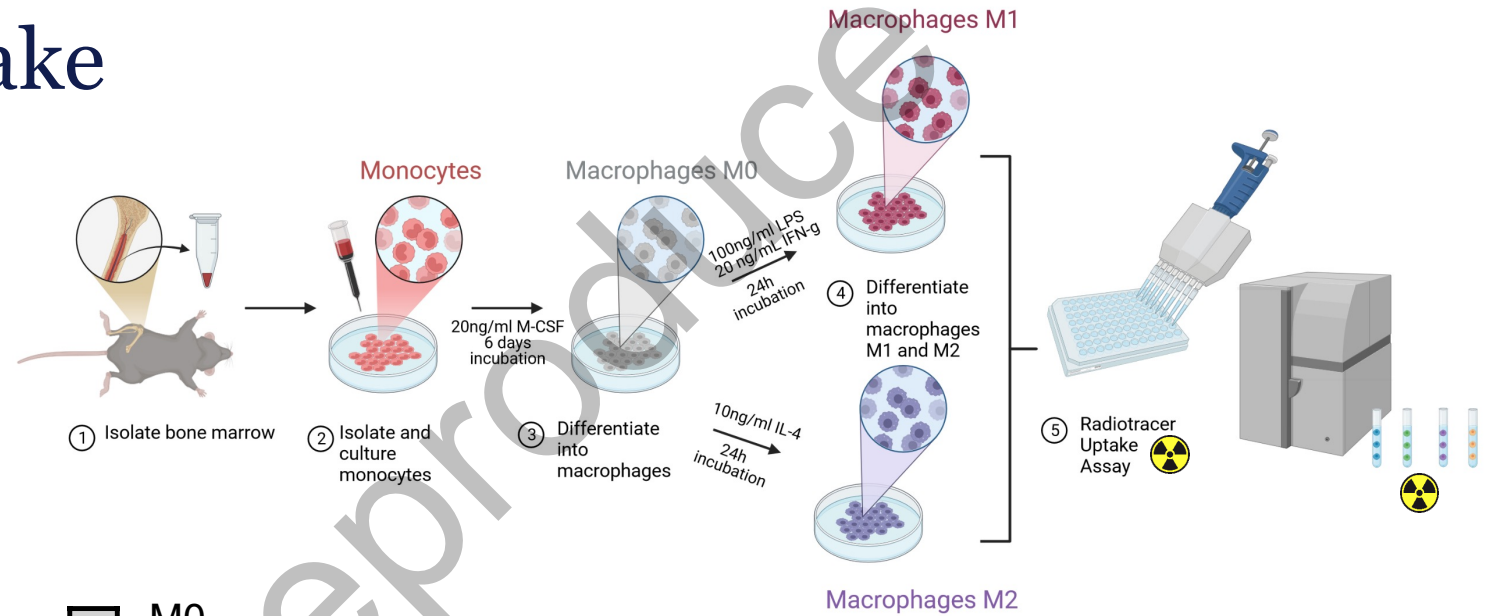


# FACS + *ex vivo* [<sup>18</sup>F]FDG uptake

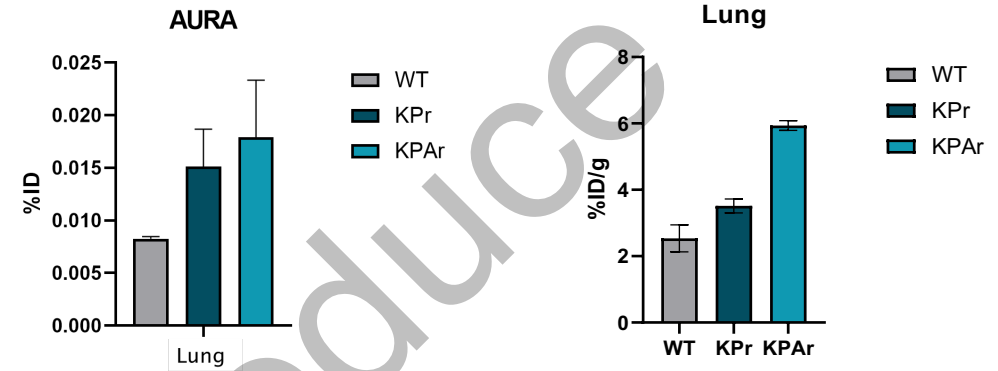




# *In vitro* [<sup>18</sup>F]FDG uptake



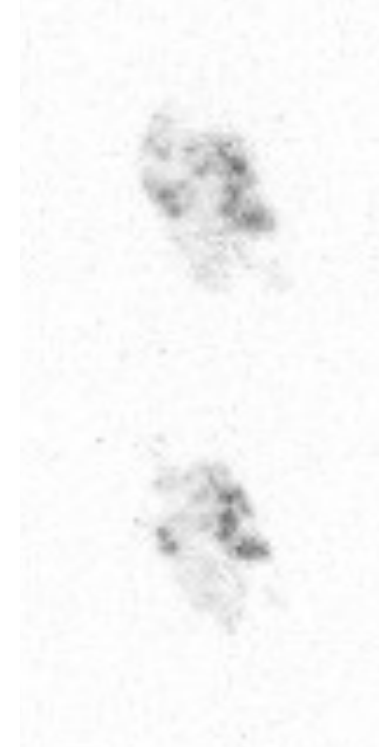
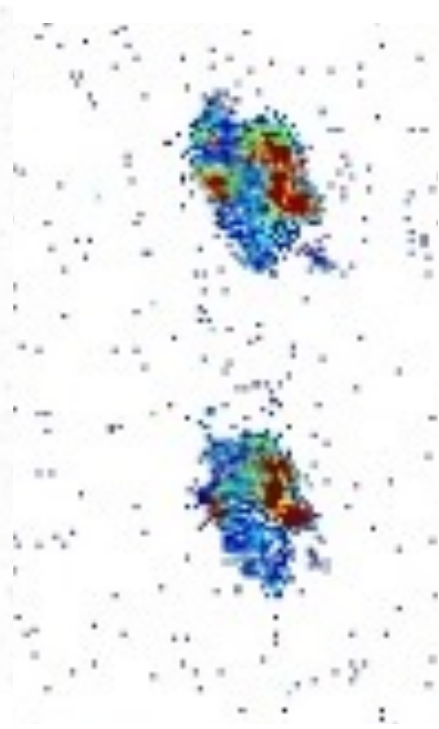
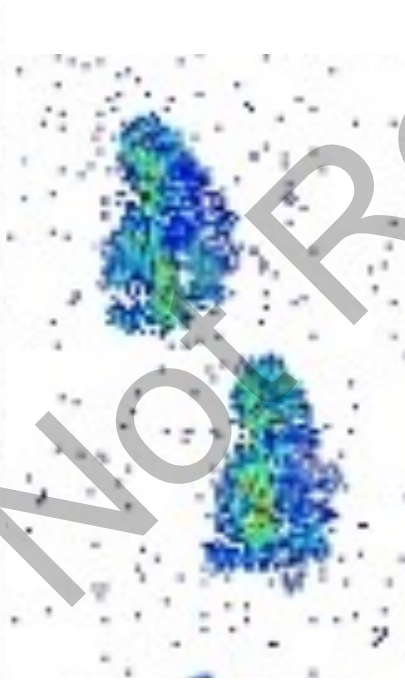
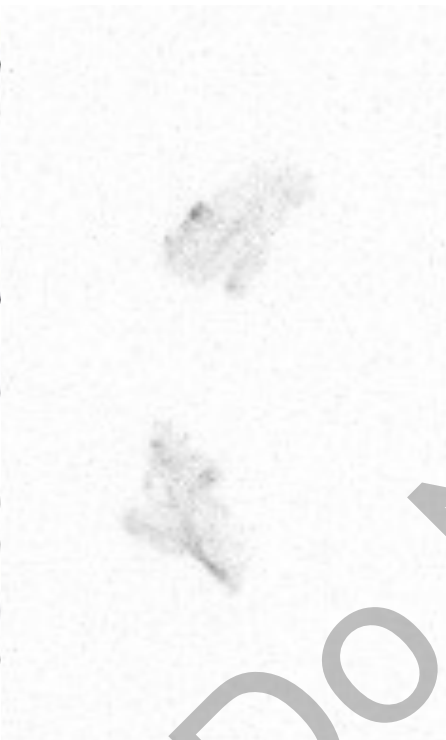
# Ex vivo Autoradiography



WT

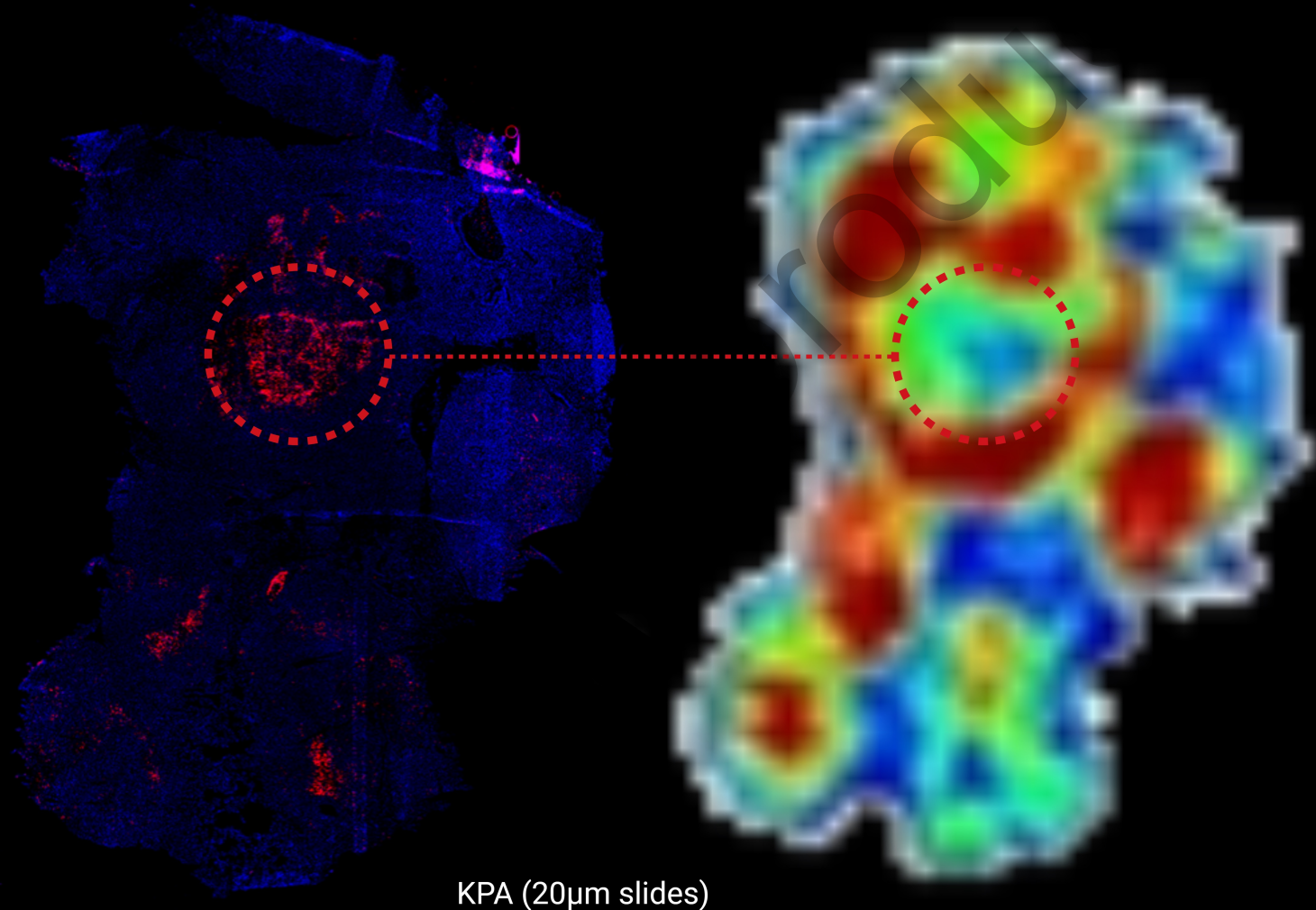
KPr

KPAr



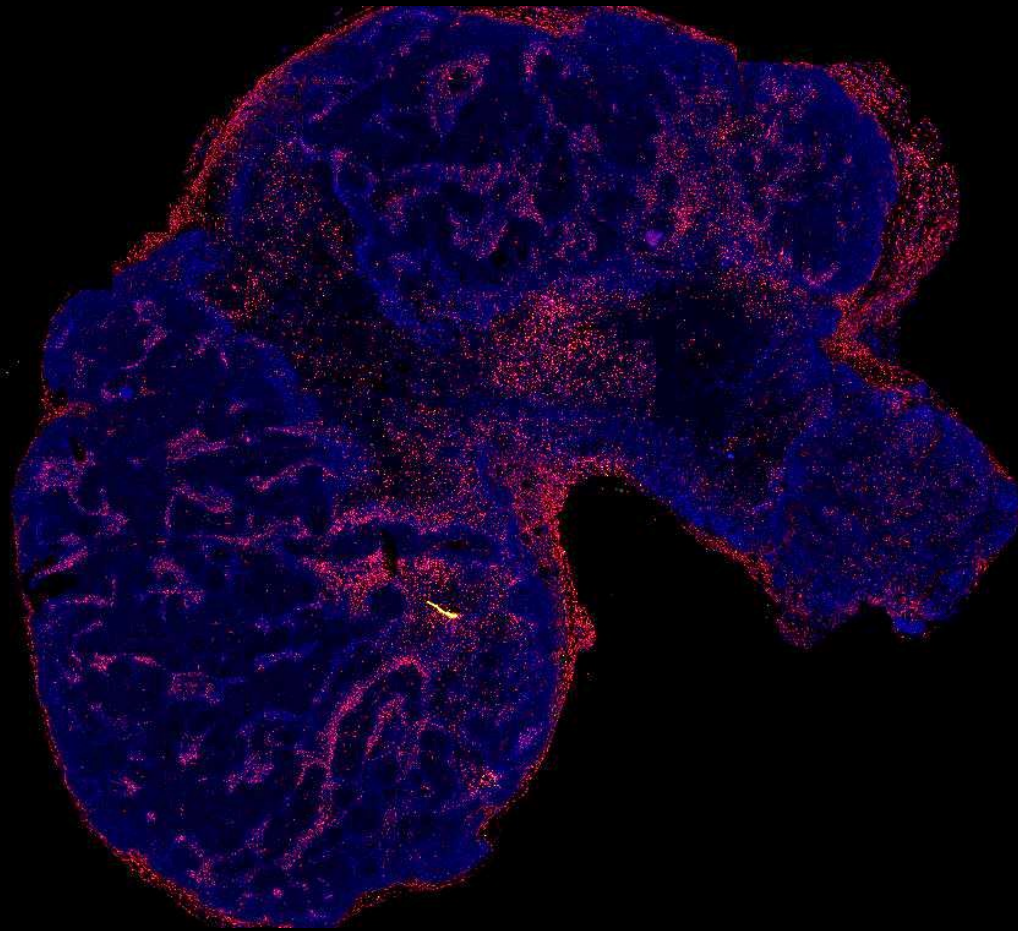
dTOM+ tumor cells (red)

[<sup>18</sup>F]FDG ex vivo AURA

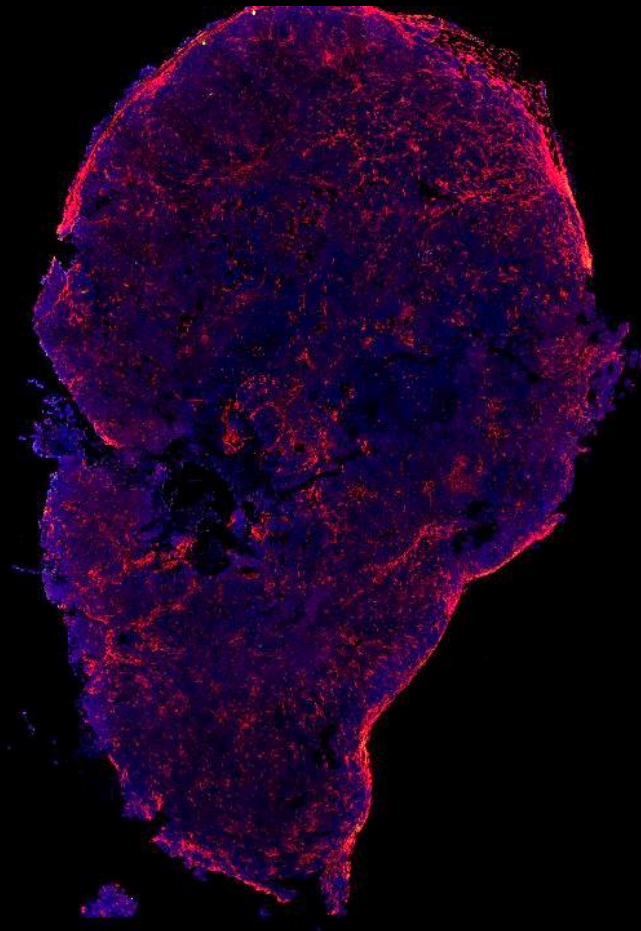


KPA (20µm slides)

IF: Macrophages (F4/80+) in red



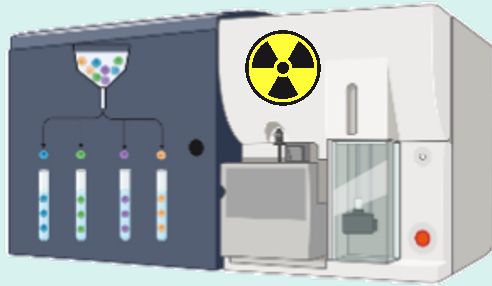
H460



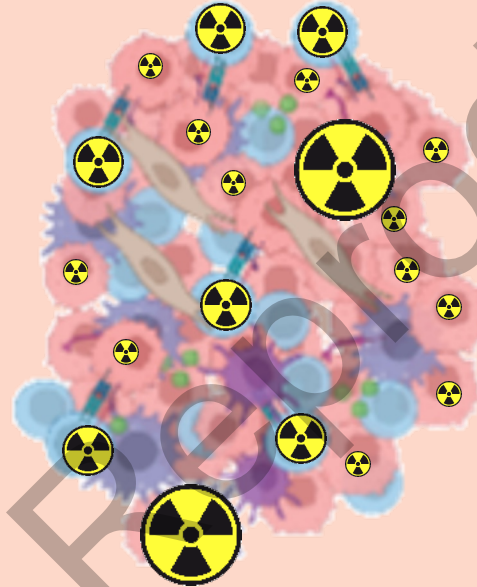
HT29

Data provided by Michaela Schlederer/Lukas Kenner

# Conclusion



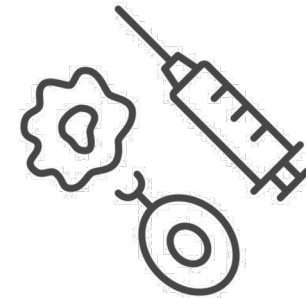
RadioFACS is a **robust method** to assess radiotracer distribution among different cell types



Data suggest that  $[^{18}\text{F}]\text{FDG}$  is mostly taken up by **immune cells** not by tumor cells.

TLG correlates with the more immunosuppressive phenotype.

# Outlook



IMMUNOTHERAPY

Study metabolic activity of **M1** and **T cells** during treatment and disease progression/response.

# Strengths & Limitations

## radioMACS



- No device
- Cost efficient

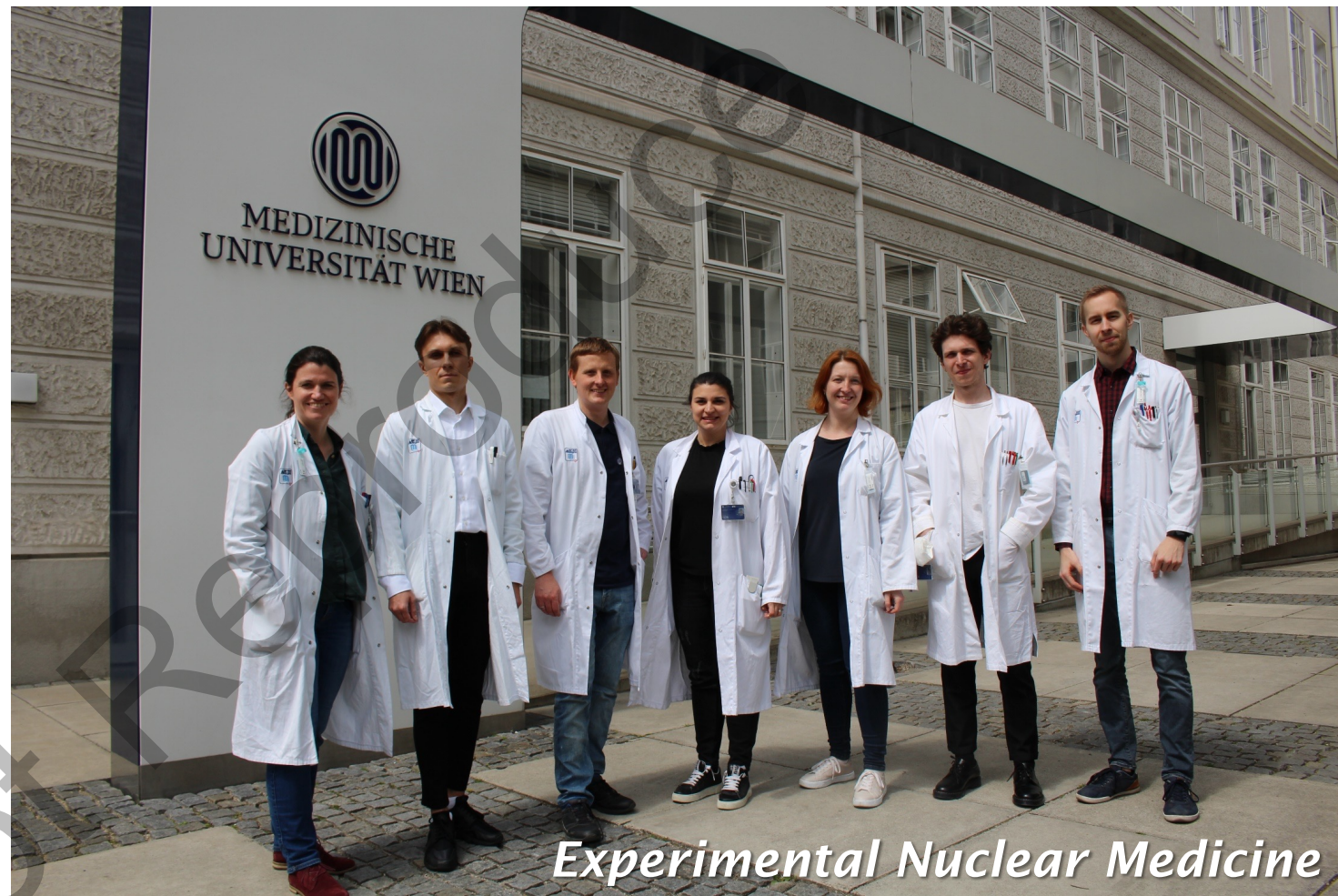


- Less accurate
- Less information

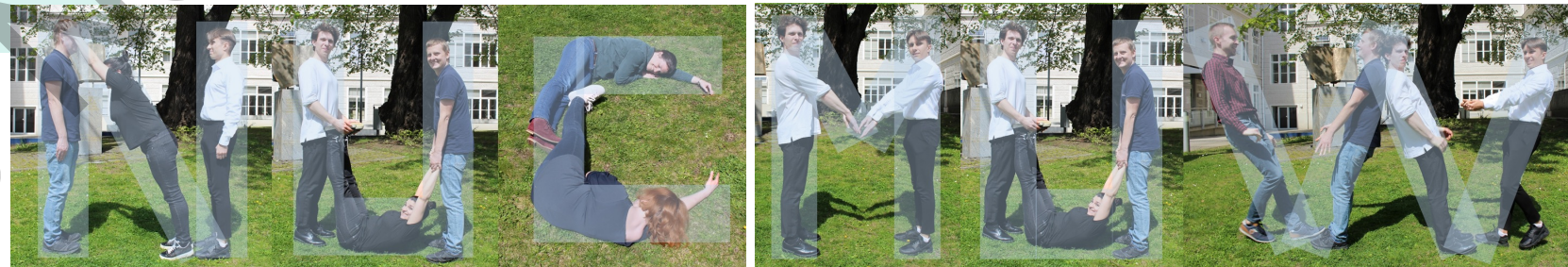


## Acknowledgements:

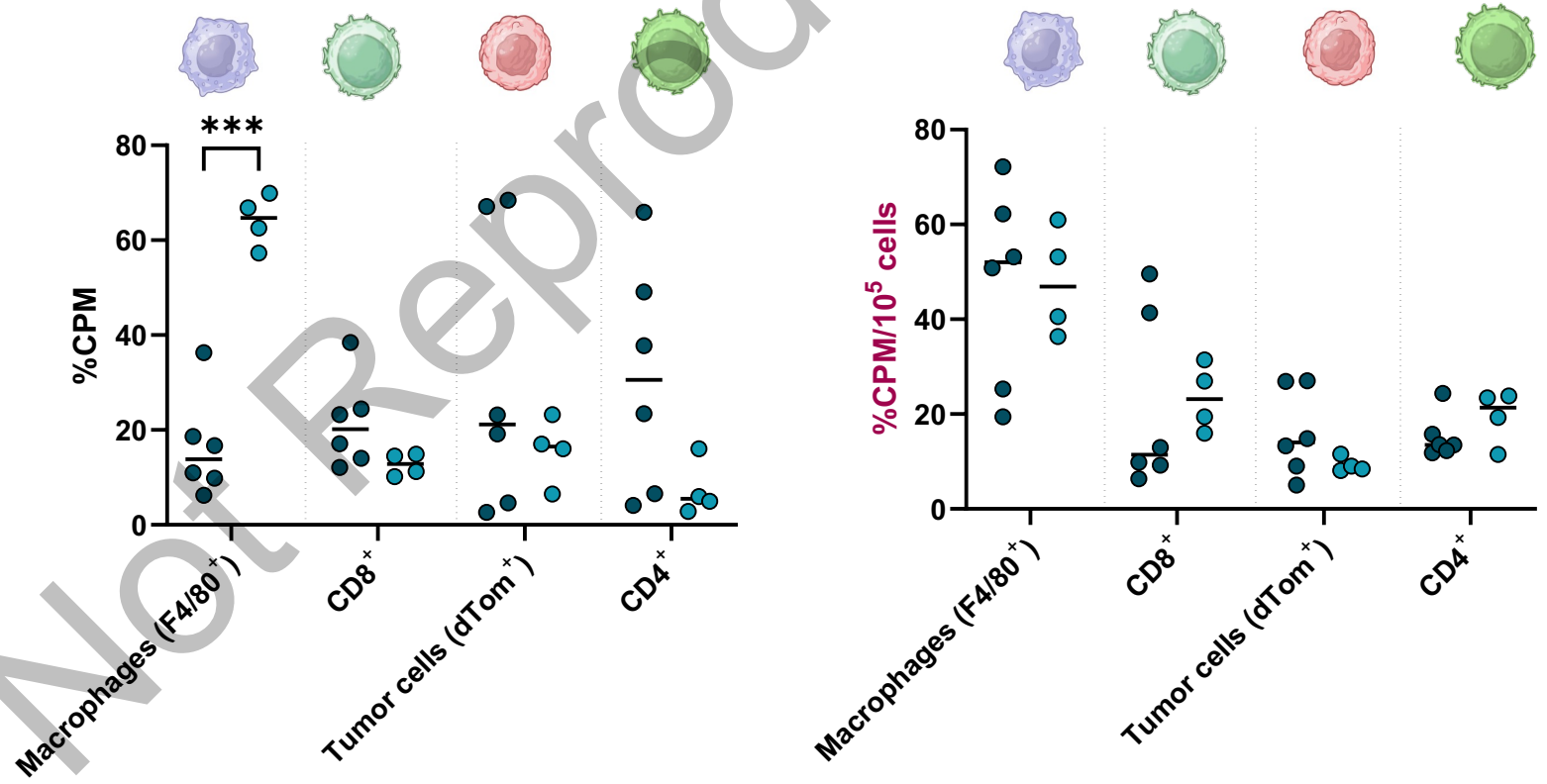
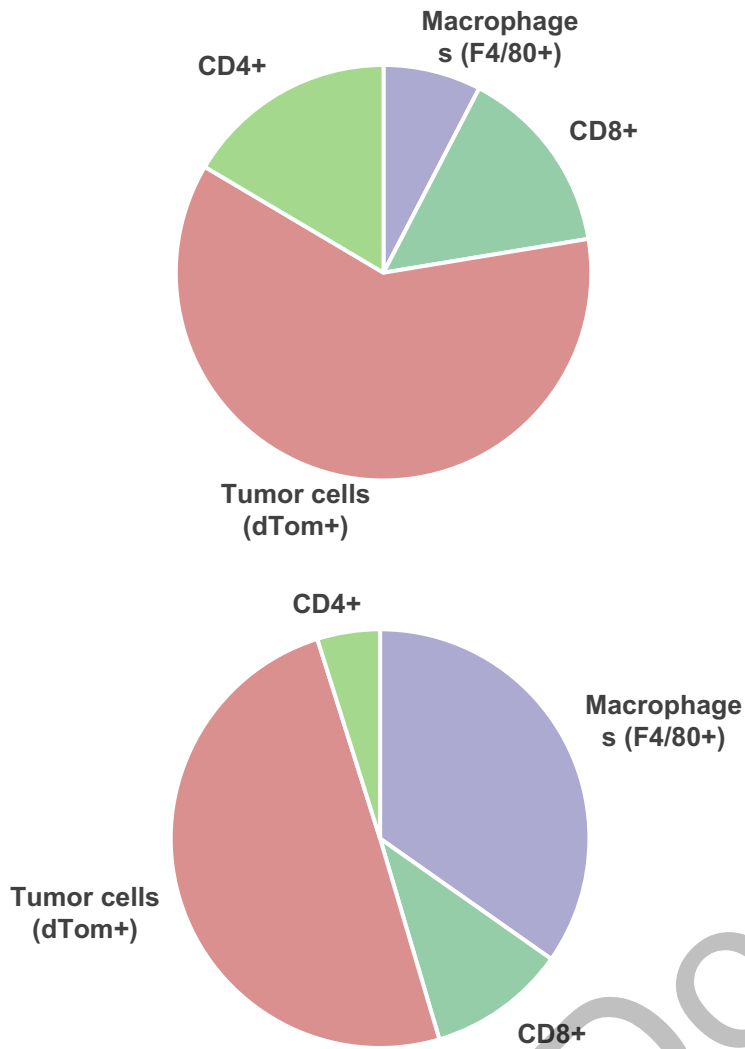
- PIL TEAM (Thomas Wanek, Claudia Kuntner-Hannes, Johann Stanek, Lara Breyer)
- Stefan Grünert
- Victoria Weissenböck
- Harald Ibeschitz
- Christoph Binder & Florentina Porsch
- Thomas Weichhart & Andrea Vogel
- Emilio Casanova, Herwig Moll & Monika Homolya
- Andreas Spittler
- Theresa Patsch



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# radioFACS





# Limitations

- Limit of quantification: cells with low tracer uptake, 150 to 200 k cell no.
- Limit of quantification: cells with high tracer uptake, 30k cell no.
- Radionuclid half life of  $> 60$  min needed (time also depending on pharmacokinetics & tissue)

