

Development of an elastography bench for histology and engineered tissue study – Preliminary results

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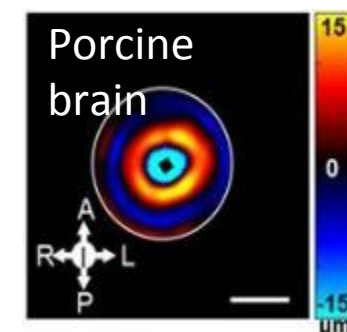
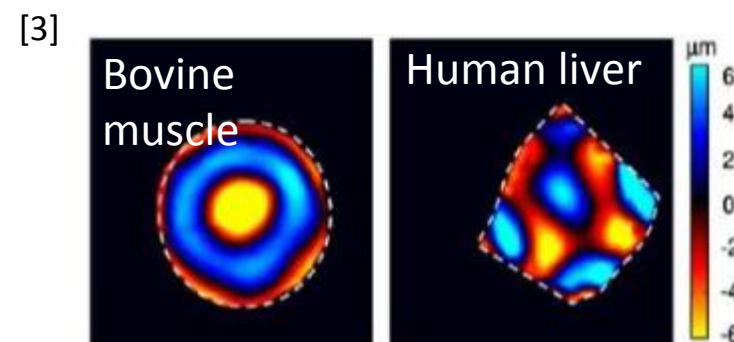
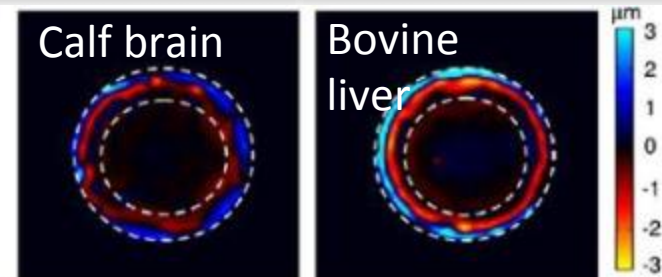
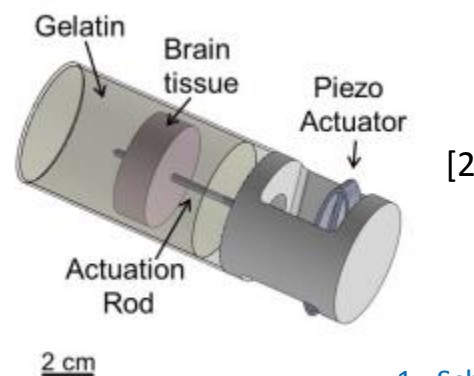
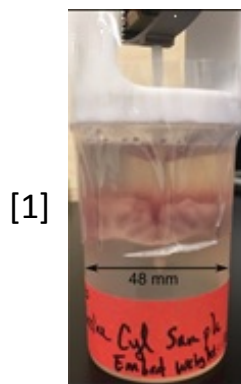
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Context	Method	Results	Perspectives
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Context

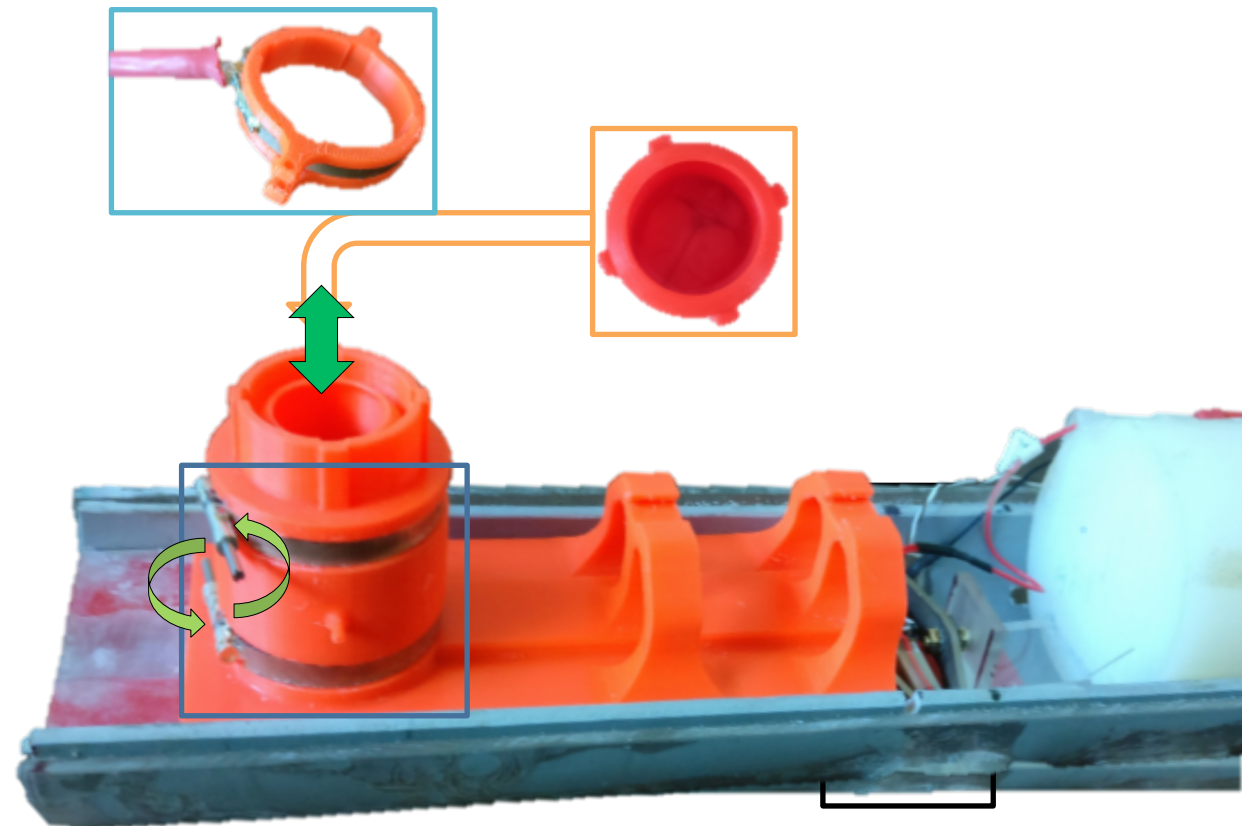
- Elastography:
 - Mechanical excitation
 - MRI imaging
 - Viscoelastic properties
- Phantom and *ex vivo* studies:
 - High spatial resolution
 - Higher frequency
- Devices:
 - Easy to handle
 - Cheap



1 - Schmidt et al., ISMRM proc., 2017
 2 - Guertler et al., ISMRM proc., 2017
 3 - Riek et al., J. Biomech. vol 44, 2011

Elastography bench

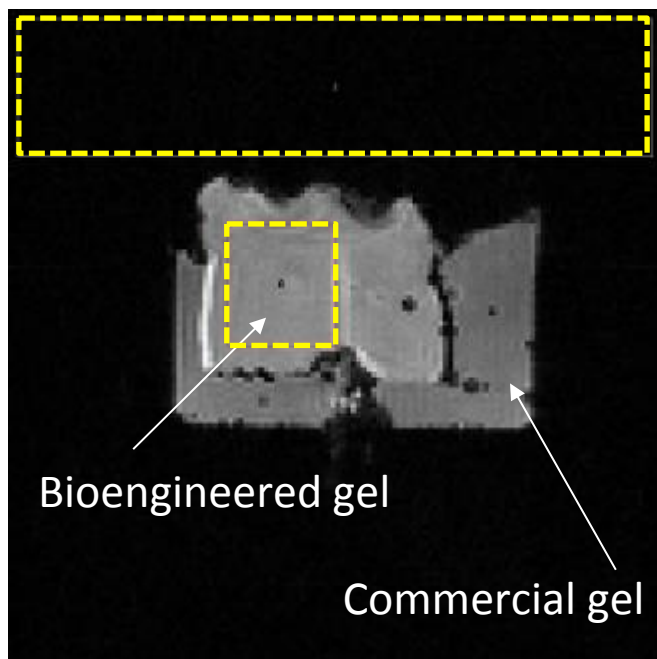
- Excitation:
 - Piezoelectric
 - Needle
- 3D-printed device:
 - Helmholtz coil
 - Sample holder
 - Coupling loop
- Tuning
- Matching



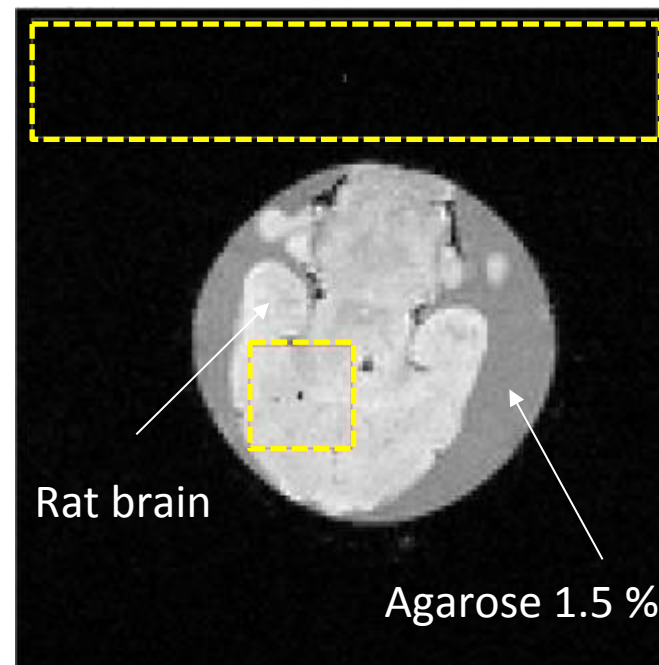
COST < 150 €

FLASH 3D

TR/TE: 15/6 ms - Acq. time: 2 minutes - $\alpha = 15^\circ$



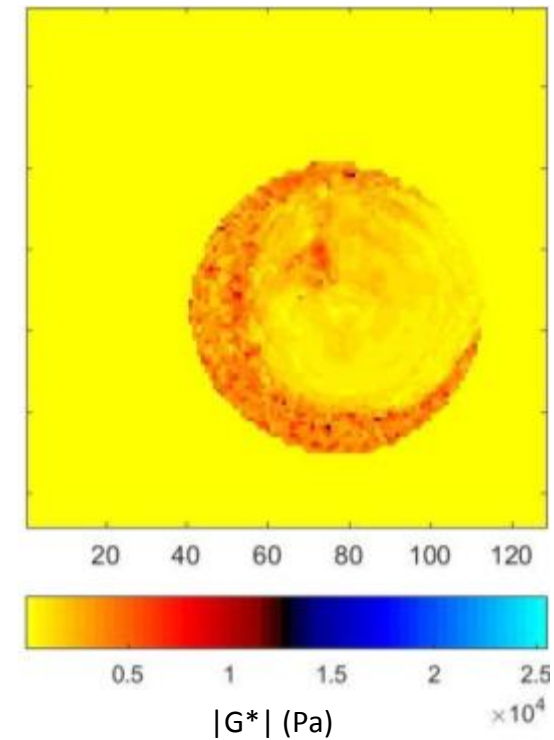
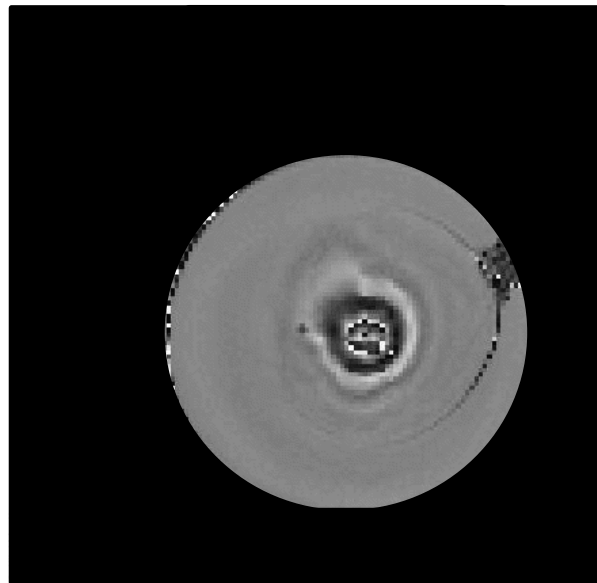
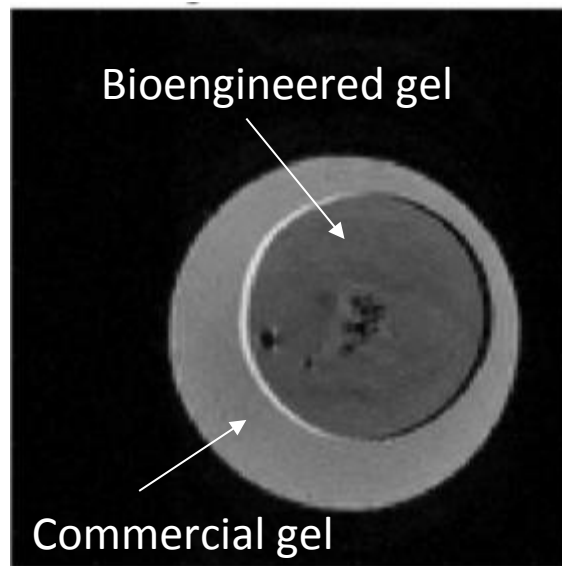
Voxel:
0.312x0.312x0.625mm³
SNR: 83



Voxel:
0.312x0.312x0.625mm³
SNR: 64

Turbo Spin Echo Elastography

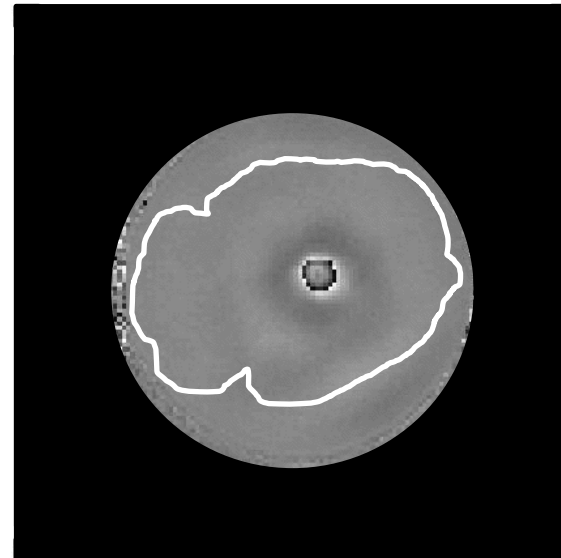
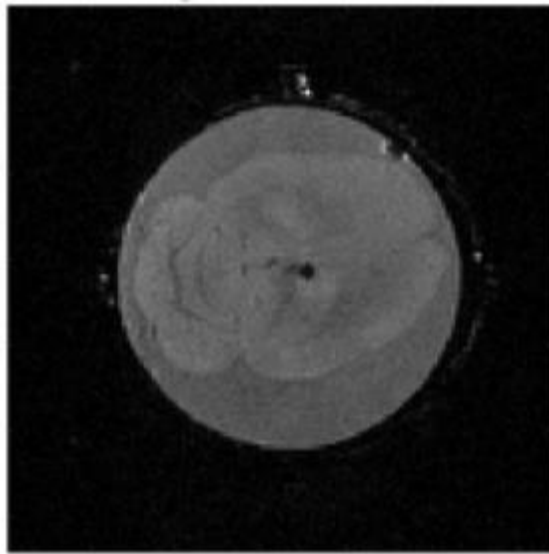
TR/TE: 2000/18 ms - $f = 600$ Hz - Acq. time: 17 min x 3 dir.



Total displacement magnitude $\langle A \rangle = 3.8 \mu\text{m}$
 $|G^*| = 1.4 \pm 0.5 \text{ kPa}$

Turbo Spin Echo Elastography

TR/TE: 2000/(18-24) ms - $f = 600-1000$ Hz - Acq. time: 17 min x 3 dir.

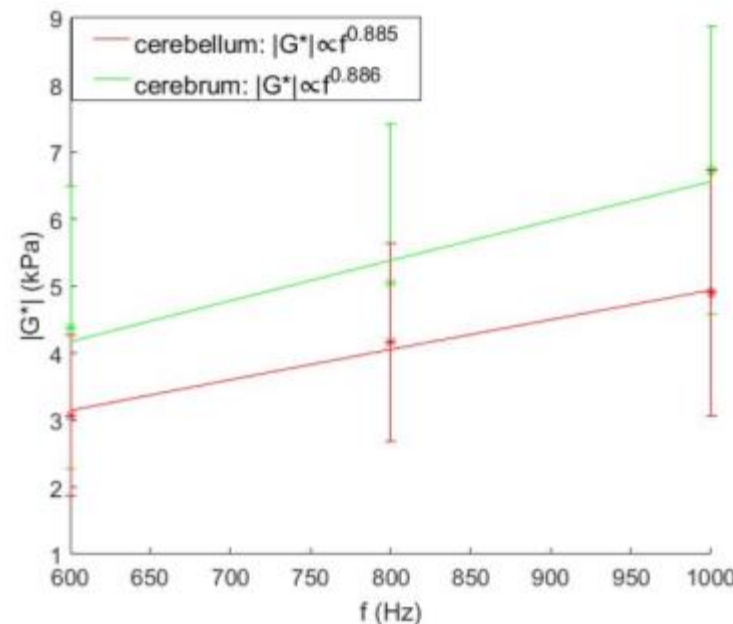
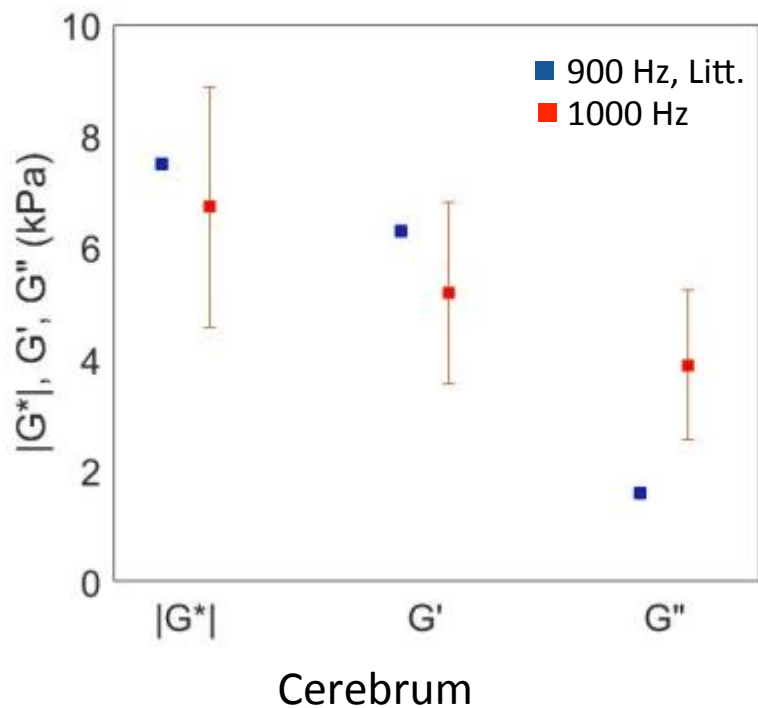


$$\langle A \rangle = 5.6 - 1.6 \mu\text{m}$$

Turbo Spin Echo Elastography

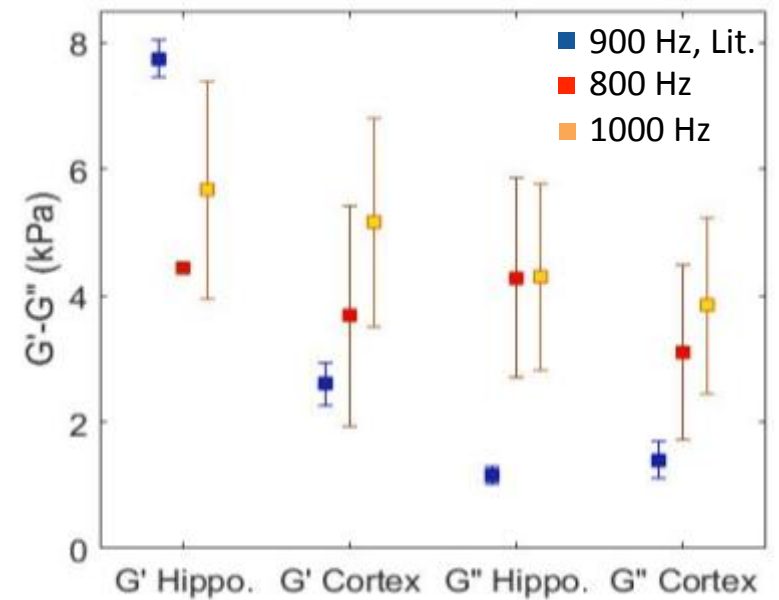
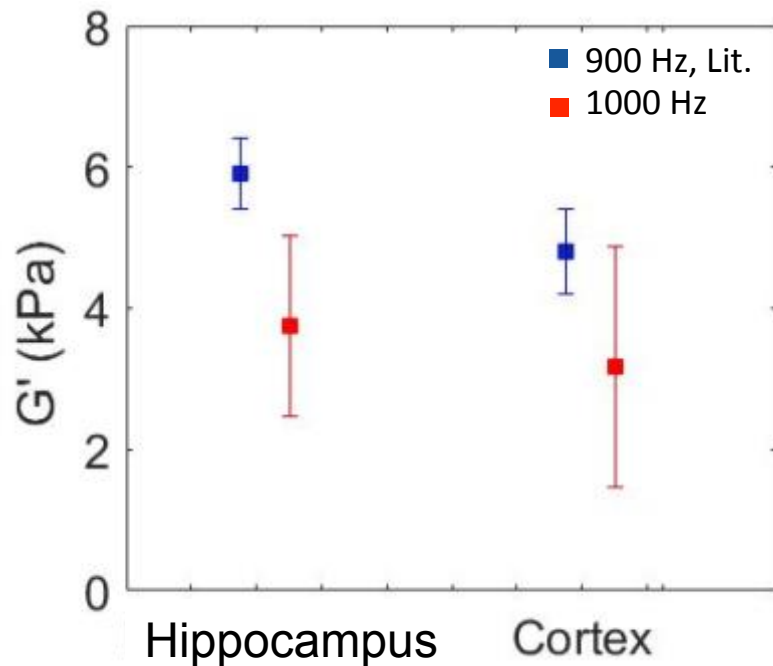
Cerebrum vs cerebellum

$|G\downarrow^*| < |G\uparrow^*|$ ✓
 $\downarrow_{\text{cerebrum}} > \downarrow_{\text{cerebellum}}$ ✓
 Similar dispersion



Millward et al., NMR Biomed., vol 28 2015

Turbo Spin Echo Elastography Hippocampus vs Cortex

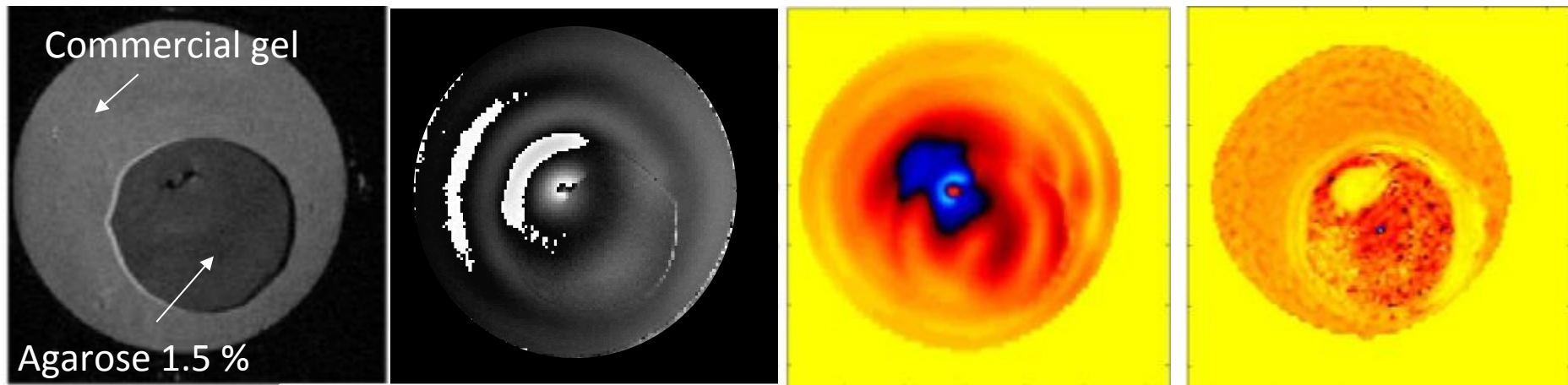


Agreement G'

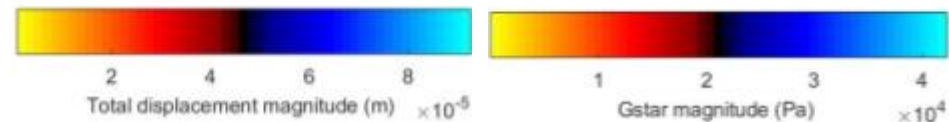
1-Boulet et al., J. Neurosci. Methods, vol 201, 2011
2-Munder et al., J. Magn. Reson. Imaging, 2017

Turbo Spin Echo Elastography

TR/TE: 2000/18 ms - f = 600 Hz - Acq. time: 17 min x 3 dir.

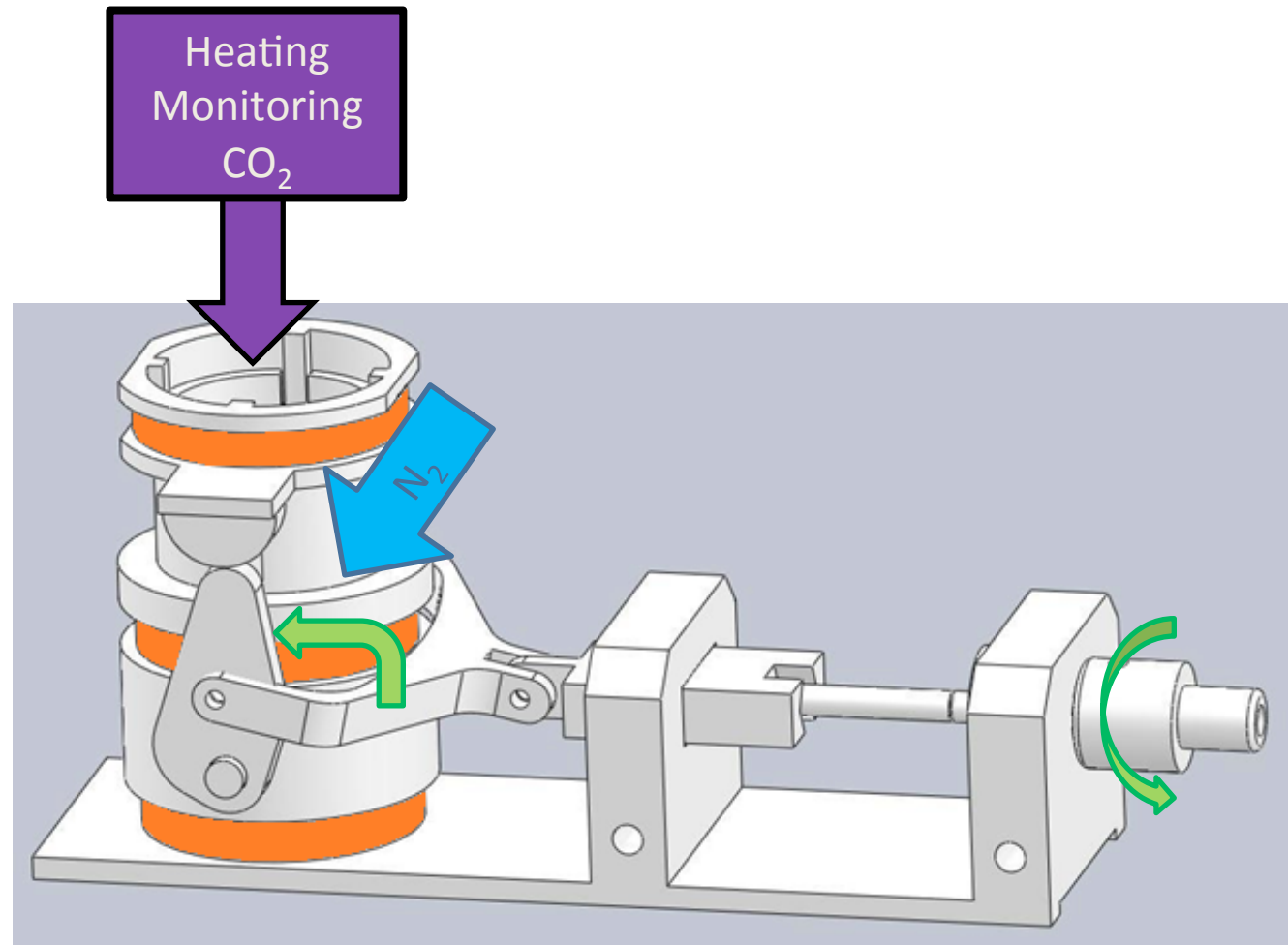


$\langle A \rangle = 25.5 \mu\text{m}$ - $|G^*| = 7.3 \pm 3.9 \text{ kPa}$



Perspectives

- Easier matching
- Cell survival set-up
- Cooling



Thank you for your
attention