# Brain tissue

As pressure within the skull increases, brain tissue displacement can lead to brain herniation, resulting in disability or death.

Brain tissue deforms significantly after opening the dura and during tumor resection, invalidating pre-operative imaging data.

In its natural state is too soft to work with, but it can be hardened by immersion in alcohol or other fixatives, and then sliced apart for examination of the interior. Visually, the interior of the brain consists of areas of so-called grey matter, with a dark color, separated by areas of white matter, with a lighter color. Further information can be gained by staining slices of brain tissue with a variety of chemicals that bring out areas where specific types of molecules are present in high concentrations. It is also possible to examine the microstructure of brain tissue using a microscope, and to trace the pattern of connections from one brain area to another.

The brains of all species are composed primarily of two broad classes of cells: neurons and glia cells.

Vargas-Caballero et al suggest that replicating elements of research findings from animals and stem cell models in resected human brain tissue would strengthen our understanding of disease mechanisms and the therapeutic strategies and aid translation. The use of human brain tissue alongside induced pluripotent stem cells iPSC-derived neural models can validate molecular mechanisms identified in rodent disease models and strengthen their relevance to humans. If drug target engagement and mechanism of cellular action can be validated in human brain tissue, this will increase the success rate in clinical research. The combined use of resected human brain tissue, alongside iPSC-derived neural models, could be considered a standard step in pre-clinical research and help to bridge the gap to clinical trials [1].

---

Determining the mechanical properties of brain tissues is essential in the field of brain biomechanics. Liu et al., use ultrasound-based shear wave elastography to measure both in vivo and ex vivo elastic properties of brain tissues. Our results demonstrate that the shear modulus from in vivo measurements is about 47% higher than that given by the ex vivo measurements (p value = 0.0063). The change in ex vivo elastic properties within 60-min post-mortem is negligible. The results also show that within 60-min post-mortem and in a temperature range of 37-23 °C, the elastic properties of brain tissues approximately linearly depend on the temperature in both cooling and re-heating processes [2].

## Brain tissue oxygen monitoring

Brain tissue oxygen monitoring.

1)
Vargas-Caballero M, Willaime-Morawek S, Gomez-Nicola D, Perry VH, Bulters D, Mudher A. The use of human neurons for novel drug discovery in dementia research. Expert Opin Drug Discov. 2016 Feb 15. [Epub ahead of print] PubMed PMID: 26878555.
2)

Liu YL, Liu D, Xu L, Su C, Li GY, Qian LX, Cao Y. In vivo and ex vivo elastic properties of brain tissues measured with ultrasound elastography. J Mech Behav Biomed Mater. 2018 Apr 19;83:120-125. doi: 10.1016/j.jmbbm.2018.04.017. [Epub ahead of print] PubMed PMID: 29702328.