

Precision medicine for aggressive brain tumors: chasing a moving target

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Precision medicine has revolutionized cancer care by tailoring therapies to the molecular characteristics of an individual patient's tumor. The integration of high-resolution multi-omics with high-throughput functional profiling offers an unprecedented opportunity to further refine patient stratification, identify actionable vulnerabilities, and improve treatment outcomes. However, despite major advances in molecular classification and biomarker discovery, these developments have yet to translate into effective precision medicine strategies for patients with aggressive brain tumors.

In this presentation, I will discuss how patient cohorts and patient-derived preclinical models can be leveraged to dissect the biological complexity of diffuse adult gliomas, the most common malignant primary brain tumors in adults. Longitudinal multi-omic analyses reveal substantial diversity both between and within tumor subtypes, highlighting dynamic changes in tumor cell states and their interactions with the tumor microenvironment during disease progression. Complementing these studies, patient-derived avatars enable functional assessment of therapeutic responses and provide a platform to identify treatment sensitivities at the individual patient level.

Together, these approaches demonstrate how integrating molecular and functional profiling can uncover personalized therapeutic vulnerabilities and accelerate the development of more effective precision medicine strategies for patients with aggressive brain tumors.

References

De Lucas Sanz M., Niclou S.P, Golebiewska A., Modeling brain tumors with organoids: toward precision medicine in neuro-oncology. Nature Reviews Neurology, 2026, <https://doi.org/10.1038/s41582-026-01190-2>

Ermini, L., et al. Integrative multi-omics combined with functional pharmacological profiling in patient-derived organoids identifies personalized therapeutic vulnerabilities of adult high-grade gliomas. bioRxiv: 2025.2009.2009.675145.

Johnson KC, Spitzer A, Varn FS, et al. Acquired genetic and cell state changes underlie IDH-mutant glioma progression. Nature. 2026 Jun 3. doi: 10.1038/s41586-026-10612-6.

Biosketch

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CURRENT AND PAST POSITIONS

Dr Anna Golebiewska is Group leader of the NORLUX Neuro-Oncology laboratory at the Department of Cancer Research, Luxembourg Institute of Health. She has a background in molecular and cellular biology and obtained her PhD in stem cell research. Her work focuses on understanding brain tumor biology and development of clinically relevant laboratory models. She is particularly interested in the various aspects of tumor heterogeneity. Her current projects aim to tackle intrinsic plasticity, allowing brain tumor cells to adapt and survive external pressures from microenvironmental cues and treatment. Her lab developed a large collection of glioma patient-derived organoids and orthotopic xenografts for preclinical research and precision medicine drug testing.

EDUCATION

2018 – Autorisation à diriger des recherches (ADR), University of Luxembourg

2008 – Ph.D. in Stem Cell Biology, University of Newcastle (UK)

2005 – M.Sc. in Molecular Biology, University of Wroclaw (Poland)

AWARDS AND HONORS

2021 – FNR Award for Outstanding Scientific Achievement, Luxembourg National Research Fund

2019 – Legs Kanning prize, Action LIONS 'Vaincre le Cancer', Lions Clubs Luxembourg

2019 – Award in pre-clinical sciences (best abstract), European Association of Neuro-Oncology (EANO)

2014-2026 – Grant awards from FNR, Télévie, EU TRANSCAN-3, EU H2020 MSCA

OTHER RELEVANT PROFESSIONAL ACTIVITIES AND ACCOMPLISHMENTS

Scientific PI of the CNS tumor collection PRECISION-PDX (www.precision-pdx.lu).

International consortia membership: GLASS, EurOPDX, GLIORESOLVE, CARE.

Commission of trust: EUnetCCC Comprehensive Cancer Center Luxembourg working groups, National Cancer Plan Luxembourg (Plan National Cancer) – Axe 8, Council – Doctoral School in Science and Engineering, University of Luxembourg, Biosafety Committee, Department of Cancer Research, Luxembourg Institute of Health.