PROSPLIGN project: Prospecting Natural Lignin for Antitumor Activity: Unlocking the Potential of a Sustainable Biopolymer

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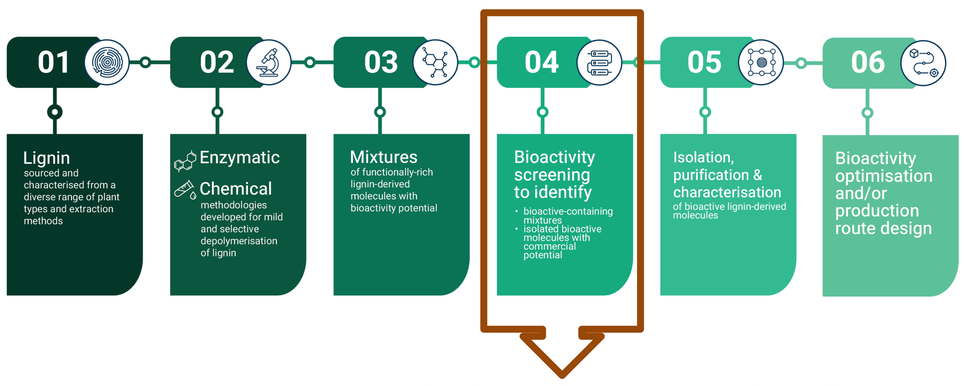
PROSPLING Project

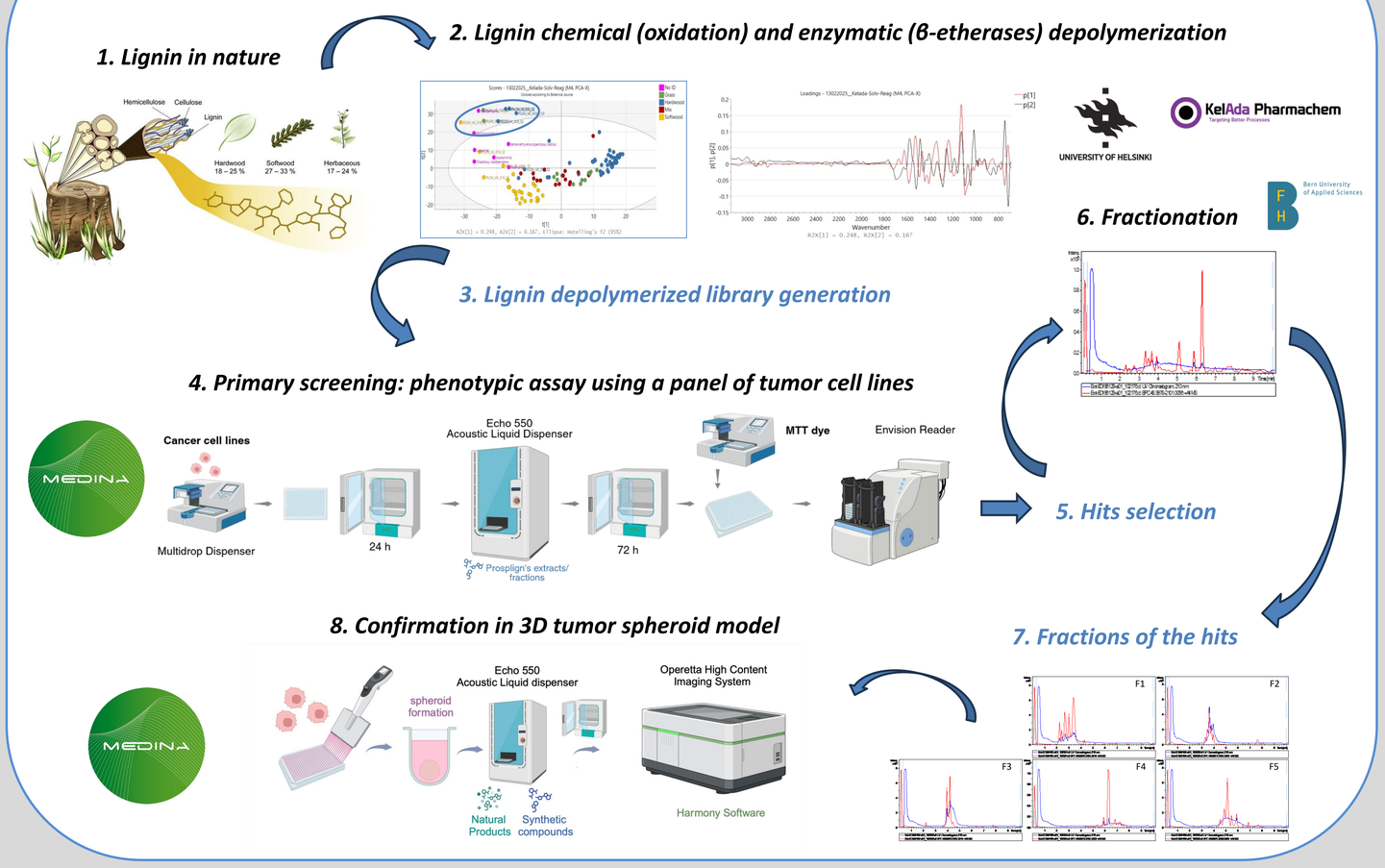
- **Lignin** is a natural, abundant and sustainable biopolymer that constitutes a major component of lignocellulosic biomass. The PROSPLIGN project aims to unlock the bioactive potential of lignin through innovative bioprospecting strategies.

- The project workflow combines the selection of sustainable lignin feedstocks with advanced depolymerization technologies, **high-throughput bioactivity screening**, isolation and characterization of active compounds, bioactivity optimization, and data-driven process development supported by multivariate analysis.



At MEDINA, we evaluate lignin-derived preparations for the discovery of **novel antitumor agents.**

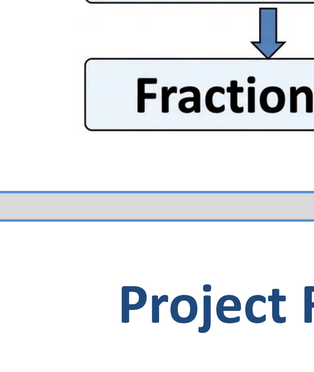
Project Workflow



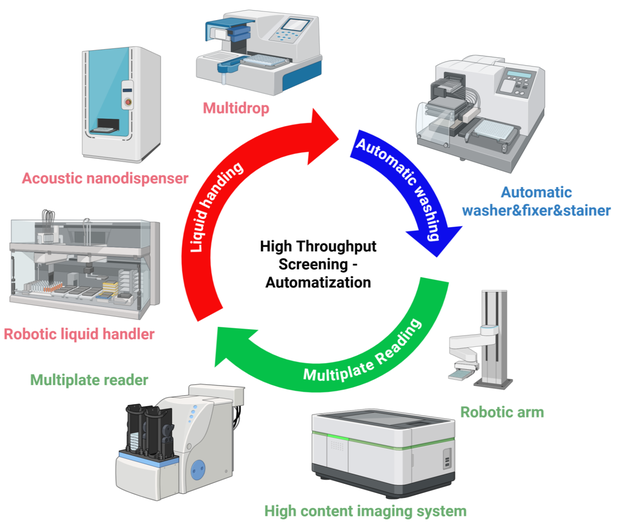
Primary Screening

Human tumour cell lines:

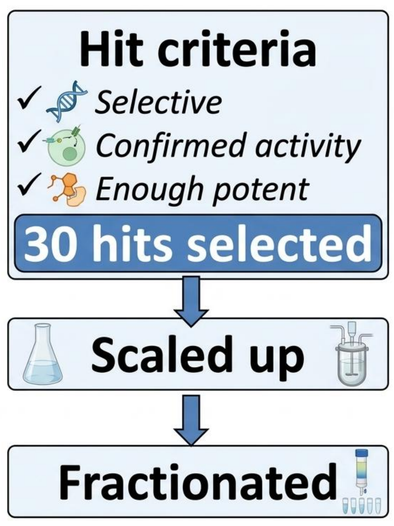
Viability assay-MTT test:



Screening Using MEDINA's Automated HTS Platform[1,2]:

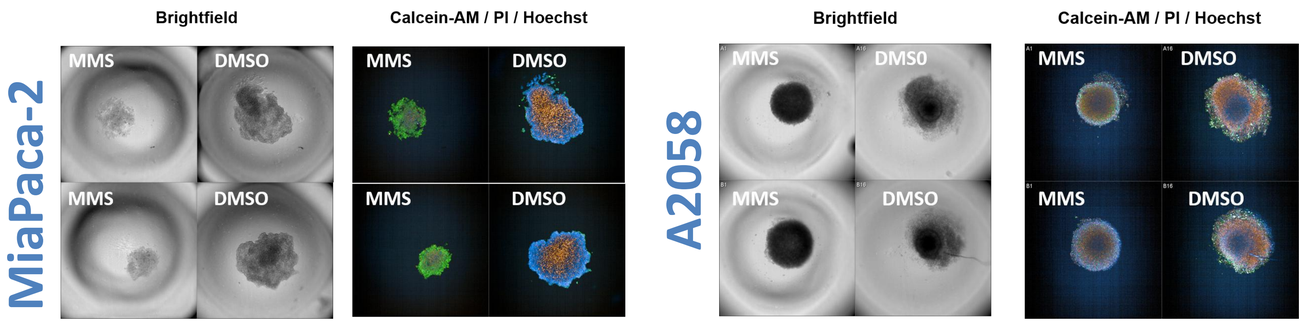


Results:



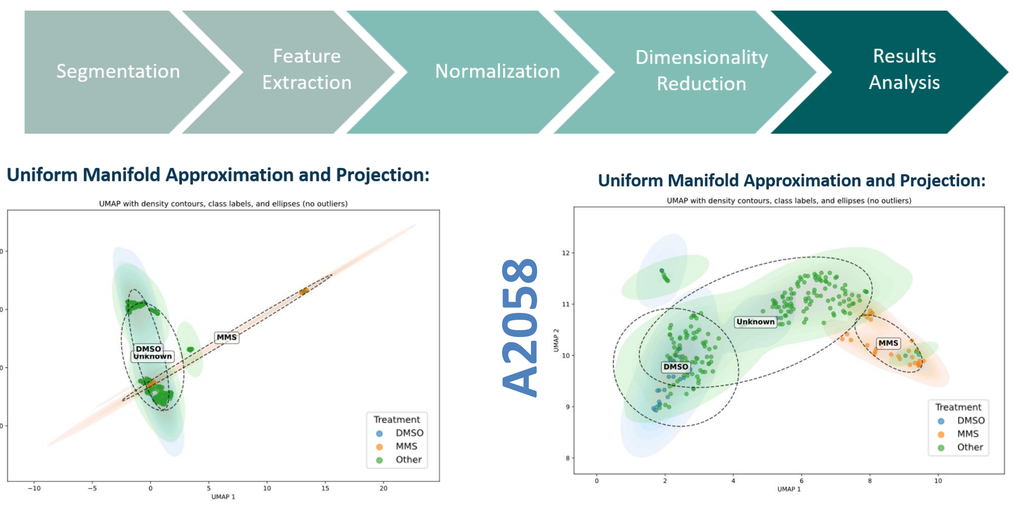
Confirmation in 3D cultures

- **Spheroids** formed in U-bottom low attachment plates.
- Spheroids **stained** with Hoechst (blue-nuclei), Calcein-AM (green-live cells) and Propidium Iodide, PI (red-dead cells).
- **High-Content Imaging** acquisition (Operetta CLS, Revvity).



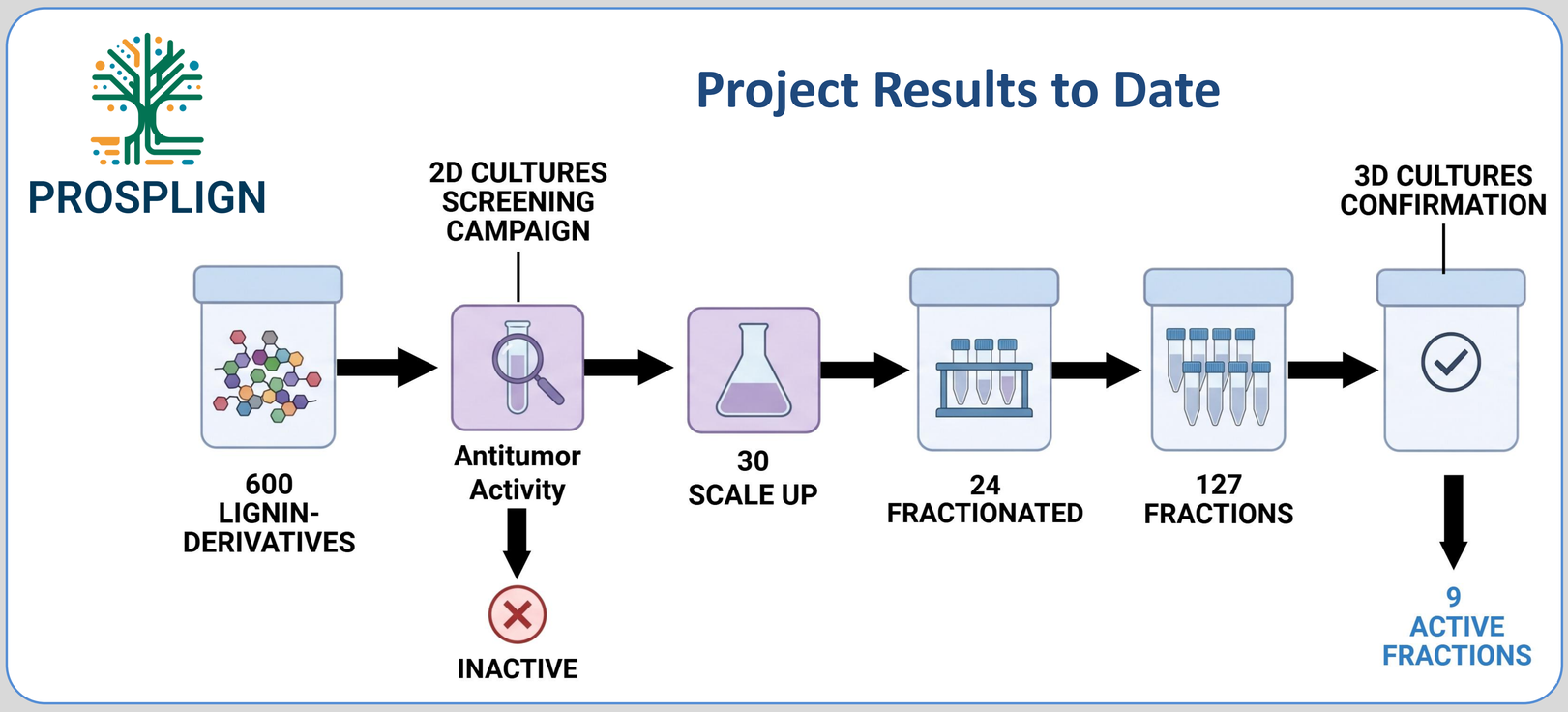
DMSO (dimethyl sulfoxide), MMS (methyl methanesulfonate)

- **Morphological** analysis – Harmony software (Revvity) – m3DinAI HCS DrugQuest **by MEDINA[3]**



- **Active fractions selected to identify the specific lignin-derived compound**

Project Results to Date



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- **Mackenzie et al. 2024.** Naphthoquinone Derivatives from Angustimassarina populi CF-097565 Display Anti-Tumour Activity in 3D Cultures of Breast Cancer Cells. Molecules. 2024 Jan 15;29(2):425.
- **Iañez et al. 2026.** Label-free morphometric profiling reveals early drug responses in 3D tumor spheroids. Research Square, preprint. https://doi.org/10.21203/rs.3.rs-9208673/v1.

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