Paper summaries

## Fundamentals of cancer metabolism – DeBeradinis

* Paper deals with the fact that cancer cells reprogram metabolic pathways to adapt to microenvironmental changes (oxygen limitation, ATP depletion…) and thus ensure the proliferation and growth of the cancer cells
* The goal of reprogramming the metabolic pathways is to e.g., take up adjacent nutrients which could be used for ATP-production or generate macromolecules (proteins, lipids, nucleic acid)
* Autophagy is used to metabolize excessive macromolecules (inside or outside of the cell) to compensate for the lack of nutrients (recycle amino acids)
* Mutations could be the cause of the reprogrammed pathways
* The altered genetic information within a cancer cell could lead to the accumulation of certain metabolites (oncometabolite) -> support cell proliferation or cell growth
* Abundant metabolites could also affect other enzymes and therefore influence signaling pathways
* Due to the reasons mentioned above, knowing which pathways are altered/ what kind of metabolites accumulate inhibition could be applied in these areas -> careful though: systemic effect of the inhibition has to be tested (difficult to replicate the tumor microenvironment in the lab)

# Elucidating cancer metabolic plasticity by coupling gene regulation with metabolic pathways – Jia

* Metabolic plasticity correlates with tumor progression, metastasis
* The goal of this paper is to find the link between gene regulation and metabolism in cancer cells
* Problem is the huge, intertwined network of metabolic pathways enabling cancer cells to survive/ proliferate
* Many different reactions partake in the production of a certain metabolite
* By breaking this complex network into a simpler framework consisting of major paths could analyze these individual paths in depth
* In this case the AMP activated Protein Kinase (AMPK), HIF-1, ROS explained their observations
* Discovery: three metabolic states: glycolytic, oxidative, hybrid) in cancer cells only first two states apply to normal cells
* These three states correspond to the HIF-1 degradation rate and the ROS being produced due to mitochondrial respiration
* Occurrence: cancer cells don’t respond to therapeutic approach because the cell switches to a different pathway -> drug combination
* **There bioinformatic approach: the use of transcriptomics and metabolomics data from breast cancer patients revealed revealed a higher glycolytic activity in BC samples compared to normal cells; AMPK and HIF-1 activity heterogeneity**