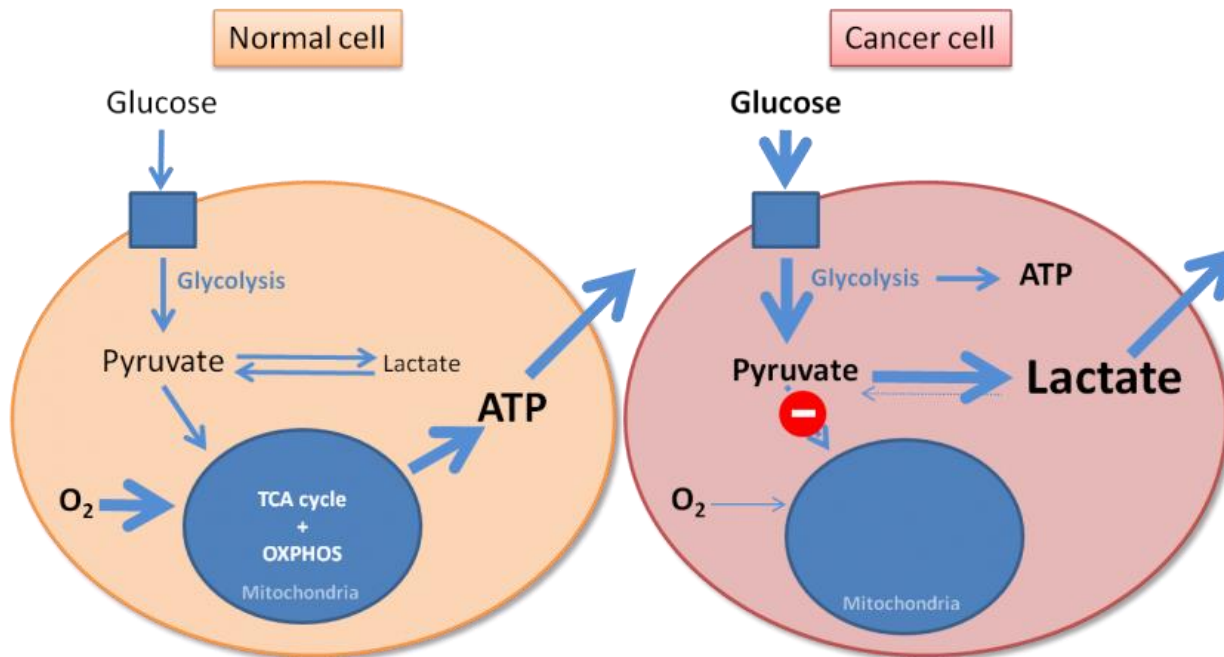


# Biological background: Cancer metabolism – Warburg effect

- Healthy cells primarily produce energy through mitochondrial ox. phos.
- Most cancer cells have high rate of glycolysis followed by lactic acid fermentation even in presence of abundant oxygen
- Aerobic glycolysis (the Warburg effect)
- Can we simulate the same behaviour using Genome-Scale Metabolic Models?



# Outline of practical

1. We will use the Recon 2.2 genome scale metabolic model (Swainston *et al.* 2016) and the COBRA package in Matlab (<https://opencobra.github.io/cobratoolbox/stable/>)
2. For all simulations, we will treat the model as 'cells growing in a medium' by virtually feeding it with RPMI medium
3. First, we will assess the difference between how much energy can be created in this model under aerobic and anaerobic conditions
4. Next, we will assess where the main differences in reactions fluxes occur
5. Finally, we will create a cancer specific model and repeat the steps. What are the differences between a metabolic model of a healthy cell culture and a cancer cell culture?

*We don't have the time for a complete programming course in Matlab, the focus of the practical is on interpretation. However, there is 'cheat sheet' [here](#) with the most common Matlab commands.*

# Short instructions

1. You can find all the required materials on Canvas
2. We will use Matlab for the practical
3. The installation process is as follows:
  1. Save **GEM\_Practical\_2021.zip** to: 'SYSTEM(C:) → 'Users' → 'Public' → 'Public Downloads'
  2. Unzip **GEM\_Practical\_2021.zip** (right-click and use e.g. 7-Zip)
  3. Open Matlab
  4. Open the **FBA\_normal.mlx** file in Matlab
    - *Go through the script line by line (use the 'Step' button on top)*
4. After completing the code and questions from **FBA\_normal.mlx**, open the **FBA\_cancer.mlx** file and go through it step by step as well
5. All instructions, including screenshots and weblinks with additional info, are included in the *mlx* files.
6. You may write your answers to the questions (also contained in the *mlx* files) in the separate Word file provided on Canvas.