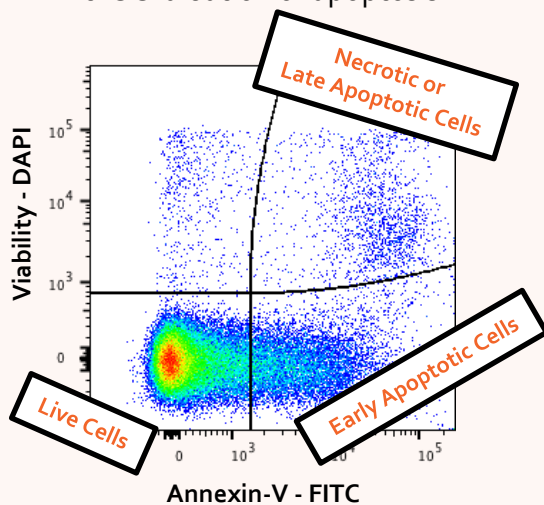


Apoptosis, or programmed death cell, is a highly controlled and complex process that occurs naturally in cells, differing from necrosis or accidental cell death. Apoptosis is a fundamental mechanism in the normal development of a living being. Apoptosis dysregulation can cause several diseases, including cancer. **The study of the cell changes during apoptosis can be done with flow cytometry.**

Plasma membrane modifications

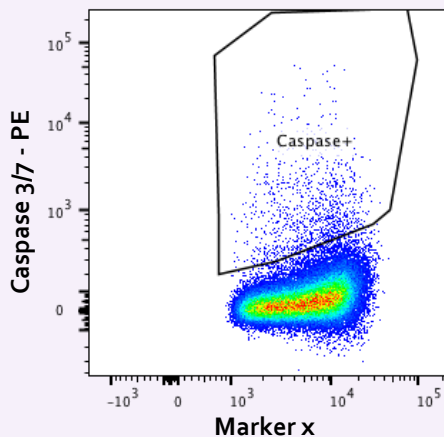
A unique feature of apoptosis is the externalization of phosphatidylserine (PS) in the phospholipid bilayer.

Annexin V can bind externalized PS. The conjugation of a fluorochrome to Annexin V coupled with a DNA-binding dye results in the evaluation of apoptosis.



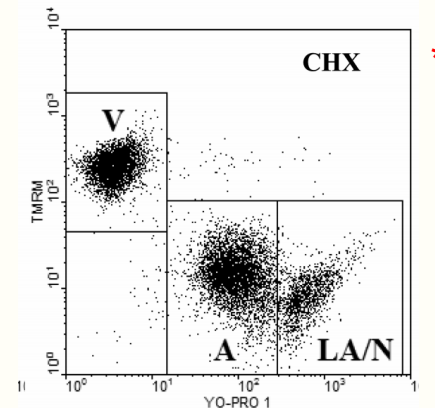
Activation of caspases

Another characteristic of apoptosis is the **activation of caspases** through caspase dimerization or cleavage. By staining caspase with specific antibodies it is possible to quantify the number of cells dying through apoptosis.



Mitochondrial function

The increase in mitochondrial membrane permeability can be reflected in **decrease of membrane potential** and a **dysregulation in the redox activity**. Dyes like TMRM, DiOC₆, DiI_{C1} or JC-1 that can measure potential difference, mitochondrial membrane disruption or redox state, can be used to study



*Suggested reading: Wlodkowic, D. (2009) doi:10.1007/978-1-60327-017-5_2