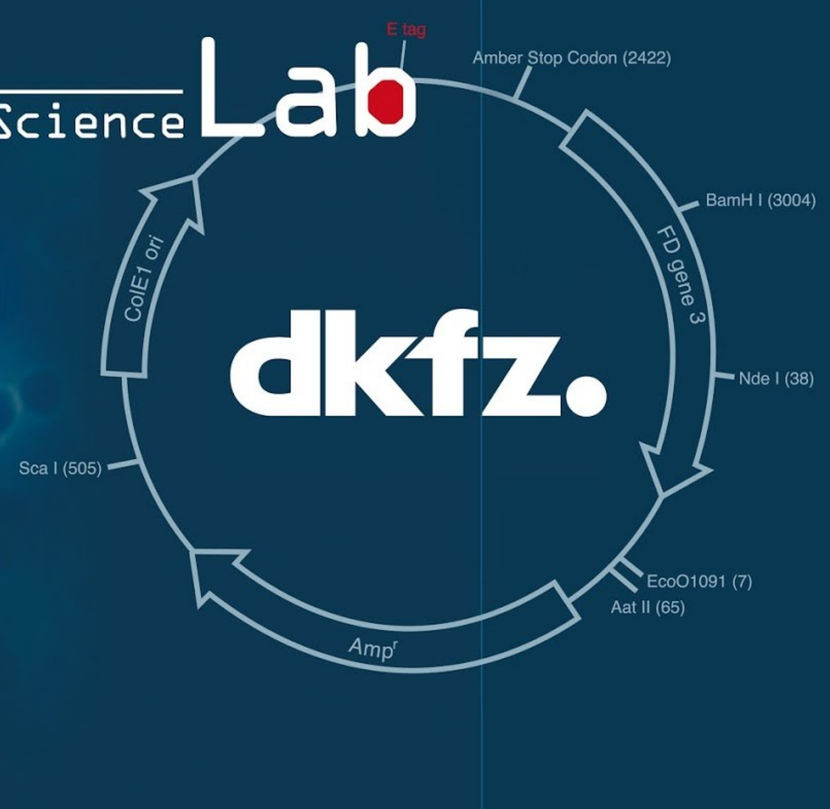
Heidelberger Life-Science Lab



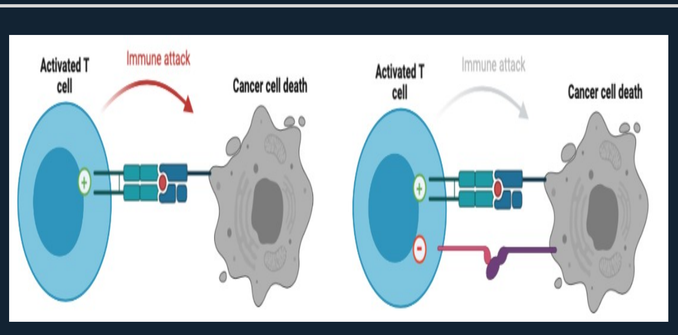
Immunology & Cancer AG

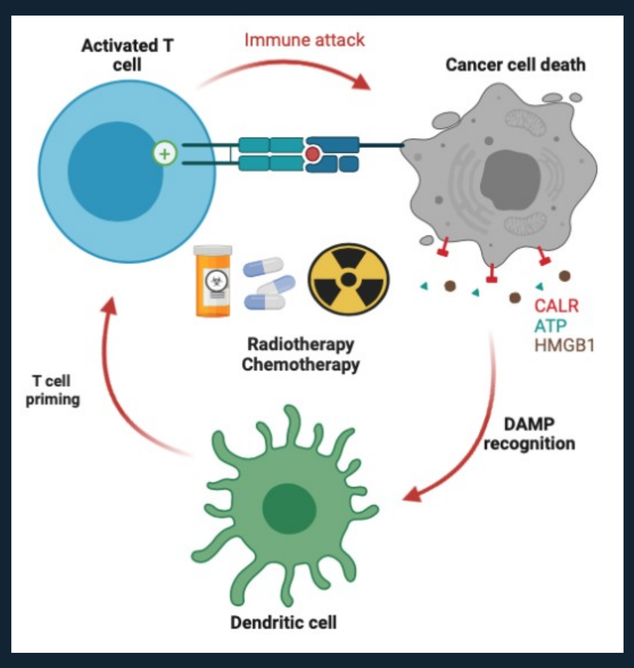
Cancer cells originate from our own cells when they accumulate extensive mutations or when they are infected by oncogenic viruses (e.g. HPV, EBV, etc.). Normally, the immune system would recognize abnormal or virus infected cells and eradicate them. However, cancer cells are capable of evading an attack by the immune system, either by making themselves unrecognizable or by directly inactivating immune cells and thereby preventing them from recognizing and killing their target.

In this working group, we will explore some of the cellular and molecular details of the immune system in the context of cancer: How can cancer cells evade the immune system? How can anti-cancer therapies (e.g. chemotherapy or radiotherapy) unmask cancer cells to the immune system?

What is the link between cancer and the immunity?

Biologically, cancer cells are not “foreign” and therefore should not be recognized by the immune system. However, the abnormalities in the cancer cell genome can be sufficient to trigger the immune system. Cancer cells can however also interact with immune cells to make themselves invisible or to inactivate them.





How does the immune system get rid of cancer cells?

The immune system is activated when a) a foreign antigen is detected and b) an inflammatory context in created (danger signals). The aberrations of cancer cells can lead to the presentation of abnormal/foreign antigens. But without the danger signals (inflammation), the innate immune system will not be able to train adaptive immune cells to recognize the cancer. Anti-cancer treatments can induce a form of cancer cell death that is accompanied by the release of danger signals (DAMPs), that activate the immune system. If in addition tumor antigens are presented, the immune system can be trained to kill cancer cells. Unfortunately, cancer cells can use various mechanisms that allow them to escape the immune cells. These complex interaction will be further explored during our group meetings.

Mentors:

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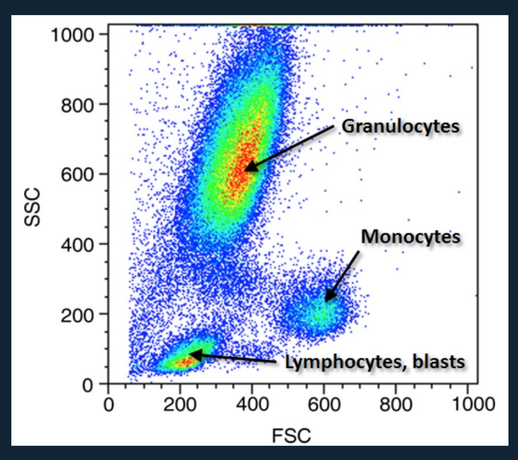
Meetings:

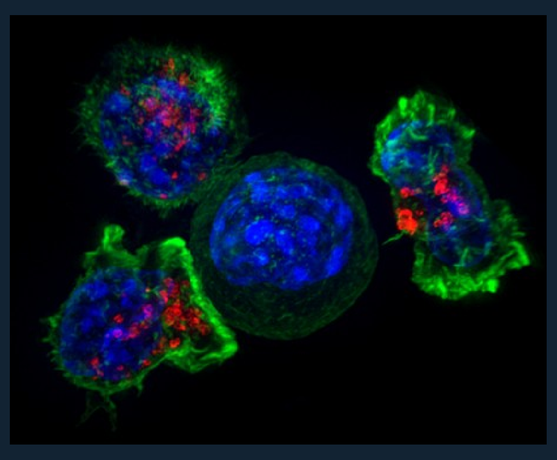
usually once a month, ca. 3-4h

What will we do in the Immunology and Cancer AG?

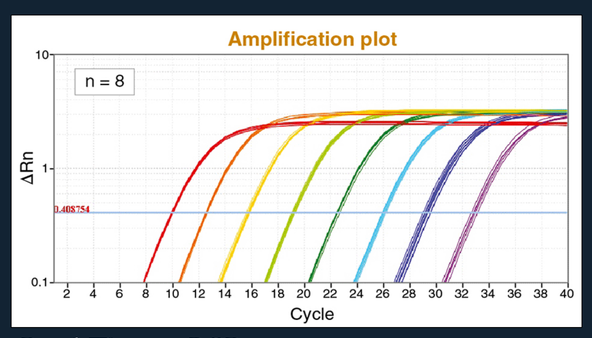
We will look at different aspects of anti-tumor immunity and mechanisms that allow cancer cells to escape the immune system. This course includes lectures about immunity and cancer, viral infections and emerging immunotherapy (e.g. CAR T cells). We will also do hands-on research and use different methods such as cell culture, Real Time qPCR, fluorescence microscopy, western blotting and flow cytometry. As **English** is the international language of science, we will do most of our classes in English. We are looking forward to do science with you!



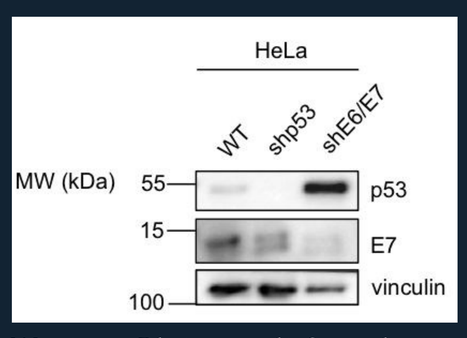
Immune cells in the blood (Flow Cytometry)



T cells killing a cancer cell (Fluorescence Microscopy)



Real Time-qPCR



Western Blot, result from last year

Links:

FACS: https://www.sinobiological.com/category/fcm-facs-what-is-fcm
pPCR: https://www.neb-online.de/en/pcr-and-dna-amplification/qpcr-real-time-pcr-and-rt-qpcr/luna-universal-rt-qpcr-reagents/
T-cells: https://viterbischool.usc.edu/news/2021/09/a-t-cell-power-up-for-tumor-treatments/