

Manifestation of Novel Social Challenges of the European Union in the Teaching Material of Medical Biotechnology Master's Programmes at the University of Pécs and at the University of Debrecen

Identification number: TÁMOP-4.1.2-08/1/A-2009-0011



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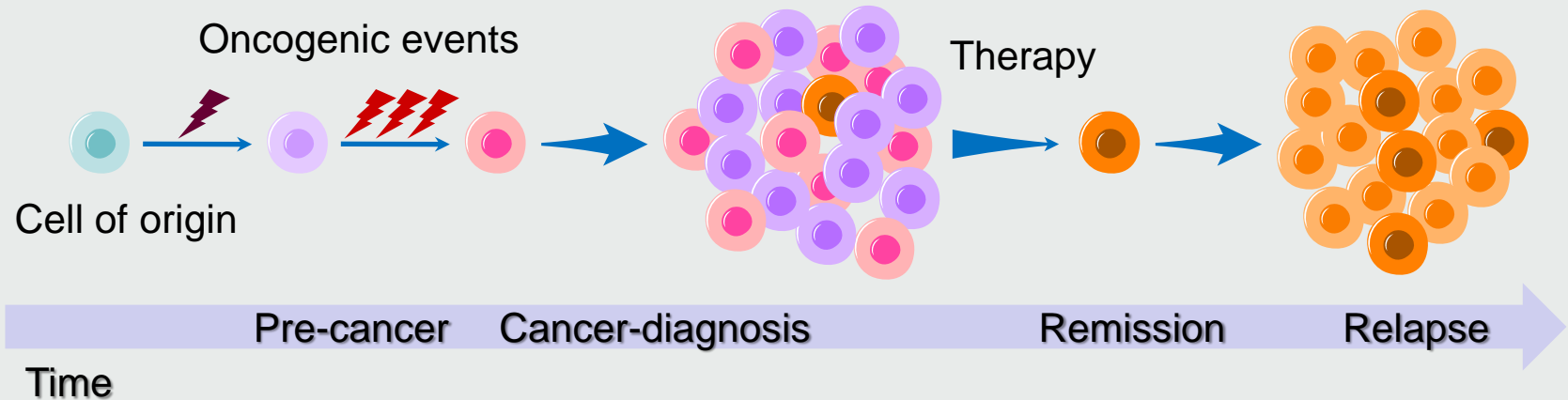
Dr. Péter Balogh and Dr. Péter Engelmann

Transdifferentiation and regenerative medicine – Lecture 13

CANCER STEM CELLS



Cancer and cancer stem cell theory



History of Cancer Stem Cell (CSC) theory

- Only a minority of malignant cells can induce tumors (1930-1950)
- SCF-U: identification of individual normal hemopoietic precursors generating large number of mature cells (1960-es)
- TFU: tumor-forming unit – malignant cells from one colony could generate large number of secondary colonies
- The composition of most tumors is heterogeneous
- AML – single cell source for an entire spectrum of malignant cells (1990-es)

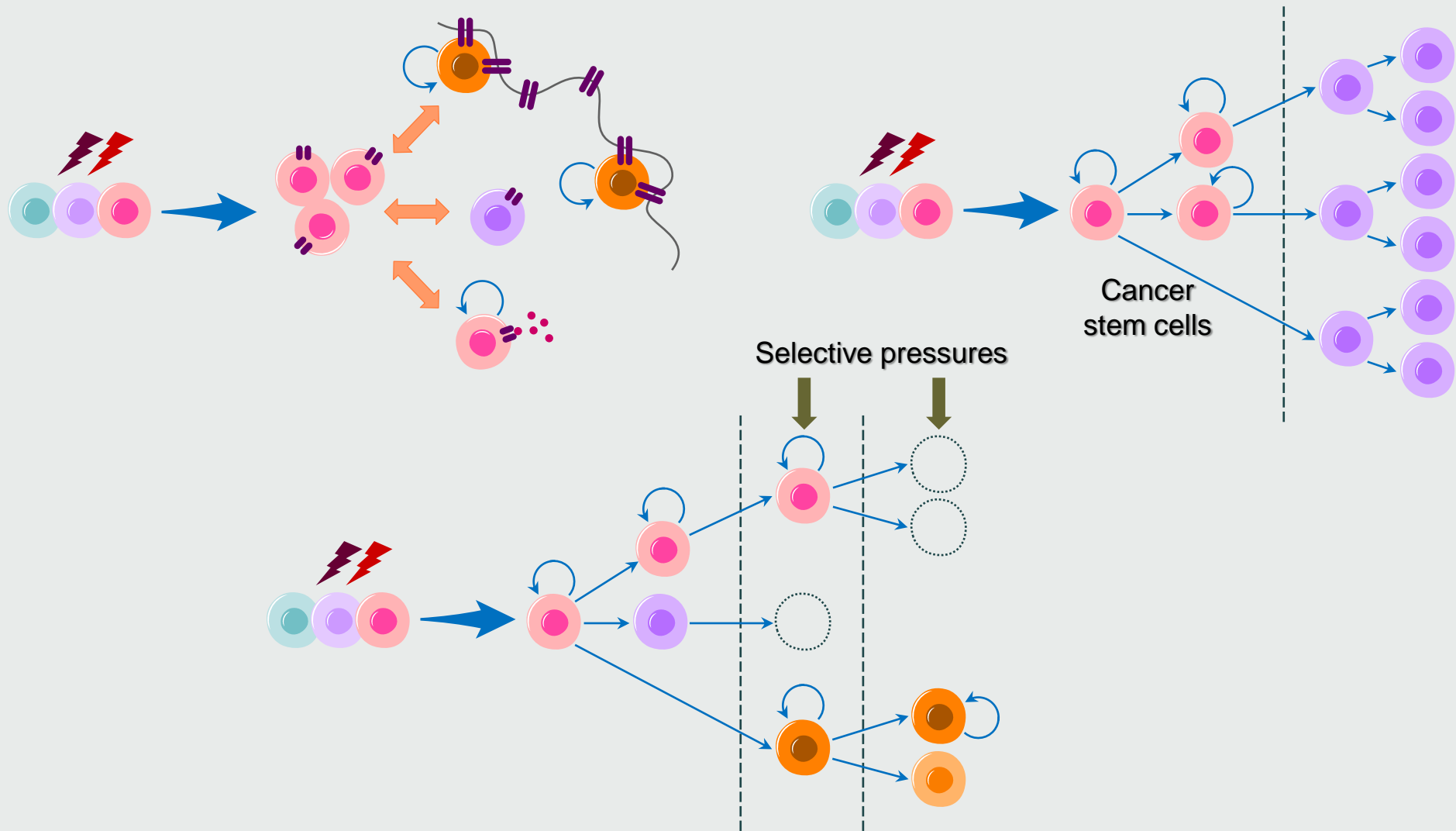
Solid tissue tumor CSCs

- Breast cancer
- Brain tumor
- Pancreatic cancer
- Lung cancer
- Colonic cancer, etc.
- Melanoma: use of a more immunocompromised mouse recipient led to the identification of higher number of CSCs than in conventional SCID recipients

Solid tissue CSC markers

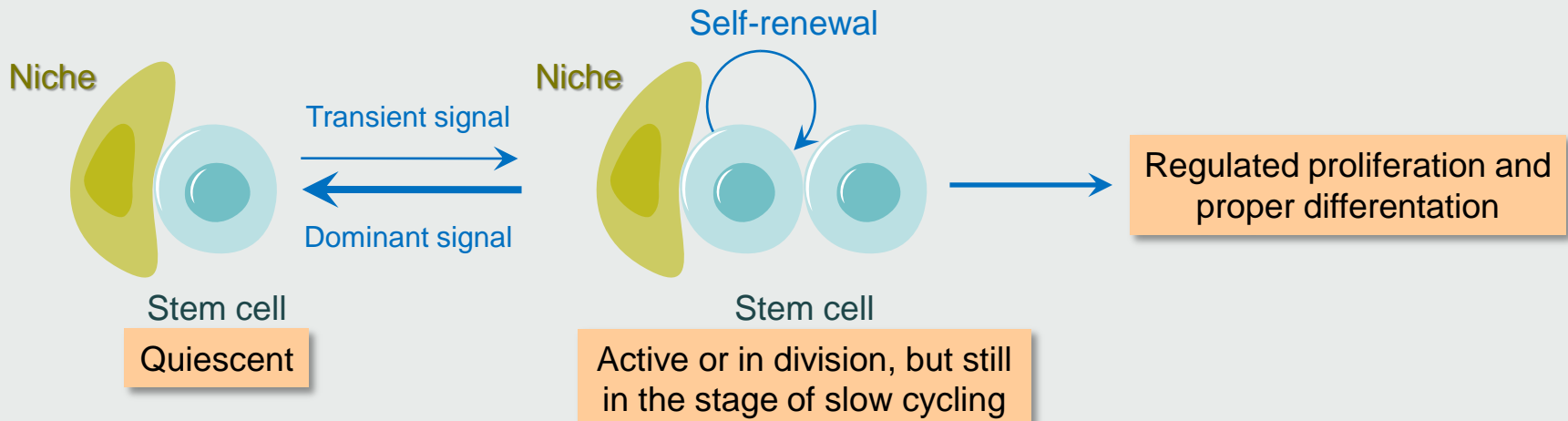
Cancer	CSC marker
AML	CD34+/CD38-
Brain tumor	CD133+
Breast cancer	CD44+/CD24-/Lin-
Prostate cancer	CD44+, CD133+
Retinoblastoma	ABCG2+
Lung cancer	SP-C+CCA+
Colon cancer	CD133+

CSC development: stochastic or hierarchic evolution and clonal selection

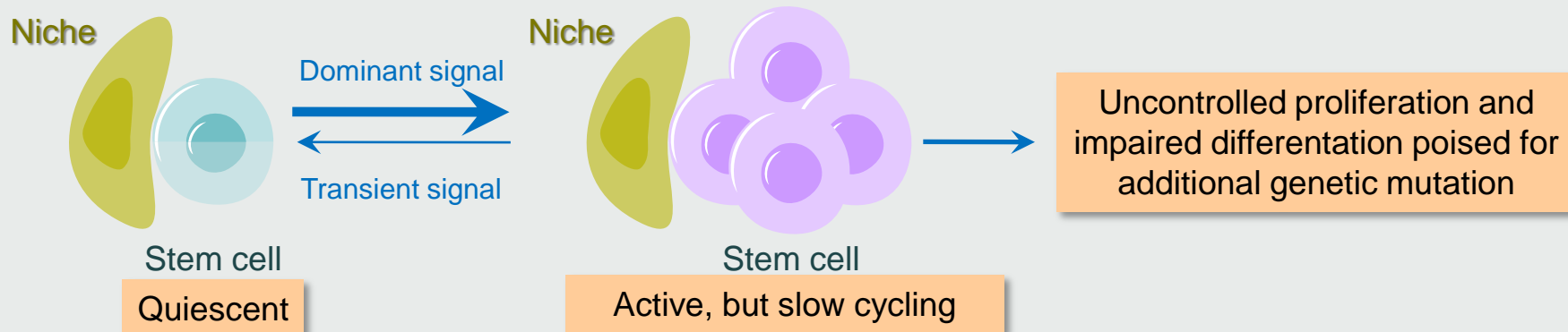


Altered niche for CSCs

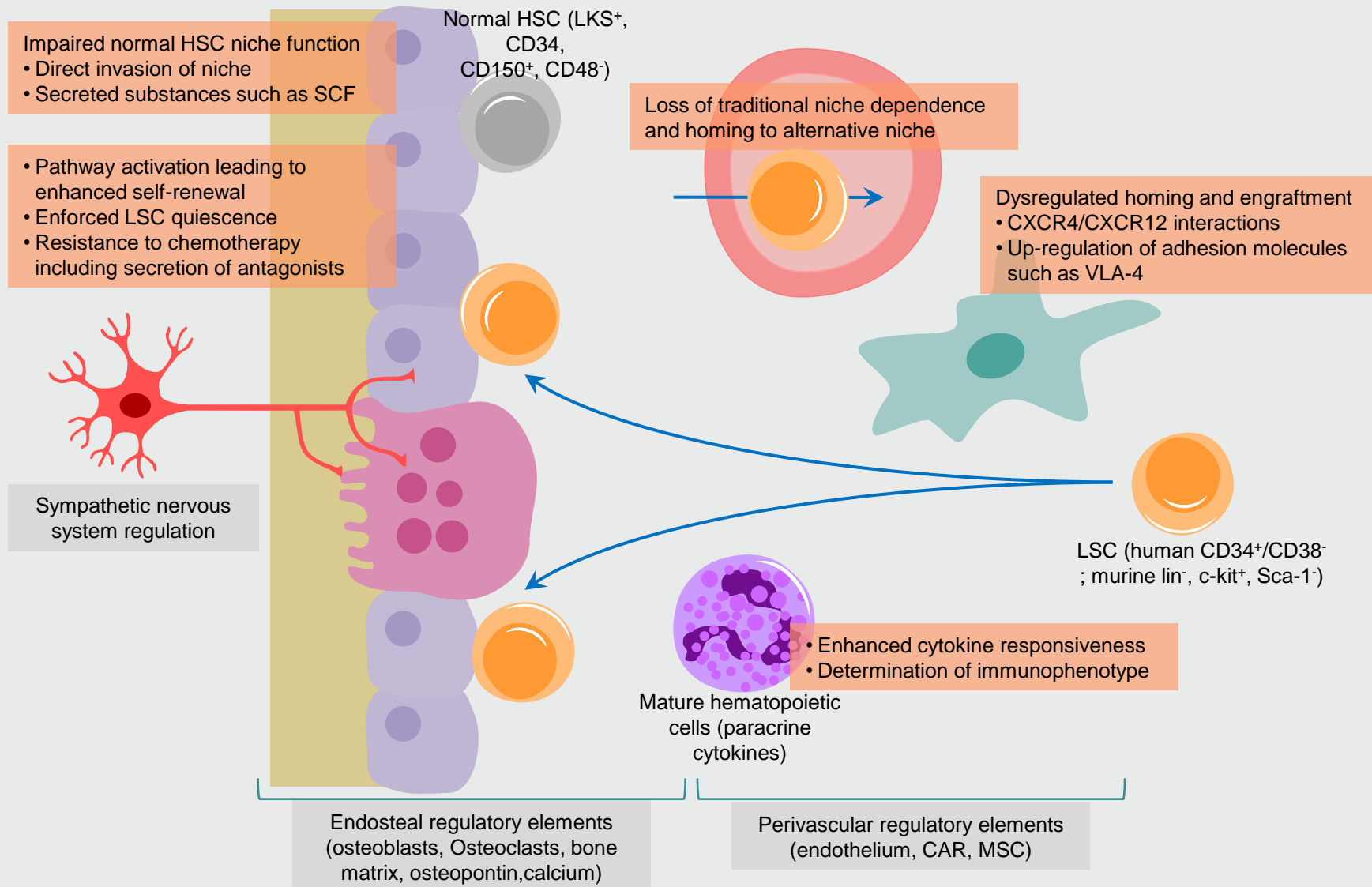
Under normal physiological conditions



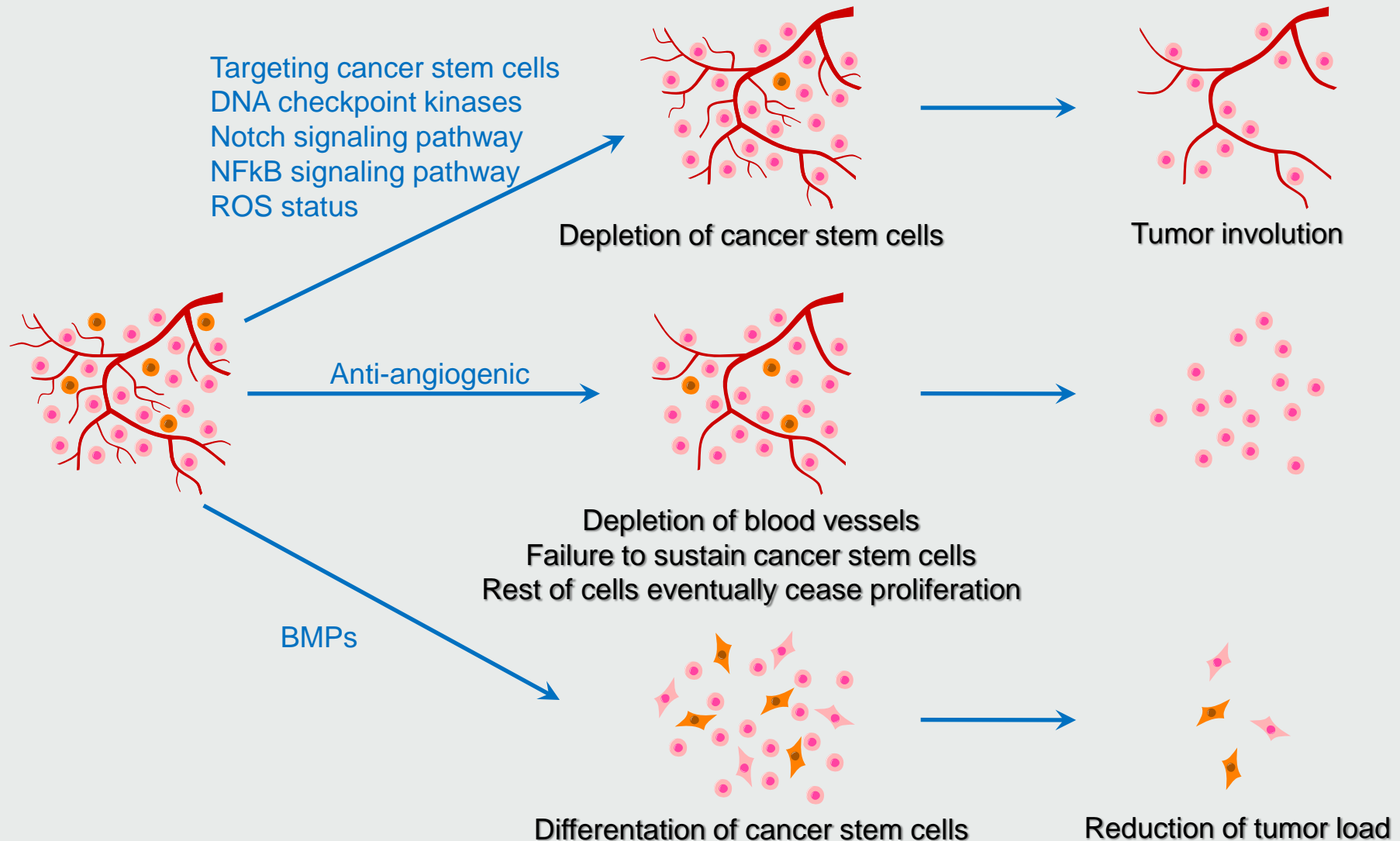
In cancers or tumors



AML niche characteristics



Combined treatment of cancers – CSCs and their niche



Summary

- Cancer stem cell represent a small compartment within the entire tumor tissue by the time of tumor diagnosis, that are capable for regenerating the entire tumor spectrum following cytoreduction; however, their adaptation to the current cytotoxic therapies poses a severe obstacle for efficient treatment.
- Similarly to the physiological stem cell niches, the interaction of CSCs with their niche is vital to the survival of CSCs and it may represent a novel target in therapy.