

Characteristics of tumour growth

The growth of cancer cells is caused by uncontrolled cell division and the impossibility of their wear and tear. Tumor cells also have an increased ability to survive. Tumor cells are characterized by the acquisition of resistance to apoptosis (their programmed death). their programmed death **transition of the G1-phase to the S-phase** is mainly affected.. A distinctive feature of the transformed cell is continued division. Their requirements for the presence of hormones and growth factors (needed for a normal cell) coming from the outside are reduced. Some transformed cells have the ability to autocrine stimulation, i.e. after the elimination of a specific substance, this in turn affects the cell. These are mainly specific growth factors. There is also a loss of the ability to stop growth.

Aberrant regulation of the cycle of cell division is one of the key points of tumor growth. The tumor cell tends to escape the physiological mechanism of controlling cell division.

Among the factors involved in this is also Efp (estrogen-responsive RING-finger protein), which controls the degradation of cell cycle inhibitors through ubiquitination and directs the rearranging of breast tumor growth from hormone-dependent mechanism to hormone-independent.

In vivo growth

The transformation of a cell into a tumor cell is caused by mutations in proto-oncogenes, tumor-suppressor genes and mutator genes. These mutations lead to **uncontrollable multiplication of transformed cells** (the main feature of malignant transformation). This process can affect the cells of all tissues.

Division of tumors

Basically, there are 3 main types of tumors:

1. sarcomas – from mesenchymal tissue,
2. carcinomas – from epithelial tissue,
3. hematopoietic and lymphoid malignancies – leukemia and lymphomas.

A more precise classification includes the site of origin, the type of tissue or, for example, the clinical stage or rate of progression.

Morphological picture

- tumors are formed by **proliferating tumor cells** (parenchyma), **connective non-tumorous tissue** (stroma) and **the vascular system**, the formation of which they stimulate themselves;
- often changed shape of the transformed cell;
- malignant reversal is associated with mutations in DNA of transformed cells;
- the suppressive effect of hormones on cell division is suppressed (impaired cell receptors);
- intercellular communication and the relationship of cancer cells to neighboring cells is disturbed;
- impaired fixation of tumor cells to a solid cell surface;
- In tumor cells we find so-called tumor neoantigens;
- cytogenetic examination reveals a high number of chromosomal breaks and numerous chromosomal abnormalities;
- mostly diagnosis in the late life of the individual;
- tumors arising as a result of several genetic changes over the years;
- However, there are also types of tumors with a specific occurrence in childhood and in younger individuals - eg. Wilms' kidney tumor, retinoblastoma, leukemia, lymphomas;
- A characteristic feature of the growth of a malignant tumor is its invasive growth - the ability to grow into the surrounding tissue and the ability to metastasize from the primary focus to other, distant organs (aggressive form of tumor tissue growth – conditioned by genetically acquired changes in the activity of proteolytic enzymes and a change in the adherence molecules of the cell surface).

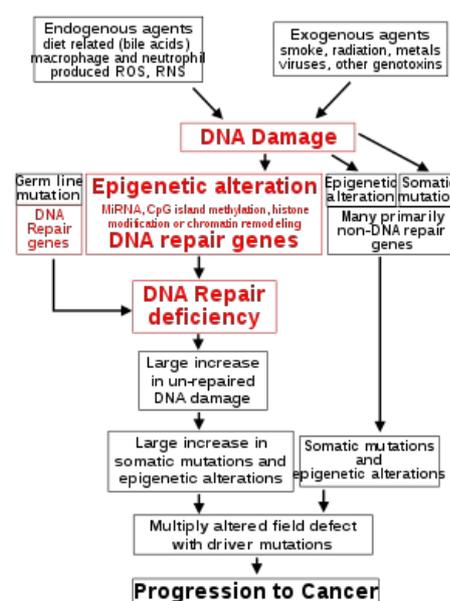


Diagram of tumor progression

In vitro growth

Having worked out the technique of tissue cultivation, it allows to define the differences between normal cells and malignantly transformed ones.

Normal cells

- during cultivation, they maintain the control of multiplication in the given environment **by regulation - the so-called contact inhibition** (cells stop growing after mutual contact, after the formation of a "monolayer");
- have a limited number of generations - max. 50;
- on the cell surface, they carry typical antigenic determinants corresponding to the antigenic determinants of the tissue from which the cell culture was derived;
- metabolism – mainly aerobic;
- high requirements for the presence of growth factors in the culture medium;
- diploid number of chromosomes;
- retain a specific cellular shape.

Tumor cells

- tumor cells have distinct surface antigens;
- when cultured, they acquire the ability of unlimited growth, loss of contact inhibition, transformed cells grow in several layers unorganized piled;
- culture is immortal, an unlimited number of generations arise;
- increased anaerobic metabolism – lower requirement for the amount of protein growth factors in the culture medium;
- altered chromosome count – heteroploid or pseudodiploid chromosomes, chromosomes of transformed cells often show random or non-random numerical or structural aberrations;
- often accompanied by a change in the shape of the cell;
- malignant reversal is encoded in the DNA of transformed cells.

chromosome of tumor-transformed cells often show various **chromosomal abnormalities**. These abnormalities can be both numerical, and structural. According to their relationship to malignant transformation, we distinguish **non-random** (primary) and **random** (secondary) changes.

Links

Bibliography

- MASOPUST, Jaroslav. *Patobiochemie buňky*. 1. edition. Praha : Univerzita Karlova, 2. lékařská fakulta, 2003. 344 pp. ISBN 80-239-1011-6.

Links

- ŠTEFÁNEK, Jiří. *Medicína, nemoci, studium na 1. LF UK* [online]. [cit. 2009]. <<http://www.stefajir.cz>>.