Neovascularization

This article has been translated from WikiSkripta; ready for the **editor's review**.

Neovascularization is a term for the new generation of vessels. It is mainly used in the sense of neovascularization of choroidal vessels or neovascularization in tumor growth.

Neovascularization in oncogenesis

🔎 *For more information see Biology of oncogenesis.*

Tumor cells begin to suffer from hypoxia at a deposit size of 1–2 mm^3. They then begin to release angiogenic growth factors and suppress angiogenic inhibitor levels. Neovascularization begins with:

- deposit sizes 1–2 mm^3;
- tumor cell count 10^6;
- tumor weight 1 mg.

At this stage, there is also the possibility of the first metastasis.

The mechanism of neovascularization is the same as for cells stimulated with growth factors.

Tumor cells produce:

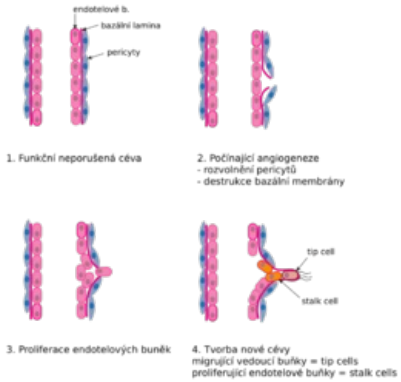
1) activators

- VEGFs (vascular endothelial growth factors),
- FGFs (fibroblast growth factors),
- PDGF (platelet derived growth factor),
- EGF (epidermal growth factor),

2) inhibitors

- thrombospondin-1,
- Statins – angiostatin, endostatin, canstatin, tumstatin.

Factor synthesis is shifted in favor of activator synthesis. In neovascularization, it is mainly the action of these factors on the precursors, from which the endothelial cells are then activated and eventually the formation of blood vessels takes place.



Mechanism of angiogenesis

The role of proangiogenic oncogenes is important in factor synthesis. Oncogene KRas, HRas ® upregulation of VEGF, downregulation of TSP-1 oncogene Fos, Bcl2 ® VEGF expression.

The network of newly formed vessels is irregular, the vessels branch a lot, "twist".

VEGF and related receptors have kinase activity, stimulating angiogenesis, lymphangiogenesis and cell proliferation.

Use of the mechanisms of neovascularization

Thanks to the known mechanism of neovascularization, there is now an effort to develop a way of treating tumors through the cessation of their vascularization. This would cause the cancer cells to become hypoxic and die. The mechanism can be:

- indirect – inhibition of angiogenic protein synthesis in tumor cells (FGF-β, VEGF, TGF-α)
- direct – inhibition of endothelial cell response to angiogenic proteins (FGF-β, VEGF, IL-8, PDGF)
  - growth factor receptor inhibition – Pertuzumab, Trastuzumab
  - growth factor inhibition – Bevacizumab (binding to VEGF ® does not bind to the receptor)
  - inhibition of receptor kinases
  - inhibition of Ras, CDK (kalmodulin dependent kinase); PKC (proteinkinase C); COX-2 (cyclooxygenase 2)

Therapy

Bevacizumab

- This substance is contained in *Avastin*. It is an anti-VEGF antibody. The drug is given every two weeks through infusions. *Avastin* is indicated for renal, gastrointestinal, breast, mediastinal, lung and pleural cancers.

Links

Related Articles

- Biology of oncogenesis
- Tumor Microenvironment

References