New strategy to combat cancer: Streamlining blood vessel walls

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Our blood vessels provide all growing tissues with oxygen and nutrients. The growth of blood vessels (a process termed angiogenesis) is indispensable for the proper functioning of organs and the repair of tissues when they have become damaged.

"Phalanx" cell

The researchers have been able to show that a reduced activity of the oxygen sensor PHD2 in case of oxygen shortage leads to the formation of a close-fitting, smooth, cobblestone-shaped lining of endothelial cells. This contiguous row of cells resembles a phalanx, the tightly-knit formation of soldiers with shields touching each other that the Greeks in classical antiquity used to win historical victories. This phalanx streamlines blood vessels, which improves the supply of oxygen - and medicines - to the surrounding tissue.

New treatments?

This discovery is an important breakthrough for the treatment of cancer. The larger a tumor grows, the more oxygen it requires. The tumor tries to remedy this situation by producing growth factors that stimulate the growth of new blood vessels. However, these new blood vessels have an abnormal shape, which impairs blood flow so that the cancer cells receive little oxygen. This shortage of oxygen forces cancer cells to escape the tumor and to metastasize to distant organs, which ultimately

results in a malignant cancer. In addition, the abnormal shape of the blood vessels restricts the delivery and effectiveness of anti-cancer medicines.

PHD2-blockers can offer new possibilities to combat cancer. By converting the abnormal endothelial layer into a phalanx of tightly aligned and impermeable cells, anti-cancer medicines can reach their destination more easily, and chemotherapy is improved. Furthermore, through the improved oxygen supply, the cancer cells are much less inclined to travel elsewhere. In addition, such a phalanx barrier of endothelial cells physically prevents cancer cells from worming their way to the blood inside the vessel and, thus, these cancer cells no longer have a chance to travel to other parts of the body and to start the growth of a new tumor there.

This research might also open new methods of treatment for disorders that are accompanied by a shortage of oxygen, such as myocardial infarction or stroke. The researchers also hope to be able to use this discovery to tackle the morbid growth of blood vessels in the retina.

Source: VIB (the Flanders Institute for Biotechnology)