The Vascular Endothelial Growth Factor Pathway of Angiogenesis in Tumors: Associated Pharmaceutical Targets and Treatments

David P. Maison

[1]*Life Chiropractic College West, Hayward, California 94545, United States*
[2]*Michigan State University, College of Osteopathic Medicine-Pharmacology & Toxicology, East Lansing, Michigan 48824-1316, United States*

Corresponding author. E-mail: maisondp@gmail.com

https://doi.org/10.12982/CMUJNS.2018.0023

Received: *December 8, 2017*
Revised: *April 10,2018*
Accepted: *April 19, 2018*

ABSTRACT

Tumor angiogenesis is a cellular and molecular process in many species that is responsible for the sprouting and development of blood vessels into a tumor. This vasculature supplies a tumor with nutrients and oxygen. This supply is an absolute requirement for solid tumors to grow and become metastatic. The pathway associated with VEGF (Vascular Endothelial Growth Factor) ligands and VEGF receptors is considered the primary pathway of the tumor angiogenesis process. This review first outlines the VEGF-pathway of tumor angiogenesis, focusing on the VEGF ligands and receptor cascades resulting in delta-like-ligand 4 (DLL4) and downstream intercellular reactions with Notch. The review commences at a tumor's oncogenic switch to the angiogenic phenotype, and concludes at the completion of angiogenesis – the establishment of functional tumor vasculature and enhanced metastatic capabilities. Second, this review provides an overview of current pharmaceutical tumor treatments exclusively targeting the VEGF pathway of angiogenesis, including a basic summary of the primary VEGF pathway-targeted drugs, with a focus on drug targets and Food & Drug Administration (FDA) approval status for indicated forms of cancer. Finally, this review discusses novel and hypothetical mechanisms to target tumor angiogenesis with therapeutics, focusing on two established targeting devices and proposing one possible mechanism utilizing the complement system that targets vasculature in a manner mimicking type II hypersensitivity with chimeric complement.

Keywords: Cancer, Angiogenesis, Antibodies, Cancer therapy, VEGF