Tumor-associated angiogenesis refers to the growth of new vessels toward and within the tumor. Several studies have revealed that increasing intratumoral microvessel density, a major of tumor-associated angiogenesis, correlates with greater aggressiveness of prostate cancer. Angiogenesis consists of multiple, sequential, and interdependent steps dependent on the local balance of proangiogenic and antiangiogenic molecules. Many proangiogenic and antiangiogenic molecules have been demonstrated to regulate growth and metastasis of prostate cancer.

As tumor-associated angiogenesis is a crucial step in the process of prostate cancer development, inhibition of tumor neovascularization, and/or destruction of tumor vasculature (antiangiogenic therapy) may maintain the tumors in a dormant state or, perhaps in combination with cytotoxic therapies, potentiate shrinkage of tumors. Recently, therapeutic agents targeting the receptors of proangiogenic molecules and their signal transduction cascade have been developed.

In this article, the role of angiogenic molecules in prostate cancer biology, and the application of angiogenesis inhibition to therapeutics for prostate cancer are reviewed.

Keywords: angiogenesis, prostate cancer, metastasis, antiangiogenic therapy
1) Vascular endothelial growth factor (VEGF)

2) Interleukin-8 (IL-8)
3) Fibroblast growth factor 2 (FGF 2)

There are many fibroblast growth factors in various stages of cell development. In vitro and in vivo studies have shown that FGF 2 plays a role in angiogenesis. In vivo, FGF 2 is involved in the proliferation of endothelial cells and the formation of new blood vessels. In vitro, FGF 2 stimulates the production of vascular endothelial growth factor (VEGF) and other angiogenic factors.

4) Epidermal growth factor (EGF)

Epidermal growth factor is a mitogenic factor that stimulates the proliferation of epithelial cells. In angiogenesis, EGF promotes the proliferation of endothelial cells and the formation of new blood vessels. EGF also stimulates the production of other angiogenic factors, such as VEGF.

5) Platelet-derived growth factor (PDGF)

Platelet-derived growth factor is a mitogenic factor that stimulates the proliferation of various cell types, including endothelial cells. In angiogenesis, PDGF promotes the proliferation of endothelial cells and the formation of new blood vessels. PDGF also stimulates the production of other angiogenic factors, such as VEGF.

H. Uehara. Angiogenesis of prostate cancer

1) Interferon (IFN)

Interferon alpha (IFN-α) and beta (IFN-β) are antiangiogenic cytokines. In vitro, IFN-α and IFN-β inhibit the proliferation of endothelial cells and the formation of new blood vessels. In vivo, IFN-α and IFN-β inhibit the growth of tumors and the formation of new blood vessels.

2) Endostatin

Endostatin is a fragment of collagen IV that inhibits angiogenesis. In vitro, endostatin inhibits the proliferation of endothelial cells and the formation of new blood vessels. In vivo, endostatin inhibits the growth of tumors and the formation of new blood vessels.

3) 45
The Journal of Medical Investigation Vol. 50 2003

Bone  Muscle

VEGF

IL-8

FGF2

PDGF B

PDGF-Rβ

Activated PDGF-Rβ

The images show the distribution of VEGF, IL-8, FGF2, PDGF, and PDGF-Rβ in bone and muscle tissues. The images indicate the presence of these growth factors and their receptors in both tissue types, suggesting a potential role in the growth and differentiation of these tissues.

The data from the images suggest that VEGF, IL-8, FGF2, PDGF, and PDGF-Rβ play a crucial role in the regulation of bone and muscle development. The presence of these factors in both tissues indicates that they may be involved in the cross-talk between these tissues during development and regeneration.

Further studies are needed to understand the specific functions of these factors in bone and muscle development, as well as their potential therapeutic applications.
Angiogenesis of prostate cancer

H. Uehara.
The Journal of Medical Investigation Vol. 50 2003

in vivo

in vitro