



Vascular Biology

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The vascular system involves the heart and blood vessels. The blood vessels include arteries, which are tubes that transport blood from your heart to the rest of your body, and veins, which return the blood to your heart. This complex system is involved in many diverse functions, but the most important is transporting vital oxygen and nutrients to your tissues and organs.

ARTERIES are thicker and are prone to developing blockages or dilations.

VEINS are thinner and have valves that keep the blood moving back toward the heart. The larger deep veins of the legs can develop clots.

Blood vessels are composed of three layers.

- The inner layer (intima) is lined by specialized cells called endothelial cells. One of the main functions of this lining is to keep the vessels from clotting.
- The middle layer (media) is composed of muscle cells, and allows the vessels to expand and contract.
- The outer layer (adventitia) provides strength so vessels do not burst under pressure.

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Why vascular biology matters to you

Diseases of the vascular system can be life-threatening or can severely decrease your quality of life. Vascular biology helps scientists and vascular surgeons and other physicians understand the causes of vascular diseases. With this knowledge, new and better methods to prevent and treat these diseases become possible.

In general, diseases of the blood vessels (particularly the arteries) involve either blockage, usually due to

atherosclerosis (hardening of the arteries), or degeneration (weakening of the wall) resulting in aneurysm. Common diseases include:

- **CAROTID ATHEROSCLEROSIS** involves blockage of the arteries that supply the brain with blood. When these arteries become diseased, a stroke (brain damage) may result.
- **AORTIC ANEURYSM** involves degeneration of the main blood vessel within the body, the aorta. When the wall of the aorta weakens, it starts to dilate. Rupture of the aorta in this circumstance can lead to death.
- **PERIPHERAL ARTERIAL DISEASE** involves blockage of the arteries that supply the legs with blood. When these arteries become diseased, the person may be unable to walk without pain, or may even lose his/her limbs.

What scientists hope to learn

Scientists hope to learn effective methods for preventing leading vascular diseases like atherosclerosis. This would lead to fewer strokes and heart attacks (the result of blocked heart arteries), and preservation of the function of our legs. Atherosclerosis is a very complex disease that results from smoking, diabetes, cholesterol and high blood pressure. Controlling these risk factors, however, is not enough to prevent such a devastating disease and future research is critical for cures in this area.

Similarly, a better understanding the nature of aortic aneurysm will help prevent deaths from rupture of the aorta. Degradation of the wall of the aorta that results in aneurysm formation is also a very complex process that can be related to smoking, high blood pressure and atherosclerosis. Current treatments involve replacement of the aorta. With more knowledge of the disease process, however, scientists may learn how to prevent the problem altogether.

The future of vascular biology

Much research has been dedicated to describing the exact changes within our arteries that result in atherosclerosis and aneurysm. Looking forward, research will focus on understanding:

- How genetics make us prone to these diseases.
- How stem cells, those cells in our bodies that are responsible for regenerating tissues, help repair degenerating arteries.

With a full understanding of these unique processes, scientists and physicians will not only find ways to prevent and treat these diseases, but also find ways to offer personalized treatments based on a person's specific genetic make-up.

Why vascular biology is important

Vascular biology research can lead to the prevention of the diseases that are the leading causes of death in Western cultures, including heart attack and stroke. This research is very costly to perform but can lead to significant improvement in lifespan and quality of life.

Most medical research is supported by government, the health care industry and various foundations, including the Society for Vascular Surgery Foundation . Contributions from patients are critical to the advancement of vascular biology and all of its benefits.

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